



Chemical Management Handbook

FOR

AUSTRALIAN SCHOOLS

Edition 3

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This handbook has been developed by Dr Virginia Ward.

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The Chemical Management Handbook was developed by Science ASSIST in recognition of a need for guidance on the safe handling, storage and waste disposal of chemicals in schools. The Handbook provides information on mostⁱ of the chemicals in the Science ASSIST List of Recommended Chemicals in the form of a one-page summary per chemical, which covers safe handling, storage and first aid, and waste disposal procedures.

For a few of the chemicals, an additional Laboratory Notes page is included, giving more detailed directions for solution preparation and/or waste disposal. For the enzymes, the individual summaries are in abbreviated form with other information provided as generic for the group.

The summary pages are arranged alphabetically in the document, and can also be accessed via the bookmarks which are ordered according to chemical group.

Explanatory Notes

IDENTIFIERS, DESCRIPTIVE, PHYSICAL AND REGULATORY DATA

Each summary page is headed by the **chemical name**, which corresponds to the chemical's main identifier in the List of Recommended Chemicals. Under this chemical name up to three of the more commonly used synonyms are given in italics.

Descriptive, Physical data and Regulatory information was drawn from a range of sources which are listed in the General References section (see below).

The **User Group** codes are defined as in the List of Recommended Chemicals as follows:

User Group	Definition
F-12	Recommended for use by students in Foundation (Reception, Kindergarten) to Year 12 as well as staff.
7-12	Recommended for use by students in Year 7 to Year 12, as well as staff.
7-12S	Recommended for use in dilute solution by students in year 7 to year 12 and recommended for use as a solid by qualified staff.
11-12	Recommended for use by students in Year 11 and Year 12, as well as staff.
11-12S	Recommended for use in dilute solution by students in Year 11 and Year 12 and recommended for use as a solid by qualified staff
Staff	Recommended for use in dilute solution by students in year 11 and year 12 and recommended for use as a solid by qualified staff. (Qualified Staff: A technician or teacher with tertiary-level chemistry training and/or experience such that they understand the chemistry and hazards involved with handling the chemical)

ⁱ Chemicals which are currently in the List and have been omitted from this Handbook are either non-hazardous or low hazard and used only infrequently, or their safe handling has been covered elsewhere by Science ASSIST

SAFE HANDLING

The main hazards of the substance and relevant notes for safe handling are summarised in this section.

Glove selection

Factors to consider when choosing protective gloves include not only whether the glove material is suitable, but also the thickness of the glove and length of the cuff. There is no glove type which provides protection from every chemical. A glove type may be unsuitable due to degradation through contact with the chemical and/or because the chemical can easily permeate the material. Degradation is a change to the structure of the material and may be obvious to the wearer as the glove may swell and feel tacky, or harden and crack. Permeation of the glove by the chemical occurs at the molecular level and may go undetected. Once the chemical has permeated through the glove, it has the potential to harm or be absorbed by the skin. If gloves are unsuitable or used beyond the limit of their protective capability, they may increase the risk of harm to the user. The glove material itself may be harmful; for example, latex may trigger an allergic reaction.

Gloves made from heavy, highly chemical-resistant material can be expensive and can limit the dexterity of the user, thus contributing to the hazard of chemical handling. Disposable gloves provide a lower level of protection, but offer convenience and less reduction in dexterity. Choosing a glove type can therefore be a compromise between chemical resistance, dexterity, economy and convenience.

The Handbook suggests the appropriate glove material(s) suitable for the chemical, based on information in safety data sheets and the glove resistance guides listed as references. As glove performance can vary between brands, the glove manufacturer's chemical resistance guide should also be consulted to check the level of protection offered by a specific type of glove for the chemical being used.

If gloves of a suitable type are unavailable, then disposable gloves can still provide protection from splash contact. Two pairs of disposable gloves (double gloves) can also be worn to provide an extra protective barrier. If the gloves being used are not ones recommended for the chemical, they should be removed immediately in the event of splash contact.

Cotton-lined gloves and powdered gloves are not recommended for handling chemicals as they have poor chemical resistance properties. However, cotton gloves worn under outer, chemically resistant gloves can protect the skin from an allergic reaction to the glove material.

Safety notes for glove use

- Before use, gloves should be checked for damage or tears.
- When removing disposable gloves, the correct technique should be used so that the skin is not contaminated with the chemical (see General References for links to instructions in this technique).
- Disposable gloves should be disposed of after a single use and not reused.
- Reusable gloves should be washed before they are removed.
- Hands should be washed with soap and water immediately after removing gloves.

STORAGE

Storage Categories

Safe storage of chemicals is integral to ensuring the health and safety of school laboratory technicians, science teachers and students as well as preventing structural damage to school facilities. Hazardous chemicals need to be stored safely with appropriate segregation in order to minimise the potential for dangerous reactions between incompatible substances.

The Australian Dangerous Goods Code provides a good basis for the organisation of chemical storage according to the physical hazards of chemicals, such as flammability, corrosivity and oxidising properties. Further consideration is required for incompatibilities within a Dangerous Goods class and where a chemical belongs to more than one class.

Ideally, chemicals with more than one Dangerous Goods class should be segregated from all other chemicals. However, if space is limited, then storage along with chemicals in the main DG class, with secondary containment, is acceptable.

General Requirements for chemical storage can be found in AS/NZS 2243 Safety in Laboratories, Part 10: 2004 Storage of chemicals. This Standard covers the basic principles of storage, required features in a laboratory, storeroom or space, the use and storage of chemicals within a laboratory and storage of chemicals in a separate store. This standard also specifies the quantities of chemicals which may be stored in a laboratory outside of a storage cabinet.

Separation and segregation

In the context of chemical storage, the term 'separation' refers to physical distance between chemical storage areas. The term is generally used in relation to storage of large quantities of dangerous goods and is not so relevant to schools where smaller quantities of chemicals are involved. Barriers such as a fire-proof walls are an acceptable substitute for separation distances.

The term 'segregation' refers to the storage of chemicals within one storeroom, laboratory or storage cabinet. Chemicals can be segregated vertically by means of walls, cupboard partitions or storage cabinets, and horizontally by means of shelves, either open or within a cupboard or cabinet.

Ideally, incompatible chemicals will be segregated through vertical segregation or storage in separate cabinets. Vertical segregation has the advantage that it avoids the mixing of incompatible chemicals in the event of a shelf collapse.

Secondary containment can provide a sufficient segregation barrier where quantities of chemicals are small.

Secondary containment

A secondary container should be large enough to contain 1.1 times the volume of the bottle it holds and should be resistant to the chemical being contained. Suitable chemically resistant secondary containers include sturdy polypropylene (PP) or high density polyethylene (HDPE) tubs. A layer of sand in the bottom of the container is a good measure for absorbing any spills and keeping the bottle in a stable, upright position.

General guidelines for safe chemical storage

- Label all containers of chemicals according to the relevant legislation.
- Each chemical container should have a designated storage location to where it is replaced after use. Shelves can be labelled accordingly or the locations of chemicals recorded on a diagram.
- Store chemicals away from sunlight. Sunlight can damage lids and containers as well as promote the decomposition of chemicals.
- Store chemicals away from extremes of heat.
- Store liquids below solids.
- Store concentrated solutions on low shelves, below dilute solutions and solids.
- Store concentrated corrosives with secondary containment. Other liquids and toxic substances should preferably be stored with secondary containment/spill trays.
- Ensure good ventilation where volatile chemicals are stored.
- Check stock, lids and containers regularly for damage or deterioration.
- Store chemicals securely, with access restricted to authorised staff, and particularly for toxic and security-sensitive chemicals.
- Purchase chemicals in small quantities. Mark the date received on new chemicals.
- Mark the date opened on peroxidisable chemicals.
- Do not store chemicals in alphabetical order except within their storage class.
- Do not use food containers for laboratory chemicals.
- Do not store chemicals on shelves which are incompatible with the chemical, such as metal shelves for corrosives or wooden shelves for oxidising agents.
- Do not store containers of chemicals on the floor.

SPILLS

For many liquid spills the use of an absorbent mixture of equal volumes of sodium carbonate, vermiculite or bentonite (clay cat litter), and dry sand has been suggested. This recipe was developed by Armour *et al.*¹ as a general, inexpensive absorbent mixture which could be pre-prepared and stored as part of a spill response kit. The sodium carbonate is included to help to neutralise the spill. The cat litter or vermiculite absorbs the liquid and helps to eliminate fumes. The sand 'moderates and smothers any reaction that may occur'.¹

Commercial spill absorbents are also available and dry sand can be used in the absence of an alternative.

WASTE DISPOSAL

School science activities in general do not produce large volumes of chemical waste and do not generate the same type of waste on a continual basis. Nevertheless, managing chemical waste in schools can be challenging as there may be limited resources to treat and store waste. Hazards also arise from the need to store waste for long periods of time until there is sufficient to justify a collection by a licenced waste contractor.

The Handbook includes procedures for the treatment of chemical waste where the procedure is straightforward and within the usual expected capacity of schools. Treating chemical waste can minimise the volume of waste, remove or reduce the hazard and reduce the cost of disposal. Such treatments include evaporation of water from an aqueous solution, neutralisation of acids and bases, controlled destruction of reactive chemicals, reduction of oxidising substances to give a less reactive product, and precipitation of heavy metal ions as stable salts.

The accepted pH for waste water varies between regions, with the wider range of pH 6-10 accepted by some water authorities. The Handbook specifies neutralising acids and base to within the range pH 6-8 in order to accommodate the variation between regions. Modern schools usually have settling or neutralisation tanks installed in line from the science area. These tanks usually contain lime and therefore will contribute to the neutralisation of acid and the precipitation of insoluble carbonates, and enable the settling of suspended solids.

The waste water acceptance limit for a particular analyte can be found on the relevant water authority website. In determining whether a concentration complies with the waste water acceptance standard, dilution due to the school's total output of waste water should be taken into consideration.

The following categories of waste must not be discharged to sewer:

Heavy metal waste: hazardous for the environment. Sludge from waste water treatment plants is ultimately returned to the environment, often as fertiliser for agriculture. For this reason only very low levels of heavy metal ions are acceptable in waste water.

Halogenated solvent

Fats and oils: can affect waste water processing operations

Flammable or volatile liquids, water-immiscible liquids which float on water: can cause a fire or explosion and create hazards for water authority workers.

Aqueous solutions with high or low pH: can corrode pipes and present hazards for workers.

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DANGER



Formula C₄H₉Br
CAS No. 109-65-9
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid. Heavier than water.	Molar mass 137.03	ADG Class 3
SOLUBILITY Very slightly soluble in water. Soluble in ethanol, diethyl ether and acetone.	Melting point -112°C	Packing Group II
Solubility in water 0.87 g/L (25°C)	Boiling point 102°C	UN Number 1126
	Specific gravity 1.28 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton® gloves are recommended; nitrile or butyl rubber gloves provide limited splash protection). Exposure may cause irritation of the skin, eyes and respiratory tract. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Open the bottle with care to avoid inhaling the headspace vapour. Keep away from heat and ignition sources. There is potential for the vapour to collect in low-lying, confined areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back. This solvent may dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, strong bases, alkali metals, alkaline earth metals. Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior organic chemistry: substitution/elimination reactions and reaction rates

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Absorb spill with inert material such as dry sand, vermiculite or bentonite. Collect material with a non-sparking tool, place in a suitable labelled container and arrange for collection. Ventilate the spill area, then wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste in a suitable labelled container such as for halogenated organic waste. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.
IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

DANGER



Formula C₄H₉Cl
CAS No. 109-69-3
User Group 11-12

DESCRIPTION

Clear, colourless, volatile liquid with a chloroform-like odour. Lighter than water.

SOLUBILITY

Very slightly soluble in water. Soluble in ethanol, methanol, and diethyl ether.

Solubility in water 0.5 g/L (20°C)

PHYSICAL DATA

Molar mass 92.57
Melting point -123°C
Boiling point 78°C
Specific gravity 0.89 (20°C)
Flammability Highly flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group II
UN Number 1127
Poisons Schedule -
Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (fluorinated rubber or Viton gloves are recommended; nitrile or butyl rubber gloves provide limited splash protection). Exposure may cause irritation of the skin, eyes and respiratory tract.

Handle in an operating fume cupboard or well-ventilated area. Keep away from heat and ignition sources. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Open the bottle with care to avoid inhaling the headspace vapour.

There is potential for the vapour to collect in low-lying, confined areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back. This solvent may dissolve some plastics.

STORAGE

The substance is air- and light-sensitive. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, strong bases, alkali metals, alkaline earth metals, light metal powders. Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior organic chemistry: substitution/elimination reactions and reaction rates

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Absorb spill with inert material such as dry sand, vermiculite or bentonite. Collect material with a non-sparking tool and place in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor. Ventilate the spill area, then wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste in a suitable labelled container such as for halogenated organic waste. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

WARNING

Formula C₄H₉I
CAS No. 542-69-8
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with an ethereal odour. Heavier than water.	Molar mass 184.02	ADG Class 3
SOLUBILITY Slightly soluble in water. Soluble in ethanol and diethyl ether.	Melting point -103°C	Packing Group III
Solubility in water 0.2 g/L (20°C)	Boiling point 130°C	UN Number 1993
	Specific gravity 1.615 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H312 Harmful if swallowed
H332 Harmful if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton® gloves are recommended; nitrile or butyl rubber gloves provide limited splash protection). Exposure may cause irritation of the skin, eyes and respiratory tract. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Keep away from heat and ignition sources. There is potential for the vapour to collect in low-lying, confined areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back. This solvent may dissolve some plastics.

STORAGE

Substance is air- and light-sensitive. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, strong bases and alkali metals. Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

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IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

DANGER



Formula C₄H₉Cl
CAS No. 507-20-0
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with an ethereal odour. Lighter than water.	Molar mass 92.57	ADG Class 3
SOLUBILITY Slightly soluble in water. Soluble in ethanol and diethyl ether.	Melting point -27°C	Packing Group II
Solubility in water 2.9 g/L (15°C)	Boiling point 51°C	UN Number 1127
	Specific gravity 0.84 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H302 Harmful if swallowed
H412 Harmful to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton® gloves are recommended; nitrile or butyl rubber gloves provide limited splash protection). Exposure may cause irritation of the skin, eyes and respiratory tract. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Open the bottle with care to avoid inhaling the headspace vapour. Keep away from heat and ignition sources. There is potential for the vapour to collect in low-lying, confined areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back. This solvent may dissolve some plastics.

STORAGE

Substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from strong oxidising agents, strong bases, powdered metals. Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior organic chemistry: substitution/elimination reactions and reaction rates

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Absorb spill with inert material such as dry sand, vermiculite or bentonite. Collect material with a non-sparking tool, place in a suitable labelled container and arrange for collection.

Ventilate the spill area, then wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste in a suitable labelled container such as for halogenated organic waste. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

ANGER

Formula C₅H₁₂O
CAS No. 75-85-4
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a disagreeable odour and burning taste.	Molar mass 88.15	ADG Class 3
SOLUBILITY Soluble in water, ethanol, diethyl ether, acetone and glycerol.	Melting point -8°C	Packing Group II
Solubility in water 118 g/L (20°C)	Boiling point 102°C	UN Number 1105
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H332 Harmful if inhaled
H315 Causes skin irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract.

Symptoms of exposure include nausea, headache, dizziness and CNS depression. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure may cause transient corneal clouding.

Handle in an operating fume cupboard. Avoid inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, strong acids, alkali metals and alkali earth metals.

Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a tertiary alcohol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small Spill: Treat as for Waste Disposal.

Large spill: Cover spill with with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₄H₁₀O

CAS No. 78-83-1

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with a sweet, musty odour.	Molar mass 74.12	ADG Class 3
SOLUBILITY Soluble in water, ethanol, acetone and diethyl ether.	Melting point -108°C	Packing Group III
Solubility in water 85 g/L (20°C)	Boiling point 106-108°C	UN Number 1212
	Specific gravity 0.803 (25°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H315 Causes skin irritation
H318 Causes serious eye damage
H335 May cause respiratory irritation
H336 May cause drowsiness or dizziness

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of inhalation or ingestion include nausea, headache, dizziness and CNS depression. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure to the liquid may cause severe irritation and eye damage.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, strong acids, strong alkalis, alkali metals, alkaline earth metals and aluminium. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small Spill: Treat as for Waste Disposal.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₄H₁₀O

CAS No. 75-65-0

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, hygroscopic crystals or liquid with a camphor-like odour.	Molar mass 74.12	ADG Class 3
SOLUBILITY Miscible with water, alcohols, diethyl ether, esters, ketones and aromatic and aliphatic hydrocarbons.	Melting point 24-26°C	Packing Group II
Solubility in water Miscible	Boiling point 81-83°C	UN Number 1120
	Specific gravity 0.79 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H332 Harmful if inhaled
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of inhalation or ingestion include nausea, headache, dizziness and CNS depression. Prolonged or repeated skin contact can lead to dryness, cracking and allergic dermatitis. Eye exposure to the liquid may cause conjunctivitis. Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. In cool weather, if the alcohol freezes, it can be melted by placing the bottle within a plastic bag into a warm water bath.

STORAGE

The alcohol is hygroscopic. With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, strong acids, alkali metals, alkaline earth metals and aluminium. Store with flammable liquids in an AS compliant cabinet.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste.
Large spill: Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus 2-methyl-propan-2-ol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE: 13 11 26

APPLICATIONS

Senior chemistry: to observe the reactivity of a tertiary alcohol.

Formula $C_{12}H_6Cl_2NNaO_2 \cdot 2H_2O$

CAS No. 620-45-1

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green, odourless, hygroscopic powder.	Molar mass 326.11	ADG Class -
Dye family indophenol	Melting point -	Packing Group -
Solubility water Slightly soluble ethanol Soluble	Flammability Combustible	UN Number None
	Absorption ¹ (λ_{max}) 605 nm ¹	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

The substance is hygroscopic. Store in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from oxidising agents. Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful if a large amount is ingested, or if inhaled or absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor.

APPLICATIONS

- redox dye
- for monitoring the rate of photosynthesis
- determinations of ascorbic acid (vitamin C)

COLOUR CHANGE

OXIDISED

blue

REDUCED

colourless

PREPARATION

Determination of vitamin C: Dissolve 0.1g in 100mL of distilled water.²

References:

1. Aldrich Handbook
2. CLEAPSS

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

Laboratory Notes

INTRODUCTION

Dyes are organic molecules which absorb radiation in the visible spectrum and thereby appear coloured. Dyes can change colour in response to a change in the environment, such as a change in the pH, an electrical potential difference or the presence of metal ions which can bond to the dye.

Dyes and indicators can present hazards which include toxicity, sensitisation and carcinogenicity. For some dyes and indicators there is a wealth of knowledge and data regarding the health hazard they present, whereas for other dyes, such information is limited. The potential health hazard of less well-known dyes can sometimes be inferred from data on related substances which have a similar structure.

Therefore, when handling dyes and indicators, it is best to adopt a precautionary approach and take care to avoid any exposure to the substance.

SUGGESTED CONTROL MEASURES

Limiting exposure time and concentration

The dilute form of dyes and indicators and the infrequency of use helps to minimise exposure of students to dyes and indicators. Following safe practices in the handling of these substances is therefore of greater relevance to laboratory staff who prepare solutions from the dye powders.

Microscale techniques

The adoption of microscale techniques is an excellent control measure for limiting the volume of chemicals used and which have to be disposed of. Well plates are very useful for activities such as testing the pH of a variety of substances. Well plates are available as white ceramic tiles or as transparent plastic plates.

Choice of storage bottle for class sets

The use of small 'medicine' type bottles could be considered for class sets of dyes and indicators. These are amber glass bottles with a dropper and screwcap closure.

The amber glass helps to protect the dye from degradation due to light exposure. The screwcap closure helps to protect the contents from air-oxidation and to prevent loss of solvent where ethanol is a component. There is also less chance of the cap becoming contaminated with the dye compared with other types of bottles, such as plastic screwcap bottles.

Medicine bottles are also available in small volumes (25mL), which may be preferable for indicators which are used infrequently and in small quantities.

PREPARING SOLUTIONS

It is important to work in a well-ventilated, draft-free area when weighing fine powders. Working in an operating fume cupboard may not be ideal when handling fine powders as the powder can be swept up in the air flow and can contaminate the fume cupboard surfaces.

Therefore, if the substance is in the form of a fine powder, it is recommended that transfers of the powder be carried out in a fume cupboard which is switched off, but with the sash down; this provides a barrier to exposure to the powder.

To weigh a fine powder

- Wear PPE. Work in a fume cupboard that is not turned on, with the sash lowered, to minimise exposure to the powder.
- Position an electronic balance in the fume cupboard.
- Place a shallow, chemically-resistant tray in the fume cupboard.
- Carry out transfers of the powder in the shallow tray. This will contain any spills of the powder.
- After the solution has been prepared, switch the fume cupboard on. Clean up any spills according to the Spill directions specific for the chemical.
- Finally, wash the tray with water and detergent.

To weigh a crystalline or granular substance

- Wear PPE. Work in an operating fume cupboard.
- Place a shallow, chemically-resistant tray in the fume cupboard.
- Position the electronic balance close to the fume cupboard.
- Carry out transfers of the substance in the shallow tray. This will contain any spills of the substance.
- Pre-weigh a covered vessel (e.g. a small beaker covered with a watchglass)
- In the fume cupboard, transfer the substance to the vessel.
- Cover the vessel before removing it from the fume cupboard to weigh the substance.
- Return the covered vessel to the fume cupboard to adjust the quantity of substance and continue in this way until the required has been transferred.
- After the solution has been prepared, clean up any spills according to the directions specific for the chemical.
- Finally, wash the tray with water and detergent.

If the substance is to be made into a solution which is partly ethanol (or methylated spirits) and partly water, then it should first be dissolved in the ethanol, with warming if necessary. Distilled water is then added to make up to the desired volume.

REFERENCES

For the sources of the recipes and some items of data given in the summary pages for dyes and indicators, abbreviated references is given with corresponding full references in the table below.

Abbreviation	Reference
Gabb & Latchem	Gabb, M.H. and Latchem, W.E. 1967. A Handbook of Laboratory Solutions, Andre Deutsch Ltd, Oxford G.B.
Flinn	Flinn Scientific Inc. 2008. Laboratory Solution Preparation, Flinn Scientific website. https://www.flinnsci.com/api/library/Download/18ce587821c24fb3b0ad7d878bd6a3d9
Dungey	Dungey, Barbara. 2006. The Laboratory: a science reference and preparation manual for schools (Rev. ed), National Library of Australia: Traralgon, Vic..
Protocol Online	Protocol Online – Your lab’s reference book, http://www.protocol-online.org/ (Accessed November 2018)
IHC World	IHC WORLD Life Science Products and Services, Protocol database, http://www.ihcworld.com/ (Accessed November 2018)
StainsFile	StainsFile, the Internet Resource for Histotechnologists, http://stainsfile.info/StainsFile/jindex.html (Accessed November 2018)
Carolina	‘Carolina Solution Sheets’, Caroline Biological Company website, https://www.carolina.com/teacher-resources/carolina-solution-sheets/22401.co (Accessed November 2018)
CLEAPSS	CLEAPPS. 2011. The CLEAPPS recipe book. CLEAPPS website, http://science.cleapss.org.uk/Resource-Info/All-CLP-Recipe-Sheets.aspx (updated March 2017) (login required)
Canterbury	Determination of Total Calcium and Magnesium Ion Concentration’. University of Canterbury website. https://www.canterbury.ac.nz/media/documents/science-outreach/magnesium_calcium.pdf (accessed October 2018)
Sabnis	Sabnis, R.W. 2010. Handbook of Biological Dyes and Stains, synthesis and industrial applications, John Wiley and Sons, Inc. Hoboken, New Jersey.
Guelph	‘Dye-reduction-tests-methylene-blue-and-resazurin’ University of Guelph website. https://www.uoguelph.ca/foodscience/book-page/dye-reduction-tests-methylene-blue-and-resazurin (accessed November 2018)
Aldrich Handbook	Green, F. J. 1990. The Sigma-Aldrich Handbook of Stains, Dyes and Indicators, Aldrich Chemical Company, Inc: U.S.A.

WARNING

Formula C₅H₁₂O
CAS No. 123-51-3
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with a disagreeable odour.	Molar mass 88.15	ADG Class 3
SOLUBILITY Sparingly soluble in water. Miscible with ethanol, diethyl ether, petroleum ether and glacial acetic acid.	Melting point -117°C	Packing Group III
Solubility in water 25 g/L (20°C)	Boiling point 131°C	UN Number 1105
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H332 Harmful if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of inhalation or ingestion include nausea, headache, dizziness and CNS depression. Prolonged or repeated skin contact can lead to dryness and cracking. Eye contact with the liquid may cause severe irritation.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, acid chlorides, halogens, reducing agents, alkali metals and aluminium. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus 3-methyl-butan-1-ol in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₆H₁₂O
CAS No. 108-10-1
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile, highly flammable liquid with a sharp, agreeable, mint-like odour.	Molar mass 100.16	ADG Class 3
SOLUBILITY Slightly soluble in water. Soluble in ethanol, acetone and diethyl ether.	Melting point -84°C	Packing Group II
Solubility in water 19 g/L (20°C)	Boiling point 116°C	UN Number 1245
	Specific gravity 0.80 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H332 Harmful if inhaled
H319 Causes serious eye irritation
H335 May cause respiratory irritation
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause irritation of the skin, eyes and respiratory tract. Ingestion or inhalation may cause CNS depression, drowsiness and dizziness. Eye contact may result in severe irritation. Prolonged or repeated skin contact may have a degreasing effect and may lead to dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid inhaling fumes, vapour or mist. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Test for peroxides before use. Heating to over 30°C may promote the formation of peroxides.

STORAGE

The ketone is hygroscopic and may form explosive peroxides when heated or on exposure to air. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents, metals, acids, alkalis, plastics and rubber. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: solvent for extraction of natural products; sample compound for gas chromatography.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand.
Small quantity: Place spill material in a shallow vessel in an operating fume cupboard and allow the ketone to evaporate from the absorbent. Dispose of the absorbent material as general waste.

Large quantity: Place in a suitable labelled container and store for collection.

Ventilate the spill area to evaporate any residual ketone and wash thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Isobutyl methyl ketone is not toxic for aquatic life and is expected to biodegrade in the environment and not bioaccumulate.

Small quantity: Place in a shallow vessel in an operating fume cupboard and allow to evaporate.

Large quantity: Store in a suitable labelled bottle such as for 'waste non-halogenated organic liquid'. Arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose empty bottles to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove immediately contaminated clothing. Rinse skin with water/shower. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



Formula C₈H₉NO
CAS No. 103-84-4
User Group 11-12

DESCRIPTION

White, shiny crystalline leaflets or powder with a faint acetic acid odour and slightly burning taste.

SOLUBILITY

Slightly soluble in water. Soluble in ethanol, acetone, diethyl ether and glycerol.

Solubility in water 6.1 g/L (25°C)

PHYSICAL DATA

Molar mass 135.17
Melting point 114°C
Boiling point 305°C
Specific gravity 1.21 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of inhalation or ingestion include headache, cough, shortness of breath and dizziness.

Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and ingestion and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from heat and any sources of ignition.

Store away from strong oxidising agents and strong bases. Store with general organic solids.

APPLICATIONS

Senior chemistry: investigating the properties of amides; aromatic substitution reactions.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Scoop up with a non-sparking tool, transfer to a suitable labelled container and store for collection.

Wipe down spill area with paper towel dampened with 60-70% ethanol/methylated spirits then wash area thoroughly with detergent and water. Store contaminated paper towel in a sealed plastic bag or in container with spill material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation occurs, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately contaminated clothing. Rinse skin with water/shower. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



DANGER

Formula C₂H₄O₂
CAS No. 64-19-7
User Group 11-12



DESCRIPTION

Clear, colourless, hygroscopic liquid or clear crystalline solid (in cold weather) with a characteristic pungent, vinegar-like odour.

SOLUBILITY

Miscible with water, ethanol, diethyl ether and acetone.

Solubility in water 602.9 g/L (20°C)

PHYSICAL DATA

Molar mass 60.05
Melting point 16.7°C
Boiling point 118°C
Specific gravity 1.05 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 8 (3)
Packing Group II
UN Number 2789
Poisons Schedule S6
Security IDM Cat 3

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, butyl rubber; nitrile gloves provide splash protection). Exposure may cause irritation of the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage.

Handle in an operating fume cupboard. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Vapour is heavier than air and may collect in low-lying areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back. Handle away from heat and ignition sources.

STORAGE

The concentrated acid is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents, bases, alkali metals and alkaline earth metals.

Store with separately from other chemicals, on a low shelf, with secondary containment.

APPLICATIONS

General science: diluted, an example of an organic acid.
Senior chemistry: titration of a weak acid; ester preparation.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Decant the neutral solution down the sink with further dilution. Dispose of the residual solids as general waste. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



DANGER

Formula C₃H₆O
CAS No. 67-64-1
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile, highly flammable liquid with a characteristic sweet odour.	Molar mass 58.08 Melting point -95°C Boiling point 56°C Specific gravity 0.79 (20°C) Flammability Highly flammable	ADG Class 3 Packing Group II UN Number 1090 Poisons Schedule S5 Security IDM Cat 3
SOLUBILITY Soluble in water, ethanol and diethyl ether. Solubility in water Miscible		

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause irritation of the skin and respiratory tract. Ingestion or inhalation may cause CNS depression, drowsiness and dizziness. Eye contact may result in severe irritation. Repeated or prolonged skin contact may have a degreasing effect and may lead to dermatitis. There is a risk of aspiration into the lungs if ingested. Handle in an operating fume cupboard or well-ventilated area. Avoid inhaling fumes, vapour or mist. Avoid contact with skin and eyes. Handle away from heat and other sources of ignition. There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back.

STORAGE

Acetone is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents, metals, acids, alkalis, plastics and rubber. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: in the reaction rate experiment, the iodination of propanone.
Technical: solvent for many organic compounds and some inorganic substances; for welding plastics (acrylic, ABS).

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand. Place spill material in a shallow vessel in an operating fume cupboard and allow acetone to evaporate from the absorbent. Dispose of the absorbent material as general waste. Ventilate the spill area to evaporate any residual acetone and wash thoroughly with water.

WASTE DISPOSAL

Acetone is readily biodegradable and is not expected to bioaccumulate.
Small quantity: Place in a shallow vessel in an operating fume cupboard and allow to evaporate.
Large quantity: Store in a suitable labelled bottle such as for 'waste non-halogenated organic liquid'. Arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose empty bottles to heat, open flames or other sources of ignition. Rinse empty bottles thoroughly with water to remove any residual solvent.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.
IF ON SKIN: Remove immediately contaminated clothing. Rinse skin thoroughly with water/shower. If irritation occurs, seek medical advice.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

DANGER

Formula C₂H₃ClO

CAS No. 75-36-5

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless fuming liquid with a pungent odour.	Molar mass 78.5	ADG Class 3 (8)
SOLUBILITY Miscible with diethyl ether, glacial acetic acid and petroleum ether. Soluble in acetone.	Melting point -112°C	Packing Group II
Solubility in water Decomposes	Boiling point 51°C	UN Number 1717
	Specific gravity 1.1 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H314 Causes severe skin burns and eye damage
AUH014 Reacts violently with water

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber; nitrile for splash contact). Acetyl chloride is corrosive and a lachrymator. Exposure may cause irritation and burns to the skin, eyes, respiratory tract and on ingestion. Prolonged or repeated skin contact may cause dermatitis. Eye contact may cause permanent eye damage. Handle in an operating fume cupboard. Avoid breathing vapour and contact with skin and eyes. Handle away from heat and sources of ignition. The acid chloride reacts violently with water, giving acetic acid and corrosive fumes of hydrogen chloride.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from alcohols, oxidising agents, strong bases, alkali hydroxides, alkali metals and alkaline earth metals. Store separated from other chemicals, with secondary containment.

APPLICATIONS

Senior chemistry: preparation of esters, amides.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with a mixture of sodium carbonate or sodium bicarbonate and non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter). Scoop up with a non-sparking tool into a bucket of water. Test the pH (pH paper) and neutralise the solution by addition of dilute HCl (1-2M) or sodium carbonate as necessary. Flush the neutral solution down the sink. Dispose of residual absorbent material as general waste. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid chloride can be decomposed by its reaction with aqueous base to give a non-hazardous water-soluble salt. Acetyl chloride requires 2 equivalents of base for neutralisation.
Small quantity: Add the waste acid chloride to sodium hydroxide solution (2M) or sodium carbonate solution (2M) at the rate of 1mL of acid chloride to 20 mL of aqueous base. Carbon dioxide gas will evolve from the reaction with sodium carbonate. Neutralise the solution to pH ~7 by addition of HCl (1-2M) and flush down the sink.
Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water. Call a POISONS CENTRE or doctor.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26.



Formula C₂H₂
CAS No. 74-86-2
User Group Qualified Staff

DESCRIPTION

Colourless gas with a slight garlic-like odour which is due to phosphine impurities in the calcium carbide from which the gas is generated. Pure acetylene has a slight ethereal odour. Acetylene burns in air with a smoky flame.

PHYSICAL DATA

Molar mass	26.04	Vapour density (air = 1)	0.9
Melting point	-	Liquid density (water = 1)	-
Boiling point	-84°C sublimes	Flammability	Extremely flammable
Solubility in water	1185 mg/L	Flammability Range (% by volume of air)	2.3-82%

HAZARD STATEMENTS

H220 Extremely flammable gas
H230 May react explosively even in the absence of air

WASTE DISPOSAL

Unused acetylene may be vented to the atmosphere in an operating fume cupboard or well-ventilated area.
Unreacted calcium carbide: Add to a large volume of water and place in a well-ventilated area until completely reacted. Neutralise the resulting solution to within pH 6-8 and wash down the sink.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Acetylene gas is not toxic and is not known to have any harmful long-term effects. However, exposure to high concentrations may lead to asphyxiation due to displacement of air. Exposure to low concentrations may have narcotic effects (dizziness, headache, nausea).

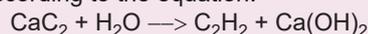
The gas should be prepared and handled in an operating fume cupboard or well-ventilated area. All ignition sources, including static discharges, should be removed from the work area. Use non-sparking tools. Avoid inhalation. Acetylene forms explosive mixtures with air over a wide range of concentrations and can decompose explosively into its elements if subjected to slight heating or slightly increased pressure. Avoid exposing the gas to heat, shock or friction.

Flammable/explosive vapours have the potential to accumulate in confined spaces.

Acetylene can react dangerously with oxidising agents, halogens and alkali metals. Explosive acetylides can form if acetylene comes into contact with the metals copper, copper alloys, silver and mercury and their salts.

PREPARATION NOTES

Acetylene is prepared from the reaction of calcium carbide with water according to the equation:



Calcium carbide is usually the limiting reagent.

To stop the reaction, cover the reaction mixture completely with an excess of dry sand.

APPLICATIONS

Demonstration of the preparation and properties of acetylene gas.

FIRST AID

IF IN EYES: Adverse effects to the eyes are not expected.

IF SWALLOWED: Ingestion is considered unlikely.

IF ON SKIN: Adverse effects to the skin are not expected.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

POISONS CENTRE: 13 11 26

DANGER

Formula C₆H₈Cl₂O₂

CAS No. 111-50-2

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless to yellow liquid with a pungent odour.	Molar mass 183.03	ADG Class 8
SOLUBILITY Soluble in ethyl acetate and petroleum ether.	Melting point -	Packing Group II
Solubility in water Decomposes	Boiling point 105-107°C	UN Number 3265
	Specific gravity 1.259 (25°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H302 Harmful if swallowed
H332 Harmful if inhaled
AUH014 Reacts violently with water

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber, Viton®; nitrile for splash contact). Adipoyl chloride is corrosive and a lachrymator. Exposure may cause irritation and burns to the skin, eyes, respiratory tract and on ingestion. Eye contact may cause permanent eye damage.

Handle only in an operating fume cupboard. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

The reaction with water is violent, giving adipic acid and corrosive fumes of hydrogen chloride.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from alcohols, oxidising agents, bases, alkali hydroxides, amines, alkali metals and alkaline earth metals. Store with corrosive liquids (organic acids).

APPLICATIONS

Senior chemistry: a reagent in the preparation of nylon.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with a mixture of sodium carbonate or sodium bicarbonate and non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter). Scoop up with a non-sparking tool into a bucket of water. Test the pH (pH paper) and neutralise the solution by addition of HCl (1-2M) or sodium carbonate as necessary. Flush the neutral solution down the sink. Dispose of residual absorbent material as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid chloride can be decomposed by its reaction with aqueous base to give a non-hazardous water-soluble salt. Note that adipoyl chloride requires 4 equivalents of base for neutralisation.

Small quantity: Add the waste acid chloride to sodium hydroxide solution (2M) or sodium carbonate solution (2M) at the rate of 1mL of acid chloride to 20 mL of aqueous base. Carbon dioxide gas will evolve from the reaction with sodium carbonate. Neutralise the solution to pH ~7 by addition of HCl (1-2M) and flush down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical attention.

POISONS CENTRE: 13 11 26.

Formula n/a
CAS No. 9002-18-0
User Group F-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to pale buff, odourless powder.	Molar mass -	ADG Class -
SOLUBILITY Soluble in water with boiling. Dissolves slowly in hot water, forming a viscous solution. Insoluble in alcohol.	Melting point 90°C	Packing Group -
Solubility in water 20 g/L (60°C)	Boiling point -	UN Number None
	Specific gravity -	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The material has the potential to form a dust explosion.

For more detailed guidance on the handling of agar see the following Science ASSIST resources:

Guidelines for best practice for microbiology in Australian schools

Standard Operating Procedure: Preparing Agar Plates

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Protect from moisture.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Culture medium for bacteriology; reaction medium for chemistry/biology activities.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources and combustible material from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as the original container or with solid organic waste. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention if a large amount ingested.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical attention.

Formula C₁₄H₈O₄
CAS No. 72-48-0
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Yellow to orange to red needles or powder.	Molar mass 240.21	ADG Class -
Dye family anthraquinone	Melting point 279-283°C	Packing Group -
Solubility water ¹ 0.4 mg/mL ethanol ¹ 2 mg/mL Soluble in hexane and glacial acetic acid.	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 567 nm, 609 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation.

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from alkalis and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- red textile dye
- histology: stains free calcium and calcium compounds
- standard in UV Vis spectrophotometry
- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste. **Solution waste:** Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 5.5	pH 6.8	pH 10.1	pH 12.1
yellow	red	red	purple

PREPARATION

Dissolve 0.1 g in 100mL of distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Dungey

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula C₁₄H₇O₇S.Na
CAS No. 130-22-3
User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark red powder	Molar mass 342.26	ADG Class -
Dye family anthraquinone	Melting point 287-289°C	Packing Group -
Solubility water ¹ 20 mg/mL ethanol ¹ 1 mg/mL	Flammability	UN Number None
	Absorption ² (λ _{max}) 556 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin. Chronic or repeated skin exposure may cause dermatitis.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: stains calcium; stains cartilage and bone
- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 3.5	pH 6.5	pH 9.4	pH 12.0
yellow	red	orange	violet

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

PREPARATION

pH indicator: Dissolve 0.1 g in 100mL of distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Dungey

Formula Al
CAS No. 7429-90-5
User Group F-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Silvery white, malleable, ductile metal.	Molar mass 26.98	ADG Class -
SOLUBILITY Reacts with alkalis, sulfuric acid and hydrochloric acid, forming soluble salts.	Melting point 660°C	Packing Group -
Solubility in water Insoluble	Boiling point 2467°C	UN Number None
	Specific gravity 2.7	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to aluminium dust may cause irritation to the respiratory tract and mechanical irritation to the eyes. Sharp metal edges may damage skin. Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure. Aluminium reacts with acids or alkalis, with evolution of flammable hydrogen gas. Aluminium corrodes in contact with other metals; the reaction is vigorous in contact with mercury.

STORAGE

On exposure to moist air, aluminium develops a thin passivating layer of the oxide. Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture. Store away from acids, alkalis, halogens and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: qualitative properties of the element.
Senior chemistry: redox reactions; electrochemistry.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantities may be disposed of as general waste.
Large quantity: Store in a suitable labelled container for waste aluminium metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.



Formula Al
CAS No. 7429-90-5
User Group Staff

DESCRIPTION

Odourless, silvery white powder. It's reactivity is reduced by a coating of oil.

SOLUBILITY

Reacts with alkalis, sulfuric acid and hydrochloric acid, forming soluble salts.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 26.98
Melting point 660°C
Boiling point 2467°C
Specific gravity 2.7
Flammability Flammable

REGULATORY INFORMATION

ADG Class 4.1
Packing Group II
UN Number 1309
Poisons Schedule -
Security -

HAZARD STATEMENTS

H228 Flammable solid

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the respiratory tract and mechanical irritation to the skin and eyes. Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure. Aluminium powder reacts with acids or alkalis, with generation of flammable hydrogen gas. The powder has the potential to form explosive mixtures in air and when mixed with oxidising agents. Aluminium corrodes in contact with other metals; the reaction is vigorous in contact with mercury. In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

On exposure to moist air, aluminium develops a thin passivating layer of the oxide. Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture. Store away from acids, alkalis, halogens and oxidising agents. Store with flammable solids (DG Class 4.1).

APPLICATIONS

Demonstration of the Thermite reaction.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Using a non-sparking tool, collect spill material and transfer to a suitable non-reactive container. Treat as for Waste Disposal.

Wipe surfaces with dampened paper towel to remove residual aluminium dust. Rinse the paper towel and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE. Work in an operating fume cupboard. Dissolve waste aluminium powder in a solution of sodium hydroxide (5M) in the proportion of 1 gram of Al to 20mL of NaOH solution. Carry out the reaction in a beaker large enough to accommodate foaming due to evolution of H₂. When the reaction is complete, add the solution to an equal volume of water and adjust the pH to approximately pH 7.5 to precipitate aluminium hydroxide. Allow the mixture to age over days, then decant the supernatant. Wash the supernatant down the sink. Allow the residue to dry and transfer to a suitable labelled container such as for waste inorganic salts and store for collection by a licenced waste disposal contractor.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor or metal recycling facility. Do not mix with other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.



Formula AlCl_3
CAS No. 7446-70-0
User Group Staff

DESCRIPTION

White to yellowish crystals or powder with a sharp, pungent odour of hydrogen chloride.

SOLUBILITY

Soluble in water and alcohol.

Solubility in water

450 g/L (20°C) decomposes

PHYSICAL DATA

Molar mass 133.34
Melting point 180-181°C sublimes
Boiling point 262°C decomposes
Specific gravity 2.44 (25°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group II
UN Number 1726
Poisons Schedule -
Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Aqueous solutions of the salt are acidic and corrosive. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent injury.

Handle in an operating fume cupboard. Vent container before opening in case of a build up of pressure. Avoid generating or inhaling dust, vapour, mist or gas. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The reaction with water is violent and exothermic, generating toxic and corrosive hydrogen chloride gas. Heating of the substance generates hydrogen chloride. The reaction with bases, alkenes or alkali metals can be vigorous and explosive. The reaction with metals in the presence of moisture may produce flammable hydrogen gas.

STORAGE

The substance is hygroscopic and deliquescent and decomposes on absorption of water, forming hydrated Al^{3+} ions and hydrochloric acid.

Store in a tightly closed corrosion-resistant container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, alkali metals, bases and oxidising agents.

Store with corrosive solids (DG Class 8).

APPLICATIONS

Senior chemistry: demonstration of Friedel-Crafts reaction.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with a mixture of sodium carbonate and sand or other inert absorbent material. Collect spill material in a corrosion-resistant container. Working in an operating fume cupboard, cautiously add the spill material in portions to a large volume of water. Adjust pH to approximately 7.5 and allow the mixture to stand for 24 hours. Decant the supernatant solution down the sink with further dilution. Dispose of solid residue as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus aluminium chloride in the original container or other suitable, labelled container and arrange for collection by a licenced disposal company. Do not mix with other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. Do not attempt to neutralise. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek immediate medical attention.

POISONS CENTRE: 13 11 26

aluminium chloride, hexahydrate

aluminium trichloride hexahydrate

WARNING



Formula $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$

CAS No. 7784-13-6

User Group 11-12

DESCRIPTION

Colourless to white or yellow, deliquescent, crystalline powder with a sweet astringent taste.

SOLUBILITY

Soluble in water, alcohol, ether and glycerol.

Solubility in water 1330 g/L (20°C)

PHYSICAL DATA

Molar mass	241.43
Melting point	ca 100°C decomposes
Boiling point	-
Specific gravity	2.4
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Aqueous solutions of the salt are acidic and corrosive. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion may cause severe irritation to the gastrointestinal tract.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating or inhaling dust, vapour, mist or gas. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating of the substance produces toxic and corrosive hydrogen chloride gas.

STORAGE

The substance is hygroscopic and decomposes over time on exposure to air.

Store in a tightly closed, corrosion resistant container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, bases and strong oxidising agents. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Cover spill with a mixture of sodium carbonate and sand. Treat as for Waste Disposal.

Solution spill: Neutralise with sodium carbonate solution. Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect spill material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solution waste: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste aqueous solutions. Arrange for collection.

Small volumes of dilute solutions: Add sodium carbonate solution until a pH of 7.5 is reached. Allow the mixture to stand for 24 hours. Collect the precipitate by decanting or filtration. Wash the filtrate down the sink. Dispose of solid residue as general waste.

Solid waste: Transfer to a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If skin irritation occurs, get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention if feeling unwell.



Formula $\text{Al}(\text{OH})_3$
CAS No. 21645-51-2
User Group 7-12

DESCRIPTION

Colourless, odourless crystalline powder, balls or granules.

SOLUBILITY

Practically insoluble in water and in alcohol. Soluble in strong acids and strong alkalis.

Solubility in water 0.0015 g/L (25°C)

PHYSICAL DATA

Molar mass 78.00
Melting point 300°C
Boiling point > 230°C (loss of water)
Specific gravity 2.42 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation of the skin, eyes and respiratory tract. Ingestion of large doses may be harmful. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating aluminium hydroxide above about 230°C causes decomposition with release of water of crystallisation.

STORAGE

This substance absorbs carbon dioxide from the air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from strong acids and strong oxidising agents. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: to demonstrate its thermal decomposition to aluminium oxide; to demonstrate amphotericism.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill (slurry): Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of as general waste.

Large quantities: Transfer to a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

DANGER

Formula $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$

CAS No. 7784-27-2

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, nearly odourless, deliquescent crystals.	Molar mass 375.13	ADG Class 5.1
SOLUBILITY Soluble in water, alcohol and ethylene glycol. Very slightly soluble in acetone. Almost insoluble in ethyl acetate.	Melting point 73°C	Packing Group III
Solubility in water 640 g/L (25°C)	Boiling point 135°C decomposes	UN Number 1438
	Specific gravity 1.72	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong oxidising agent. Aqueous solutions of the salt are acidic. Exposure may cause irritation of the skin, eyes and respiratory tract. Symptoms of ingestion include CNS effects and gastric upset. Handle in well ventilated area. Avoid inhalation and ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from sources of ignition and flammable/combustible materials. In case of fire, use water as the extinguishing agent.

STORAGE

The substance is hygroscopic and deliquescent. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from heat and sources of ignition. Store away from reducing agents, powdered metals, combustible materials, organic substances and strong acids and bases. Do not store on wooden surfaces. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; construction of a metal reactivity series.

SPILLS

Wear PPE. Ensure good ventilation. Remove combustible material and ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula Al₂O₃
CAS No. 1344-28-1
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless balls, lumps or powder.	Molar mass 101.96	ADG Class -
SOLUBILITY Insoluble in water. Soluble in some concentrated acids and alkalis.	Melting point 2050°C	Packing Group -
Solubility in water Insoluble	Boiling point 2980°C	UN Number None
	Specific gravity 3.94 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mechanical irritation of the skin, eyes and respiratory tract.
Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from strong acids, strong bases and oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: to demonstrate amphotericism; chromatography.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill (slurry): Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of as general waste.

Larger quantity: Transfer to a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



aluminium potassium sulfate, dodecahydrate

potassium alum; aluminium potassium disulphate dodecahydrate

Formula $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

CAS No. 7784-24-9

User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder with an astringent taste.

SOLUBILITY

Soluble in water, glycerol and dilute acid.
Insoluble in alcohol and acetone.

Solubility in water 139 g/L (20°C)

PHYSICAL DATA

Molar mass 474.38

Melting point 92°C

Boiling point 60-200°C (-12H₂O)

Specific gravity 1.75 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause irritation and corrosive effects to the skin, eyes and respiratory tract and on ingestion. Ingestion of large doses may be harmful.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The salt is corrosive to some metals when heated in the presence of water.

When preparing a saturated solution, note that the solubility increases ~10-fold as the solution temperature is increased from 20°C to 100°C.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand and vermiculite or bentonite. Collect spill material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solution waste: Small volumes of dilute solutions: Add sodium carbonate solution until a pH of 7.5 is reached. Allow the mixture to stand for 24 hours. Collect the precipitate by decanting or filtration. Wash the filtrate down the sink. Dispose of solid residue as general waste.

Solutions may be allowed to evaporate in a fume cupboard and the residue treated as solid waste. Alternatively, the salt can be recrystallised and recycled.

Solid waste: Small quantities can be disposed of as general waste. Store large quantities of waste solid in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed, corrosion-resistant container in a cool, dry, well-ventilated place away from heat and light.

Store away from strong bases and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: crystal growing.

Senior chemistry: determination of the empirical formula.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$

CAS No. 7784-31-8

User Group 11-12

DESCRIPTION

Colourless, odourless, lustrous crystals or granules with a sweet, mildly astringent taste.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 364 g/L (20°C)

PHYSICAL DATA

Molar mass 666.42

Melting point 90-340°C (-12H₂O)

Boiling point 770°C anhydrous salt decomposes

Specific gravity 1.72

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause moderate to severe irritation of the skin, eyes and respiratory tract. Symptoms of ingestion include burns to the mouth, nausea and vomiting. Chronic exposure may lead to CNS effects.

Handle in a well-ventilated area. Avoid generation and inhalation of dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The salt is corrosive to some metals in the presence of water.

STORAGE

This salt hydrolyses in moist air and in solution, forming sulfuric acid.

Store in a tightly closed, corrosion-resistant container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong bases and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: a flocculating agent in water treatment.

Senior chemistry: in electrochemistry, battery construction; an example of an amphoteric salt.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Neutralise with sodium carbonate solution. Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect spill material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solution waste: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste aqueous solutions. Arrange for collection.

Solutions may be allowed to evaporate in a fume cupboard and the residue treated as solid waste. Alternatively, the salt can be recrystallised and recycled.

Small volumes of dilute solutions: Add sodium carbonate solution until a pH of 7.5 is reached. Allow the mixture to stand for 24 hours. Collect the precipitate by decanting or filtration. Wash the filtrate down the sink. Dispose of solid residue as general waste.

Solid waste: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms persist, seek medical attention.

POISONS CENTRE: 13 11 26

ammonia, generated from a reaction

anhydrous ammonia

DANGER

Formula NH₃
CAS No. 7664-41-7
User Group Staff



DESCRIPTION	PHYSICAL DATA			
Colourless gas with a pungent, suffocating odour. Ammonia burns in air with a yellow flame.	Molar mass	17.03	Vapour density (air = 1)	0.59
	Melting point	-77.7°C	Liquid density (water = 1)	-
	Boiling point	-33.4°C	Flammability	Flammable
	Solubility in water	517 g/L	Flammability Range (% by volume of air)	15-28%

HAZARD STATEMENTS

H221 Flammable gas
H331 Toxic if inhaled
H314 Causes severe skin burns and eye damage
H410 Very toxic to aquatic life with long lasting effects

WASTE DISPOSAL

Unused ammonia gas can be bubbled into water. Any glassware, tubing and other items of apparatus contaminated with the gas should be rinsed with water. The rinsing water may then be neutralised and washed down the sink.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Anhydrous ammonia is corrosive. Anhydrous ammonia is hygroscopic and hydrolyses in water, forming alkaline solutions of ammonium hydroxide. Exposure to low concentrations may cause irritation to the eyes and respiratory tract. Exposure to high concentrations may cause burns to the skin, eyes and respiratory tract and may lead to pulmonary oedema, which can be fatal. Chronic exposure may lead to damage to the respiratory system. Prepare and handle the gas in an operating fume cupboard. Avoid inhalation and contact with skin and eyes. Avoid prolonged or repeated exposure. Handle away from sources of heat and ignition. Ammonia can react dangerously with oxidising agents, yielding toxic oxides of nitrogen. The reaction with acids can be exothermic and violent.

PREPARATION NOTES

Ammonia gas can be prepared by warming a sample of concentrated ammonium hydroxide solution or, alternatively, by gently heating a mixture of ammonium chloride and calcium hydroxide and passing the gas through a drying tube containing calcium oxide to remove the water vapour. The gas is collected into an inverted receiving vessel by downward displacement of air. Anhydrous ammonia gas will rapidly absorb water.

APPLICATIONS

General science: the preparation of ammonia gas and investigation of its properties.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Ingestion is considered unlikely.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. Seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.
POISONS CENTRE: 13 11 26



DANGER



Formula NH₄OH
CAS No. 1336-21-6
User Group 11-12

DESCRIPTION

Clear to slightly turbid liquid with a strong pungent odour.

SOLUBILITY

Miscible with water. Soluble in ethanol and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 35.1 (NH₄OH)
Melting point -8°C (8%)
-69°C (28%)
Boiling point 24.7°C (32%)
Specific gravity 0.898 (20°C, 28%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 2672
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl-rubber, nitrile). The solution is strongly alkaline. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury. Handle only in an operating fume cupboard. Avoid inhaling mist or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The pressure in the bottle may build up, particularly at elevated temperatures. Bottles should therefore be opened cautiously, in an operating fume cupboard.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to avoid leakage. Store away from heat and sources of ignition.

Storage at or below room temperature (25°C) is recommended. Over time, the concentration will decrease as ammonia evolves from the solution.

Store away from acids, alkalis, oxidising agents and metals. Store segregated from other chemicals, on a low shelf with secondary containment.

APPLICATIONS

General science: diluted, in investigations of acids and bases.

Senior chemistry: reagent for qualitative inorganic analysis.

Technical: preparation of buffer solutions.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up into a plastic container. In a fume cupboard, add the material slowly to a bucket of cold water and neutralise as for Waste Disposal. Decant neutral solution down the sink with further dilution. Dispose of residual solid material as general waste. Ventilate spill area and wash thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste ammonia solution slowly, with stirring, to a large volume of cold water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Store in the original bottle or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor
IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

Formula NH_4OH
CAS No. 1336-21-6
User Group 7-12



DESCRIPTION

Cloudy white liquid with a pungent, irritating odour. An aqueous solution of ammonium hydroxide (generally, <5%) with added soap or surfactant.

SOLUBILITY

Miscible with water. Soluble in ethanol and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 35.05 (NH_4OH)
Melting point -2.9°C (4%)
-8°C (8%)
Boiling point ca. 100°C
Specific gravity 0.981 (20°C, 4%)
0.965 (20°C, 8%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5 (≤5%)
S6 (>5%)
Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl-rubber, nitrile). The solution is strongly alkaline. Exposure may cause moderate irritation to the skin and respiratory tract. Eye contact may cause severe irritation, redness and pain. Ingestion may result in ulceration and burns to the mouth and throat. Handle in an operating fume cupboard or well-ventilated area. Avoid inhaling mist or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. As the pressure in the bottle may build up, particularly at elevated temperatures, bottles should be opened cautiously.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to avoid leakage. Store away from heat and sources of ignition. Storage at or below room temperature (25°C) is recommended. Over time, the concentration becomes lower as ammonia evolves from the solution. Store away from acids, oxidising agents, alkalis and metals. Store with dilute aqueous solutions.

APPLICATIONS

General science: investigations of the acidity/basicity of household substances.
Senior chemistry: titrimetric determination of ammonia in a commercially available product.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up into a plastic container. In a fume cupboard, add the material slowly to a bucket of cold water and neutralise as for Waste Disposal. Decant the neutral solution down the sink with further dilution. Dispose of the residual solid material as general waste. Ventilate spill area and wash thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste ammonia solution slowly, with stirring, to 2-3 times its volume of cold water. Neutralise the solution to within pH 6-8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.
Large quantity: Store in the original bottle or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms persist, seek medical attention.
POISONS CENTRE: 13 11 26

Formula CH₃CO₂NH₄

CAS No. 631-61-8

User Group 7-12

DESCRIPTION

Colourless, deliquescent crystalline solid with a weak odour of acetic acid.

SOLUBILITY

Soluble in water and alcohol. Slightly soluble in acetone.

Solubility in water 1480 g/L (4°C)

PHYSICAL DATA

Molar mass 77.08

Melting point 114°C

Boiling point decomposes

Specific gravity 1.17 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and add to a large volume of water. Decant the supernatant, neutralise to within pH 6-8 if necessary, and wash down the sink. Dispose of residual solid as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%): Neutralise to within pH 6-8 if necessary, and wash down the sink.

Large quantity: Store in a suitable labelled container such as for dry organic solids and arrange for collection by a licenced waste disposal contractor. Alternatively, the salt can be applied to soil as a fertilizer.

STORAGE

The substance is hygroscopic and loses ammonia over time.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

Technical: buffer preparation.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula $(\text{NH}_4)_2\text{CO}_3$ or mixture: $\text{H}_2\text{NCOONH}_4 + (\text{NH}_4)\text{HCO}_3$

CAS No. 506-87-6 (diammonium carbonate) or
10361-29-2 (mixture)

User Group 7-12

DESCRIPTION

Colourless crystalline powder with a strong odour of ammonia. Composed of a mixture of ammonium carbamate and ammonium bicarbonate.

SOLUBILITY

Soluble in water.

Solubility in water 320 g/L (20°C)

PHYSICAL DATA

Molar mass 96.09 $[(\text{NH}_4)_2\text{CO}_3]$

Melting point 58-60°C decomposes

Boiling point -

Specific gravity 1.5 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause moderate skin irritation and severe eye irritation and eye damage. The dust and ammonia vapours may cause irritation to the respiratory tract.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The salt decomposes when heated or on exposure to air, releasing ammonia and carbon dioxide. On contact with base, ammonia is released.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant, neutralise to within pH 6-8 if necessary, and wash down the sink. Dispose of residual solid as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%): Neutralise to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container such as for dry inorganic solids and arrange for collection by a licenced waste disposal contractor. Alternatively, the salt can be applied to soil as a fertilizer.

STORAGE

The salt is sensitive to air, light and heat and over time, decomposes with loss of ammonia and carbon dioxide, forming ammonium bicarbonate.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids, alkali hydroxides, oxidising agents and reducing agents.

Store with general inorganic solids.

APPLICATIONS

General science: demonstration of the decomposition of the salt to give ammonia, carbon dioxide and water.

Technical: buffer preparation.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula NH_4Cl
CAS No. 12125-02-9
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or granules.

SOLUBILITY

Soluble in water, methanol and glycerol.
Slightly soluble in ethanol. Almost insoluble in acetone, diethyl ether and ethyl acetate.

Solubility in water 372 g/L (20°C)

PHYSICAL DATA

Molar mass 53.49
Melting point 340°C sublimes
Boiling point -
Specific gravity 1.53 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile). Aqueous solutions of the salt are moderately acidic. Exposure to dust or vapour may cause irritation to the skin, eyes and respiratory tract. Prolonged or repeated skin contact may cause allergic dermatitis. Inhalation of vapour may cause an asthma-like allergy. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating the substance generates toxic and irritating fumes of ammonia and hydrogen chloride. The reaction with acid may liberate toxic and corrosive hydrogen chloride gas. On contact with base, ammonia is released. Ammonium chloride is corrosive to ferrous metals, aluminium and copper.

STORAGE

The salt is hygroscopic and over time, loses ammonia, becoming more acidic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from acids, alkalis, oxidising agents and halogens. Store with general inorganic solids.

APPLICATIONS

General science: demonstration of an endothermic process (dissolution in water).
Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Collect material and treat as for Waste Disposal.
Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and add to a large volume of water. Neutralise to within pH 6-8 and decant the supernatant down the sink. Dispose of solid residue as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%): Neutralise the solution to within pH 6-8 and wash down the sink.
Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. Alternatively, the salt can be applied to soil as a fertilizer, the application of which will have an acidifying effect on the soil.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

WARNING



Formula (NH₄)HCO₃

CAS No. 1066-33-7

User Group 7-12

DESCRIPTION

Colourless crystals or powder with an odour of ammonia.

SOLUBILITY

Soluble in water. Insoluble in methanol.

Solubility in water 220 g/L (20°C)

PHYSICAL DATA

Molar mass 79.06

Melting point 36-60°C decomposes

Boiling point -

Specific gravity 1.58 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust, mist or vapour. Avoid contact with skin, eyes and clothing.

The salt decomposes when heated above about 60°C, releasing irritating and toxic ammonia gas, carbon dioxide and water.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

The salt is heat-sensitive; to minimise decomposition, storage below 15°C is recommended by some suppliers.

Store away from acids, alkalis and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and add to a large volume of water.

Decant the supernatant down the sink and dispose of solid residue as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solution (concentration < 1%) can be washed down the sink.

Alternatively, small quantities of the solid or of solutions can be heated to decomposition in an operating fume cupboard.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Alternatively, the salt can be applied to soil as a fertiliser.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



ammonium iron (III) sulfate dodecahydrate

ferric alum; ammonium ferric sulfate dodecahydrate

WARNING



Formula $\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

CAS No. 7783-83-7

User Group 7-12

DESCRIPTION

Odourless, efflorescent, violet crystals.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 1240 g/L (25°C)

PHYSICAL DATA

Molar mass 482.19

Melting point 39-41°C

Boiling point -

Specific gravity 1.71 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

STORAGE

The salt is light-sensitive.

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight, heat and moisture.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: crystal growing.

Senior chemistry: ferric alum indicator for the determination of chloride.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Solid: Very small quantities may be disposed of as general waste. Solution: Evaporate the water and dispose of as solid waste

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

DANGER

Formula NH_4VO_3
CAS No. 7803-55-6
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless to yellow, odourless crystalline powder.	Molar mass 116.98	ADG Class 6.1
SOLUBILITY Slightly soluble in water. Soluble in ethanolamine and aqueous ammonia solution. Insoluble in alcohol.	Melting point 200°C decomposes	Packing Group II
Solubility in water 5.1 g/L (20°C)	Boiling point -	UN Number 2859
	Specific gravity 2.3 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H301 Toxic if swallowed
H330 Fatal if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H341 Suspected of causing genetic defects
H335 May cause respiratory irritation
H402 Harmful to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Ammonium metavanadate is a weak oxidising agent and is moderately toxic. Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of ingestion include nausea, vomiting, abdominal pain and CNS effects. Handle only in an operating fume cupboard. Avoid generating and inhaling dust, vapour, mist or gas. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating or mixing with base may liberate irritating fumes of ammonia. Contact with metals may generate flammable hydrogen gas.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture and sunlight. Store away from heat and sources of ignition. Store away from acids, alkalis, oxidising agents and combustible materials. Store with general inorganic solids or with toxic inorganic solids. Toxic chemicals must be stored securely, with access limited to authorised staff.

APPLICATIONS

Senior chemistry: demonstration of the colours of the various oxidation states of vanadium.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area.
Solid spill: Scoop up with a non-sparking tool. Treat as for Waste Disposal.
Solution spill: Cover spill with non-combustible absorbent material such as sand, vermiculite or bentonite. Scoop up with a non-sparking tool. Treat as for Waste Disposal. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ammonium metavanadate in the original container or other suitable labelled container such as for heavy metal waste solid or solution, as appropriate, and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin with plenty of water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.
POISONS CENTRE: 13 11 26



ammonium molybdate, tetrahydrate

ammonium heptamolybdate; ammonium paramolybdate

WARNING



Formula $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}\cdot 4\text{H}_2\text{O}$

CAS No. 12054-85-2

User Group 11-12

DESCRIPTION

Colourless or slightly green-yellow crystals or powder with an odour of ammonia.

SOLUBILITY

Soluble in water, acids and alkalis. Practically insoluble in alcohol.

Solubility in water 400 g/L (20°C)

PHYSICAL DATA

Molar mass 1235.86

Melting point 90°C (-H₂O)

Boiling point 190°C decomposes

Specific gravity 2.498 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large amount can have a toxic effect on the liver and kidneys.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Ammonia is released on contact with base.

Heating to decomposition produces irritating and toxic fumes of ammonia and oxides of nitrogen.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material, place into a suitable labelled container and store for collection.

Solution spill: Cover spill with non-combustible absorbent material such as sand, vermiculite or bentonite. Collect material, place in a suitable labelled container and store for collection.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ammonium molybdate in the original container or other suitable labelled container such as for inorganic salts and arrange for collection by a licenced waste disposal contractor.

Solution: Allow the water to evaporate from the solution and store the solid residue for collection.

Alternatively, recrystallise the salt from water and recycle.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: colorimetric determination of phosphate.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

POISONS CENTRE: 13 11 26



WARNING

Formula

NH₄NO₃

CAS No.

6484-52-2

User Group

11-12 (Note M)



DESCRIPTION

Colourless to white, odourless crystals, granules or prills.

SOLUBILITY

Soluble in water, ethanol, methanol and acetone. Insoluble in diethyl ether.

Solubility in water 1877 g/L (20°C)

PHYSICAL DATA

Molar mass 80.04

Melting point 169°C

Boiling point ca. 210°C decomposes

Specific gravity 1.50 (20°C)

Flammability Non-combustible
oxidising solid

REGULATORY INFORMATION

ADG Class 5.1

Packing Group III

UN Number 1942

Poisons Schedule -

Security CSC; SSAN

CHECK WITH THE
STATE REGULATOR FOR
LICENSING REQUIREMENTS

HAZARD STATEMENTS

H272 May intensify fire; oxidizer

H315 Cause skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Ammonium nitrate is a strong oxidising agent which can react explosively when combined with combustible materials or reducing agents. Aqueous solutions of the salt are moderately acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large quantity may be harmful.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Do not mix with organic substances or combustible materials.

Ammonia is released on contact with base. Heating to decomposition produces irritating and toxic fumes of ammonia and oxides of nitrogen.

The preparation of explosive mixtures is not recommended. In case of fire, use water as the extinguishing agent.

STORAGE

The salt is hygroscopic and light-sensitive. Store in a tightly closed dark or opaque container in a cool, dry, well-ventilated place. Protect from light and moisture. The storage container must not contain any organic material or other incompatible substance. Store away from heat and sources of ignition. Store away from acids, alkalis, reducing agents, metals, alkali metals, oxidising agents, hypochlorites, combustible materials and organic substances. Store segregated from other chemicals, with secondary containment.

APPLICATIONS

General science: demo - endothermic dissolution in water.

Senior chemistry: Tollen's reagent; qualitative analysis.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area.

Solid spill: Collect material with a clean, non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover with non-combustible absorbent material such as sand, vermiculite or bentonite. Add material to a large volume of water. Decant solution down the sink or apply as fertiliser to soil. Wash solid residue with water and again decant solution. Dispose of solid residue as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ammonium nitrate in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor. Do not mix with any other waste.

If the ammonium nitrate is contaminated with organic or combustible material: For small quantity, dissolve the waste material in a large volume of water and wash down the sink. For large quantity, dissolve the waste solid in water and store the solution for collection.

Small volumes of dilute solutions (concentration < 1 %) can be washed down the sink.

Alternatively, the salt can be applied to soil as a fertiliser.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin with plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



ammonium oxalate, monohydrate

diammonium oxalate monohydrate; oxalic acid, diammonium salt

WARNING



Formula $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$

CAS No. 6009-70-7

User Group 11-12

DESCRIPTION

White odourless crystals.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 45 g/L (anhydrate)

PHYSICAL DATA

Molar mass 142.11

Melting point ca. 70°C decomposes

Boiling point -

Specific gravity 1.50 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class 6.1

Packing Group III

UN Number 2811

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H312 Harmful in contact with skin

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of ingestion or inhalation include coughing, agitation, nausea and vomiting. Ingestion can lead to kidney damage.

Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust and aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition releases the irritating and toxic gases carbon dioxide, carbon monoxide, oxides of nitrogen, and ammonia.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Waste solid: Store in a suitable labelled container such as for dry solid organic waste. Arrange for collection by a licenced waste disposal contractor.

Waste solution (large volume or more concentrated): Store for collection or allow the water to evaporate and store the solid residue for collection.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: investigations of the photoreduction of iodine with oxalate ion; determination of calcium in limestone.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Call a POISONS CENTRE or doctor if you feel unwell.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

ANGER

Formula (NH₄)₂S₂O₈

CAS No. 7727-54-0

User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Odourless, white crystals or powder.	Molar mass 228.2	ADG Class 5.1
SOLUBILITY Soluble in water.	Melting point 120°C (decomposes)	Packing Group III
Solubility in water 620 g/L (20°C)	Boiling point -	UN Number 1444
	Specific gravity 1.98 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
H317 May cause an allergic skin reaction
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (neoprene, nitrile). Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract. Chronic exposure may lead to allergic dermatitis or asthma. Handle in an operating fume cupboard. Avoid generating or inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources and combustible materials. Use only clean, dry plastic or stainless steel tools and utensils when transferring persulfate from the stock bottle. In case of fire or runaway decomposition, flooding quantities of water should be used as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place. Over time, ammonium persulfate slowly decomposes, releasing oxygen and oxides of sulfur and nitrogen. Decomposition is accelerated by heat, moisture, sunlight or contamination. Protect from air, moisture and direct sunlight. Store away from heat and ignition sources. Store away from acids, alkalis, halogens, reducing agents, organic substances, combustible materials, hydrogen peroxide and metals. Store with oxidising substances (DG Class 5.1). Store with secondary containment (e.g. in a clear, lidded polyethylene bottle). Bottles of aqueous solutions must have a vented lid to avoid overpressurisation.

APPLICATIONS

Senior chemistry: iodine clock reaction kinetics

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation. **Solid spill:** Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect material with a non-sparking tool and add slowly to a large volume of water. Reduce the persulfate and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water; ensure no persulfate residues remain in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid persulfates must not be disposed of with general waste and not mixed with other waste. Store waste or surplus ammonium persulfate in the original container or other suitable labelled container. Arrange for disposal via a licenced contractor. Persulfate which has been exposed to water or other contaminant should be disposed of.

Small quantity of solution: Solutions of concentration <1%: wash down the sink. Higher concentrations: Dilute to <10%, then add H₂SO₄ (1M) until the pH is < 3. Cautiously add a reducing agent. 350mL of 10% sodium thiosulfate solution will reduce 500mL of 10% persulfate solution. Neutralise the resulting solution to within pH 6-8 by addition of sodium carbonate and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with soap and plenty of water. If skin irritation or rash occurs: Get medical advice/attention

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26



ammonium phosphate, dibasic

*diammonium hydrogen phosphate;
phosphoric acid, diammonium salt*

Formula (NH₄)₂HPO₄

CAS No. 7783-28-0

User Group 7-12

DESCRIPTION

White crystalline solid with an odour of ammonia.

SOLUBILITY

Soluble in water. Insoluble in ethanol and acetone.

Solubility in water 690 g/L (20°C)

PHYSICAL DATA

Molar mass 132.05

Melting point >100°C decomposes

Boiling point -

Specific gravity 1.619 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Aqueous solutions of the salt are mildly alkaline. Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Repeated or prolonged skin contact may cause dermatitis. Chronic cough or asthma may result from repeated or prolonged inhalation exposure. Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Ammonia is released when the salt is heated or on contact with base. Heating to decomposition produces ammonia and oxides of nitrogen and of phosphorus.

STORAGE

The salt gradually loses ammonia on exposure to air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from acids, alkalis, sodium hypochlorite and other oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: investigations of the effect of nutrients on plant growth.

Senior science: nutrient for yeast culture.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small quantities of solid can be disposed of as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Alternatively, apply to soil as a fertiliser.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice.

POISONS CENTRE: 13 11 26



ammonium phosphate, monobasic

*ammonium dihydrogen phosphate;
phosphoric acid, monoammonium salt*

Formula (NH₄)H₂PO₄

CAS No. 7722-76-1

User Group 7-12

DESCRIPTION

White odourless crystals or powder.

SOLUBILITY

Soluble in water. Slightly soluble in ethanol.
Practically insoluble in acetone.

Solubility in water 370 g/L (20°C)

PHYSICAL DATA

Molar mass 115.03

Melting point 190°C decomposes

Boiling point -

Specific gravity 1.81 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Aqueous solutions of the salt are acidic. Exposure may cause mild irritation to the skin, eyes and respiratory tract and on ingestion. Repeated or prolonged skin contact may cause dermatitis. Ingestion of a large quantity may be harmful.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Ammonia is released when the salt is heated or on contact with base. Heating to decomposition produces ammonia and oxides of nitrogen and of phosphorus.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids, alkalis, oxidising agents, sodium hypochlorite and magnesium.

Store with general inorganic solids.

APPLICATIONS

General science: crystal growing; investigations of the effect of nutrients on plant growth

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small quantities of solid can be disposed of as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Alternatively, recrystallise the salt from water and recycle, or apply to soil as a fertiliser. The salt has an acidifying effect on the soil.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.



Formula (NH₄)₂SO₄

CAS No. 7783-20-2

User Group 11-12

DESCRIPTION

Colourless crystals with a weak odour of ammonia.

SOLUBILITY

Soluble in water. Insoluble in alcohol and acetone.

Solubility in water 754 g/L (20°C)

PHYSICAL DATA

Molar mass 132.14

Melting point >235°C decomposes

Boiling point -

Specific gravity 1.77 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately acidic. Exposure may cause mild irritation to the skin, eyes and respiratory tract and on ingestion.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

Ammonia is released on contact with base.

Heating to decomposition releases ammonia and oxides of sulfur and nitrogen.

STORAGE

The salt is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, alkalis and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: crystal growing; investigations of the effect of nutrients on plant growth

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant down the sink and dispose of solid residue as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small quantities of solid can be disposed of as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Alternatively, the salt can be recrystallised and recycled, or applied to soil as a fertiliser (which will have an acidifying effect on the soil).

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell or if large amount ingested.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

Formula C₄H₁₂N₂O₆

CAS No. 3164-29-2

User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or granules.	Molar mass 184.15	ADG Class -
SOLUBILITY Soluble in water. Very slightly soluble in alcohol.	Melting point decomposes	Packing Group -
Solubility in water 439 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 1.601 (25°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are mildly acidic. Exposure may cause mild irritation to the skin, eyes and respiratory tract. Ingestion may be harmful. Handle in a well ventilated area. Avoid generating dust. Avoid inhaling dust, vapour or aerosols. Avoid contact with skin, eyes and clothing. Ammonia is released on contact with base. Heating to decomposition produces irritating and toxic fumes of ammonia and oxides of nitrogen.

STORAGE

The salt slowly loses ammonia on exposure to air, becoming more acid. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from acids, alkalis and oxidising agents. Store with general organic solids.

APPLICATIONS

Biology: nitrogen source for yeast culture.
Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small quantities of solid can be disposed of as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container such as for dry organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell or if large amount ingested.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.



Formula NH₄SCN
CAS No. 1762-95-4
User Group 11-12

DESCRIPTION

Colourless, odourless, deliquescent crystals.

SOLUBILITY

Soluble in water, ethanol, methanol and acetone.

Solubility in water 1600 g/L (20°C)

PHYSICAL DATA

Molar mass 76.12
Melting point ca. 150°C
Boiling point > 170°C decomposes
Specific gravity 1.3 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H312 Harmful in contact with skin
H332 Harmful if inhaled
H412 Harmful to aquatic life with long lasting effects
AUH032 Contact with acid liberates very toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. The salt is harmful by ingestion; symptoms of poisoning include dizziness, disorientation, breathing difficulty, cardiovascular effects and unconsciousness.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Ammonia is released on contact with base. Mixing with acid can generate highly toxic hydrogen cyanide gas. Heating to decomposition produces the irritating and toxic gases ammonia, nitrogen oxides and hydrogen cyanide. The reaction with oxidising agents may be violent or explosive.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect material and place in a suitable labelled container and store for collection.

Solution spill: Cover spill with non-combustible absorbent material such as sand, vermiculite or bentonite. Collect material and place in a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ammonium thiocyanate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Solutions: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste inorganic salt solutions and stored for collection.

Do not mix with incompatible waste.

STORAGE

The salt is hygroscopic and light-sensitive and may decompose on exposure to light.

Store in a tightly closed, light-resistant container in a cool, dry, well-ventilated place. Protect from moisture. Store away from sources of heat.

Store away from acids, alkalis, oxidising agents, nitrates, aluminium and magnesium.

Store with general inorganic solids.

APPLICATIONS

General science: demonstration of its endothermic reaction with hydrated barium hydroxide.

Senior chemistry: qualitative test for Fe (III) ion.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



Formula (NH₄)₂S₂O₃

CAS No. 7783-18-8

User Group 7-12

DESCRIPTION

White crystals with a faint odour of ammonia.

SOLUBILITY

Very soluble in water. Slightly soluble in acetone. Insoluble in alcohol and diethyl ether.

Solubility in water 1800 g/L (20°C)

PHYSICAL DATA

Molar mass 148.21

Melting point 150°C decomposes

Boiling point -

Specific gravity 1.679

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a reducing agent. Exposure may cause mild irritation to the skin, eyes and respiratory tract. The substance could be harmful in case of ingestion. Handle in a well-ventilated area. Avoid generating dust and inhaling dust. Avoid contact with skin, eyes and clothing. Ammonia is released on contact with base. Heating to decomposition may produce irritating and toxic fumes of ammonia, and oxides of sulfur and of nitrogen.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, alkalis, oxidising agents, magnesium and aluminium.

Store with general inorganic solids.

APPLICATIONS

Photography: photographic fixative for developing film.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Dampen spill with water spray to prevent dust formation. Collect material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite, bentonite or paper towel. Collect material and add to a large volume of water. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

Alternatively, apply to soil as fertilizer (as a source of S and N, and to acidify the soil).

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If irritation occurs and persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula Ba
CAS No. 7440-39-3
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Silver-grey, malleable, lustrous metal. Stored under petroleum-based liquid to exclude air.	Molar mass 137.34	ADG Class 4.3
SOLUBILITY Reacts with water.	Melting point 725°C	Packing Group II
Solubility in water Decomposes	Boiling point 1640°C	UN Number 1400
	Specific gravity 3.51	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H228 Flammable solid
H261 In contact with water releases flammable gas
H302 Harmful if swallowed; H332 Harmful if inhaled
H315 Causes skin irritation; H319 Causes serious eye irritation; H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to dust or fumes may cause irritation to the skin, eyes, and respiratory and gastrointestinal tract. The metal can react with moisture in the skin, eyes, and respiratory or gastrointestinal tracts, causing chemical burns. Eye exposure can result in permanent eye damage. Handle in a well-ventilated area. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Eliminate all ignition sources from the work area. The reaction with water or acid is vigorous and generates flammable hydrogen gas. If the barium is finely divided, the reaction with water can generate sufficient heat to cause ignition. Barium is a reducing agent and may react vigorously with oxidising substances. In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Barium reacts with moist air, forming a passivating layer, as a mixture of the hydroxide, oxide and nitride. Store under mineral oil in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture. Store away from extreme heat and any ignition sources. Store away from water, acids, oxidising agents, alcohols and halogens. Store with like hazards, i.e. DG Class 4.3 substances which liberate flammable gas when in contact with water.

APPLICATIONS

Senior chemistry: demonstration of the reactivity of the Group 2 elements.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Collect material with a non-sparking tool. If it is uncontaminated, store the barium for future use. Otherwise, treat as for Waste Disposal.

Treat spill area with water to destroy any residual barium, then rinse thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE. Work in an operating fume cupboard. Add the barium in portions to a beaker of water in the ratio of about 1 g of barium to 100 mL of water. Allow the barium to react between additions. When all of the barium has been consumed and there is no further evolution of hydrogen, neutralise the solution by addition of dilute sulfuric acid (1M). Collect the precipitated barium sulfate by filtration. Allow the precipitate to dry and store in a suitable labelled container such as for inorganic waste solids. Wash the neutral supernatant down the sink.

Large quantity: Store covered with mineral oil in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.

FIRST AID

IF IN EYES: Immediately rinse with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Remove particles from mouth. Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off loose particles from skin. Wash affected area thoroughly with plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.



Formula BaCO₃
CAS No. 513-77-9
User Group 7-12

DESCRIPTION

Odourless, white to greyish-white powder.

SOLUBILITY

Practically insoluble in water. Soluble in solutions of hydrochloric, nitric and acetic acid, ammonium chloride and ammonium nitrate. Insoluble in ethanol and sulfuric acid.

Solubility in water 0.02 g/L (20°C)

PHYSICAL DATA

Molar mass 197.34
Melting point >1450°C decomposes
Boiling point -
Specific gravity 4.43 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 6.1
Packing Group III
UN Number 1564
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The substance is toxic by ingestion or inhalation. Exposure may cause mild irritation to the skin and eyes. Ingestion or inhalation may cause irritation of the digestive and respiratory tracts, gastric symptoms and CNS effects. Prolonged or repeated exposure may lead to skin sensitisation and organ damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste toxic inorganic solids or heavy metal waste and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Administration of a 1%-5% solution of sodium sulfate or magnesium sulfate may limit the absorption of barium by causing precipitation of insoluble barium sulfate. Seek immediate medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If symptoms develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula BaCl₂·2H₂O

CAS No. 10326-27-9

User Group 7-12

DESCRIPTION

Colourless, odourless crystals or solid with a bitter, salty taste.

SOLUBILITY

Soluble in water and methanol. Insoluble in ethanol, acetone and ethyl acetate.

Solubility in water

375 g/L (20°C, anhydrous salt)

PHYSICAL DATA

Molar mass 244.27

Melting point >100°C (-2H₂O)
963°C

Boiling point 1560°C

Specific gravity 3.86 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 6.1

Packing Group III

UN Number 1564

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H301 Toxic if swallowed

H332 Harmful if inhaled

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is toxic by ingestion or inhalation. Exposure may cause irritation to the skin and eyes. Symptoms of ingestion or inhalation exposure include gastrointestinal and cardiovascular effects, CNS effects and kidney damage. Prolonged or repeated skin exposure may lead to dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general inorganic solids or with toxic inorganic solids. Toxic substances should be stored securely.

APPLICATIONS

General science: flame test.

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for waste toxic inorganic solids or heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Add sodium sulfate solution (10%) in the ratio of 15 mL per gram of barium chloride dihydrate. Stir the mixture and allow it to stand overnight. Collect the precipitated barium sulfate by filtration. Wash the supernatant solution down the sink. When it has dried, store the solid residue as for Waste Disposal and arrange for collection. Small quantities of barium sulfate can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Administration of a 1%-5% solution of sodium sulfate or magnesium sulfate may limit the absorption of barium by causing precipitation of insoluble barium sulfate. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If symptoms develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26

barium hydroxide, octahydrate

caustic baryta

DANGER

Formula Ba(OH)₂·8H₂O

CAS No. 12230-71-6

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystalline solid.	Molar mass 315.47	ADG Class 8 (6.1)
SOLUBILITY Slightly soluble in water, methanol and ethanol. Soluble in dilute acid. Insoluble in acetone.	Melting point 78°C 100-780°C (-8H ₂ O)	Packing Group II
Solubility in water 72 g/L (20°C)	Boiling point -	UN Number 2923
	Specific gravity 2.18 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H332 Harmful if inhaled

H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is corrosive and is toxic by ingestion or inhalation. Aqueous solutions of the substance are strongly alkaline. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Symptoms of ingestion or inhalation include gastrointestinal and cardiovascular effects, CNS effects and kidney damage. Prolonged or repeated skin contact may lead to dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance is corrosive to active metals (aluminium, zinc), the reaction generating flammable hydrogen gas. Heating the substance to decomposition will generate toxic fumes of barium oxides.

STORAGE

The solid and solutions absorb carbon dioxide from the air, forming almost-insoluble barium carbonate.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture. Store away from sources of heat or ignition.

Store away from acids and oxidising agents.

Store with corrosive substances (DG Class 8).

APPLICATIONS

Senior chemistry: demonstration of endothermic solid-solid reaction with ammonium chloride; acid-base titrations.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store waste or surplus barium hydroxide in a suitable labelled container such as for waste toxic inorganic solids or heavy metal waste and arrange for collection by a licenced waste disposal contractor. Do not mix with incompatible waste.

Solution: Add dilute sulfuric acid (1M) in the ratio of 10 mL per gram of barium hydroxide octahydrate. Stir the mixture and allow it to stand overnight. Collect the precipitated barium sulfate by filtration. Allow the filtrate to dry and transfer to a suitable labelled container and arrange for collection. Neutralise the supernatant to within pH 6-8 by addition of sodium carbonate and wash down the sink. Small quantities of barium sulfate can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Administration of a 1%-5% solution of sodium sulfate or magnesium sulfate may limit the absorption of barium by causing precipitation of insoluble barium sulfate. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If symptoms develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26

DANGER

Formula Ba(NO₃)₂
CAS No. 10022-31-8
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or crystalline powder.	Molar mass 261.34	ADG Class 5.1 (6.1)
SOLUBILITY Soluble in water. Slightly soluble in ethanol and acetone.	Melting point ca 592°C	Packing Group II
Solubility in water 87 g/L (20°C)	Boiling point > 600°C decomposes	UN Number 1446
	Specific gravity 3.24 (23°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H301 Toxic if swallowed
H332 Harmful if inhaled
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong oxidising agent and is toxic by ingestion or inhalation. Exposure may cause irritation to the skin and eyes. Symptoms of ingestion or inhalation exposure include gastrointestinal and cardiovascular effects, muscle weakness and paralysis, CNS effects and kidney damage. Prolonged or repeated skin contact may lead to dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance will become shock-sensitive if mixed with readily-oxidisable substances. There is a risk of fire and explosion if mixed with combustible or readily oxidisable materials.

The preparation of explosive mixtures is not recommended.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from sources of heat or ignition. Do not store on wooden surfaces.

Store away from acids, alkalis, metal powders, reducing agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

General science: flame test.

Senior chemistry: qualitative inorganic analysis; combustion of sugar demonstration.

SPILLS

Wear PPE. Ensure good ventilation. Remove any combustible material or ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store waste or surplus barium nitrate in a suitable labelled container such as for waste toxic inorganic solids or heavy metal waste and arrange for collection by a licenced waste disposal contractor. Do not mix with any other waste.

Solution: Add sodium sulfate solution (10%) in the ratio of 15 mL per gram of barium nitrate. Stir the mixture and allow it to stand overnight. Collect the precipitated barium sulfate by filtration. Dispose of the supernatant solution down the sink. When it has dried, store the solid residue as for Waste Disposal and arrange for collection. Small quantities of barium sulfate can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Administration of a 1%-5% solution of sodium sulfate or magnesium sulfate may limit the absorption of barium by causing precipitation of insoluble barium sulfate. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If symptoms develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26

Formula BaSO₄
CAS No. 7727-43-7
User Group 7-12

DESCRIPTION

White or yellowish, tasteless, odourless crystals or powder.

SOLUBILITY

Very slightly soluble in water. Soluble in hot, concentrated sulfuric acid. Practically insoluble in dilute acid, alcohol and organic solvents.

Solubility in water 2.5 mg/L (20°C)

PHYSICAL DATA

Molar mass 233.39
Melting point 1580°C decomposes
Boiling point -
Specific gravity 4.5
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the respiratory tract and mechanical irritation to the skin and eyes. Chronic inhalation exposure may lead to accumulation of barium sulfate particles in the lungs, affecting lung function. Repeated or prolonged exposure may lead to toxic effects due to the presence of soluble barium salts as impurities.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition produces toxic fumes of sulfur oxides and barium oxide.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from active metals.

Store with general inorganic substances.

APPLICATIONS

General science: solubility of substances; flocculent for soil tests.

Senior chemistry: product in precipitation reactions; product in the gravimetric determination of sulfate.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution/slurry spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus barium sulfate in a suitable labelled container such as for waste toxic inorganic solids or heavy metal waste and arrange for collection by a licenced waste disposal contractor. Small quantities of barium sulfate can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice

IF SWALLOWED: Rinse mouth. Give water to drink. If feeling unwell, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If symptoms develop, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms develop, seek medical attention.

Formula Ba(OH)₂·8H₂O

CAS No. 12230-71-6

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals.	Molar mass 315.47	ADG Class 8 (6.1)
SOLUBILITY Soluble in water, and dilute hydrochloric acid and dilute nitric acid Slightly soluble in ethanol and methanol. Insoluble in acetone.	Melting point 78°C	Packing Group II
Solubility in water 72 g/L	Boiling point 780°C	UN Number 2923
	Specific gravity 2.18 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H332 Harmful if inhaled

H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The solid and solution are highly corrosive; aqueous solutions are strongly basic. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury. Symptoms of ingestion include headache, nausea, vomiting and muscle weakness. Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The hydroxide reacts with carbon dioxide from the air to form barium carbonate. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture.

Store away from acids, oxidising agents, metals and organic materials.

Store with corrosive solids.

APPLICATIONS

General science: to demonstrate its endothermic reaction with ammonium salts.

Senior chemistry: diluted, in acid-base titrations; a source of soluble barium ion in displacement reactions.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and place into a suitable labelled container. Store for collection. Wash spill area thoroughly with water. Residual barium salts can be dissolved with dilute hydrochloric acid (0.01M) followed by rinsing with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus barium hydroxide in the original container or other suitable labelled container. Arrange for collection by a licenced chemical waste contractor.

Waste solution: Neutralise the solution to within pH 6-8 by addition of sulfuric acid (1M). Allow the mixture to stand for 3-4 days, then test with a few drops of 10% sodium sulfate solution. If further precipitation of barium sulfate occurs, add sodium sulfate solution until there is no further precipitation. Collect the white solid by filtration and allow to dry. Small quantities of barium sulfate can be disposed of as general waste. Large quantities: place in a suitable labelled container such as for waste inorganic solids and store for collection. Dispose of the neutral filtrate down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26

Formula C₇H₆O₂

CAS No. 65-85-0

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystalline powder with a faint odour.	Molar mass 122.12	ADG Class -
SOLUBILITY Slightly soluble in water. Soluble in ethanol, diethyl ether and acetone.	Melting point 121-123°C	Packing Group -
Solubility in water 2.9 g/L (20°C)	Boiling point 249°C	UN Number None
	Specific gravity 1.27 (20°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H318 Causes serious eye damage
H372 Causes damage to organs (lungs) through prolonged or repeated exposure if inhaled

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. An allergic reaction may result from skin contact or ingestion.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating dust. Avoid breathing dust or aerosols. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents, bases and reducing agents.
Store with general organic solids.

APPLICATIONS

Senior chemistry: melting point determinations; to practise recrystallisation technique; ester preparation.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Scoop up with a non-sparking tool. Treat as for waste acid.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Scoop up and add to a large volume of water. Neutralise the solution as for Waste Disposal. Decant neutral solution down the sink. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dissolve waste by adding to 5% sodium carbonate solution. Test the pH with pH paper and neutralise the solution to within pH 6-8 by addition of sodium carbonate or dilute hydrochloric acid (0.5M) in portions as necessary. Flush the neutral solution down the sink.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

POISONS CENTRE: 13 11 26

benzoyl chloride

benzoic acid chloride

DANGER

Formula C₇H₅ClO

CAS No. 98-88-4

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless fuming liquid with a disagreeable, pungent odour.	Molar mass 140.57	ADG Class 8
SOLUBILITY Miscible with diethyl ether and oils.	Melting point -1°C	Packing Group II
Solubility in water Decomposes	Boiling point 197°C	UN Number 1736
	Specific gravity 1.22 (20°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H227 Combustible liquid
H302 Harmful if swallowed
H312 Harmful in contact with skin
H332 Harmful if inhaled
H314 Causes severe skin burns and eye damage
H317 May cause an allergic skin reaction

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®; neoprene for splash contact). Benzoyl chloride is corrosive and a lachrymator. Exposure may cause irritation and burns to the skin, eyes, respiratory tract and on ingestion. Eye exposure may cause permanent damage. Skin contact may lead to an allergic reaction. Handle only in an operating fume cupboard. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition. Benzoyl chloride decomposes in water to give benzoic acid and hydrochloric acid.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and sources of ignition. Store away from alcohols, oxidising agents, bases, alkali hydroxides, amines, alkali metals and alkaline earth metals. Store with corrosive liquids (organic acids).

APPLICATIONS

Senior chemistry: preparation of esters, amides.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with a mixture of sodium carbonate or sodium bicarbonate and non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter). Scoop up with a non-sparking tool into a bucket of water. Allow the mixture to stand overnight. Test the pH (pH paper) and neutralise the solution by addition of HCl (1-2M) or sodium carbonate as necessary. Flush the neutral solution down the sink. Dispose of residual absorbent material as general waste. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid chloride can be decomposed by its reaction with aqueous base to give a non-hazardous water-soluble salt. Benzoyl chloride requires 2 equivalents of base for neutralisation.

Small quantity: Add the waste acid chloride to sodium hydroxide solution (2M) or sodium carbonate solution (2M) at the rate of 1mL of acid chloride to 20 mL of aqueous base. Carbon dioxide gas will evolve from the reaction with sodium carbonate. Allow the mixture to stand overnight. Neutralise the solution to pH ~7 by addition of HCl (1-2M) and flush down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin with plenty of water. If skin irritation or rash occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.
POISONS CENTRE: 13 11 26.

ANGER



Formula H₃BO₃
CAS No. 10043-35-3
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder with a faintly bitter taste.

SOLUBILITY

Soluble in water, ethanol, methanol, glycerol, ethylene glycol. Slightly soluble in acetone, ethyl acetate.

Solubility in water 49.2 g/L (20°C)

PHYSICAL DATA

Molar mass 61.83
Melting point 168-171°C
Boiling point 300°C
Specific gravity 1.489 (23°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H360FD May damage fertility.
May damage the unborn child.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The aqueous solution is a weak acid. Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. May be harmful by ingestion, inhalation or by absorption through abraded skin or open wounds.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The reaction with alkali metals or metal hydrides generates flammable hydrogen gas. In the presence of water, the acid is corrosive to metals.

Boric acid should not be handled by pregnant staff.

STORAGE

Boric acid is moisture sensitive. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong oxidising agents, strong reducing agents, strong bases, alkali metals.

Store with general inorganic solids.

APPLICATIONS

General science: flame test activities.

Senior biology: a component of pollen germination media.

Senior chemistry: glass making.

Technical: preparation of buffer solutions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Scoop up with a non-sparking tool. Solution spill: Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water.

Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.

Large spill: Place material in a suitable labelled container and arrange for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift. Boron can bioaccumulate in plants but is not expected to bioaccumulate in aquatic food chains.

Small quantity: Wear PPE and work in a fume cupboard.

Add the waste acid slowly to a large volume of water.

Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.

Large quantity: Store in a suitable labelled container.

Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, seek medical advice.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. If irritation or discomfort persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms persist, seek medical advice. If exposed or concerned: Get medical advice/attention.

Formula Br₂
CAS No. 7726-95-6 (bromine)
User Group 11-12 (Note L)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, dark orange liquid with a pungent odour.	Molar mass 79.904 (bromine)	ADG Class 8 (6.1)
SOLUBILITY Miscible with water. <i>Bromine is soluble in ethanol, diethyl ether, non-polar solvents and halogenated solvents.</i>	Melting point -	Packing Group I
Solubility in water Miscible	Boiling point ca. 100°C	UN Number 1744
	Specific gravity ca. 1.0	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, neoprene). Exposure may cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion.

Bromine vapour is toxic by inhalation. Symptoms of inhalation of low concentrations of the vapour include cough, nose bleed, and CNS effects. Eye contact with the solution may result in permanent damage.

Handle only in an operating fume cupboard. Avoid inhaling fumes, vapour or mist. Avoid contact with skin, eyes and clothing. Open the bottle cautiously as pressure may have developed.

STORAGE

Bromine water is light-sensitive; sunlight accelerates the disproportionation of bromine to hydrobromic acid and hypobromous acid. Store in a tightly closed amber glass bottle in a cool, dry, well-ventilated place. Protect from sunlight. Inspect the lid periodically for damage. Consider bundling in a secondary lidded container. Do not store in the refrigerator, as bromine vapour may build up and can corrode refrigerator components.

Store away from combustible material, organic substances, reducing agents and metals.

Store with corrosive substances.

Solutions of bromine in water have a concentration of less than 5%. The concentration of the solution will reduce over time due to loss of the volatile bromine from the solution.

APPLICATIONS

Senior chemistry: test for unsaturation of organic compounds; qualitative properties of the element.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with a mixture of sodium thiosulfate and sand or other non-combustible material. Collect material and add to a large volume of water. Allow the mixture to stand for several minutes. Stir the mixture and if bromine still remains in solution (indicated by its colour), treat with further thiosulfate solution as for Waste Disposal. Decant the solution down the sink and dispose of solid residue as general waste.

Wash the spill area with dilute sodium thiosulfate solution (<0.1M) and then with water. Rinse any contaminated clothing immediately with water, and wash before reuse.

WASTE DISPOSAL

Small quantity: To the waste bromine water, slowly add a dilute solution of sodium thiosulfate (0.1-0.2 M) until the resulting solution becomes clear. Wash the solution down the sink with further dilution.

Large quantity: Store in the original bottle or a labelled amber glass bottle and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26

Formula C₂₁H₁₄Br₄O₅S
CAS No. 76-60-8
User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Green powder with a characteristic odour.	Molar mass 698.01	ADG Class -
Dye family triarylmethane	Melting point 217-218°C 225°C decomposes	Packing Group -
Solubility water ¹ 6 mg/mL ethanol ¹ 40 mg/mL Soluble in ethyl acetate.	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 423 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin and respiratory tract, and mechanical irritation to the eyes. May be harmful by ingestion, inhalation or if absorbed through the skin. When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- pH indicator
- tracking dye for electrophoresis
- histology: for protein determinations

COLOUR CHANGE

pH 3.8

yellow

pH 5.4

blue-green

PREPARATION

pH indicator: Dissolve 0.4 g in 200 mL ethanol. Make up to 1L with distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Gabb & Latchem

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids, bases, oxidising agents and reducing agents.
Store with dyes and indicators or with general organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. In severe cases, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula C₂₁H₁₆Br₂O₅S

CAS No. 115-40-2

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Pale yellow or violet crystals or powder with a characteristic odour.	Molar mass 540.22	ADG Class -
Dye family triarylmethane	Melting point 241-242°C	Packing Group -
Solubility water ¹ 20 mg/mL ethanol ¹ 80 mg/mL Soluble in dilute alkalis.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 419 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- vital stain

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 5.2

yellow

pH 6.8

purple

PREPARATION

pH indicator: Dissolve 0.4 g in 200 mL ethanol. Make up to 1L with distilled water.²

References:

1. Aldrich Handbook 2. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₁₉H₁₀Br₄O₅S

CAS No. 115-39-9

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Light pink to purple or red crystalline powder with a faint odour.	Molar mass 669.96	ADG Class -
Dye family triarylmethane	Melting point 204°C 279°C decomposes	Packing Group -
Solubility water ¹ 3 mg/mL ethanol ¹ 9 mg/mL Soluble in acetic acid and sodium hydroxide solution.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 598 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H312 Harmful in contact with skin
H332 Harmful if inhaled
H319 Causes serious eye irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful if a large amount is ingested, or if inhaled or absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- tracking dye for gel electrophoresis
- demonstrations of dichroism

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 2.8

yellow

pH 4.6

blue-violet

PREPARATION

pH indicator: Dissolve 0.4 g in 200mL of ethanol. Make up to 1L with distilled water.²

References:

1. Aldrich Handbook 2. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

Formula C₂₇H₂₈Br₂O₅S

CAS No. 76-59-5

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Cream coloured, purple, green or brown, odourless crystals.	Molar mass 624.38	ADG Class -
Dye family sulfonephthalein	Melting point 200-202°C	Packing Group -
Solubility water ¹ 1 mg/mL ethanol ¹ 20 mg/mL Soluble in aqueous alkali solutions.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 420 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Dust or mist may cause irritation.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- respiration experiments: indicates acidification of solution due to dissolved CO₂
- vital stain for cell walls and nuclei

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 6

yellow

pH 7.6

blue

PREPARATION

pH indicator: Dissolve 0.4 g in 200mL of ethanol. Make up to 1L with distilled water.²

References:

1. Aldrich Handbook
2. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice.

ANGER

Formula C₄H₁₀O

CAS No. 71-36-3

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a sweet, ethanol-like odour.	Molar mass 74.12	ADG Class 3
SOLUBILITY Soluble in water, ethanol, diethyl ether and other organic solvents.	Melting point -89°C	Packing Group III
Solubility in water 77 g/L (20°C)	Boiling point 118°C	UN Number 1120
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H302 Harmful if swallowed
H315 Causes skin irritation
H318 Causes serious eye damage
H335 May cause respiratory irritation
H336 May cause drowsiness or dizziness

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; nitrile for splash protection). Exposure may cause irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of inhalation, ingestion or skin absorption include nausea, headache, dizziness and CNS depression. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure to the liquid may cause severe irritation and serious eye damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, acid chlorides, bases, halogens, reducing agents, alkali metals and aluminium.

Store with flammable liquids in an AS compliant cabinet.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Treat as for Waste Disposal.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations.

WARNING

Formula C₄H₁₀O

CAS No. 78-92-2

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless volatile liquid with a sweet, alcohol-like odour.	Molar mass 74.12	ADG Class 3
SOLUBILITY Miscible with ethanol and diethyl ether. Soluble in water and acetone.	Melting point -115°C	Packing Group III
Solubility in water 125 g/L (20°C)	Boiling point 99°C	UN Number 1120
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H319 Causes serious eye irritation
H335 May cause respiratory irritation
H336 May cause drowsiness or dizziness

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; nitrile for splash protection). Exposure may cause irritation to the eyes, nose, throat and respiratory tract and on ingestion. Exposure to high concentrations of the vapour may cause CNS depression, nausea, headache and dizziness. Prolonged or repeated skin contact can lead to dryness, cracking and dermatitis. Eye exposure to the liquid may cause severe irritation and serious eye damage. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. Test for peroxides before use, particularly if intending to heat or distill the alcohol.

STORAGE

With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides, which may become explosive if they are concentrated. Store in a tightly closed container in a cool, dry well-ventilated place away from sunlight. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids, acid chlorides, bases, halogens, reducing agents, alkali metals and aluminium. Store with flammable liquids in an AS compliant cabinet. Mark the bottle with the date received and date opened.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus butan-2-ol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. As the alcohol is a peroxide former, waste or surplus butan-2-ol should not be stored with any other waste.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol.

DANGER

Formula C₄H₈O
CAS No. 78-93-3
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, highly volatile, highly flammable liquid with a sweet, sharp odour.	Molar mass 72.11	ADG Class 3
SOLUBILITY Soluble in water, ethanol, diethyl ether and acetone.	Melting point -86°C	Packing Group II
Solubility in water 292 g/L (20°C)	Boiling point 80°C	UN Number 1193
	Specific gravity 0.805 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security IDM Cat 3

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause irritation of the skin, eyes and respiratory tract. Ingestion or inhalation may cause CNS depression, drowsiness and dizziness. Prolonged or repeated skin contact may have a degreasing effect. Handle in an operating fume cupboard or well-ventilated area. Avoid inhaling fumes, vapour or mist. Avoid contact with skin and eyes. Handle away from heat and other sources of ignition. There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Test for peroxides before use, particularly if intending to heat the substance.

STORAGE

The liquid is hygroscopic, becoming yellow over time. May form explosive peroxides over time and on exposure to air, light or oxidising agents. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents, metals, acids, alkalis, plastics and rubber. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: solvent for extraction of natural products; sample compound for gas chromatography.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand. **Small quantity:** Place spill material in a shallow vessel in an operating fume cupboard and allow the ketone to evaporate from the absorbent. Dispose of the absorbent material as general waste. **Large quantity:** Place in a suitable labelled container and store for collection. Ventilate the spill area to evaporate any residual ketone and wash thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Butan-2-one is expected to biodegrade in the environment and is not expected to bioaccumulate. **Small quantity:** Place in a shallow vessel in an operating fume cupboard and allow to evaporate. **Large quantity:** Store in a suitable labelled bottle such as for 'waste non-halogenated organic liquid'. Arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose empty bottles to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. **IF SWALLOWED:** Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention. **IF ON SKIN:** Remove immediately contaminated clothing. Rinse skin thoroughly with water/shower. If irritation occurs, seek medical advice. **IF INHALED:** Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

DANGER

Formula C₄H₈O₂
CAS No. 107-92-6
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, oily liquid with disagreeable, rancid odour.	Molar mass 88.11	ADG Class 8
SOLUBILITY Miscible with water. Soluble in ethanol and diethyl ether.	Melting point -8 to -5°C	Packing Group III
Solubility in water Miscible	Boiling point 163.5°C	UN Number 2820
	Specific gravity 0.96 (20°C)	Poisons Schedule S6
	Flammability Combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, butyl rubber; latex or nitrile gloves provide splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage.

Handle only in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing.

Substance is combustible; vapours may form explosive mixtures with air.

Contact with reactive metals such as aluminium, iron, tin, and zinc may generate flammable hydrogen gas.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents, strong bases and reactive metals.

Store with corrosives liquids (organic acids).

APPLICATIONS

Senior chemistry: preparation of esters

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Decant the neutral solution down the sink with further dilution. Dispose of the residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove immediately contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

DANGER

Formula C₆H₁₂O₂
CAS No. 123-86-4
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a pleasant banana-like odour.	Molar mass 116.16	ADG Class 3
SOLUBILITY Slightly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone and most hydrocarbons.	Melting point -77°C	Packing Group II
Solubility in water 4.3 g/L (20°C)	Boiling point 127°C	UN Number 1123
	Specific gravity 0.88 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; nitrile for splash contact). Exposure may cause irritation to the skin, eyes and respiratory tract. Inhalation or ingestion may cause dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from light, especially direct sunlight. Store away from heat and all sources of ignition. Ensure container is kept upright to prevent leakage. Store away from strong oxidising agents, strong acids, strong bases, alkali metals and alkali hydroxides. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between acetic acid and *n*-butanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₈H₁₆O₂
CAS No. 109-21-7
User Group 11-12

DESCRIPTION

Colourless liquid with a pineapple-like odour.

SOLUBILITY

Very slightly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 0.5 g/L (20°C)

PHYSICAL DATA

Molar mass 144.21
Melting point -92°C
Boiling point 166°C
Specific gravity 0.87 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 3272
Poisons Schedule -
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; butyl rubber for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage. Store away from strong oxidising agents and strong bases. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between butyric acid and *n*-butanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.

Formula C₇H₁₄O₂
CAS No. 590-01-2
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with an apple-like odour.	Molar mass 130.19	ADG Class 3
SOLUBILITY Slightly soluble in water. Miscible with ethanol and diethyl ether.	Melting point -90°C	Packing Group III
Solubility in water 1.5 g/L (20°C)	Boiling point 146°C	UN Number 1914
	Specific gravity 0.87 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H315 Causes skin irritation
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; neoprene for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Vapours will form explosive mixtures with air. There is potential for the vapour to collect in low-lying, confined areas. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage. Store away from strong oxidising agents, strong acids, strong bases, alkali metals and reducing agents. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between propionic acid and *n*-butanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.

Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula Ca
CAS No. 7440-70-2
User Group 7-12

DESCRIPTION

Silvery-white, soft metal, in the form of pieces or granules, which acquires a grey tarnish on exposure to air.

SOLUBILITY

Reacts with water.

Solubility in water 4 g/L (20°C)
decomposes

PHYSICAL DATA

Molar mass 40.08
Melting point ca 839-845°C
Boiling point 1484°C
Specific gravity 1.54 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class 4.3
Packing Group II
UN Number 1401
Poisons Schedule -
Security IDM Cat 2

HAZARD STATEMENTS

H261 In contact with water releases flammable gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Calcium is a reducing agent and reacts with water to give strongly alkaline solutions. Exposure to dust or fumes may cause irritation to the skin, eyes, and respiratory and gastrointestinal tracts. The metal can react with moisture in the mucous membranes, skin and eyes, causing chemical burns. Eye exposure can result in permanent eye damage.

Handle in a well-ventilated area. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from ignition sources.

The metal reacts readily with water to produce flammable hydrogen gas and aqueous calcium hydroxide. Calcium can react dangerously with oxidising substances.

In case of fire, use sand or dry chemical as the extinguishing agent.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Collect material with a non-sparking tool. If it be uncontaminated, store the calcium for future use. Otherwise, treat as for Waste Disposal.

Treat spill area with vinegar to destroy any residual calcium, then wash thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE. Work in an operating fume cupboard. Add the calcium in portions to a beaker of water in the ratio of about 1 g of calcium to 100 mL of water. Allow the calcium to react between additions. When all of the calcium has been consumed and there is no further evolution of hydrogen, neutralise the solution to within pH 6-8 by addition of dilute HCl (1M) and wash down the sink.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

Do not mix with other waste.

STORAGE

Over time, calcium reacts with air, forming a passivating surface layer which is a mixture of the oxide and nitride.

Store in a tightly closed container in a cool, dry place away from heat and light. Protect from water and moisture and ensure that the metal is kept dry during storage.

Store away from extreme heat and any ignition sources.

Store away from water, acids, oxidising agents, alcohols and halogens.

Store with like hazards, i.e. DG Class 4.3 substances, which liberate flammable gas when in contact with water.

APPLICATIONS

General science: observations of its reactivity with water.

Technical: preparation of limewater.

FIRST AID

IF IN EYES: Immediately rinse with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Remove particles from mouth. Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water. Immerse in cool water/ wrap in wet bandages. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.



Formula CaCO₃
CAS No. 471-34-1
User Group F-12

DESCRIPTION

Colourless, odourless crystals or powder with a chalky taste.

SOLUBILITY

Sparingly soluble in water. Insoluble in ethanol. Dissolves in dilute acids, with evolution of carbon dioxide.

Solubility in water 14 mg/L (20°C)

PHYSICAL DATA

Molar mass 100.09
Melting point 825°C decomposes
Boiling point -
Specific gravity 2.7-2.95
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. A weak solution of acid (0.01M HCl) can be used to dissolve any residues, followed by rinsing with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: acid-base chemistry; to investigate its thermal decomposition to form calcium oxide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula CaCl₂
CAS No. 10043-52-4
User Group 7-12

DESCRIPTION

Colourless, odourless, hygroscopic crystals, granules, flake, prills or powder.

SOLUBILITY

Soluble in water and ethanol. Dissolution in water generates heat.

Solubility in water 740 g/L (20°C)

PHYSICAL DATA

Molar mass 110.98
Melting point 772°C
Boiling point 1670°C
Specific gravity 2.15 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion. Prolonged or repeated skin contact may cause dermatitis.

Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

Use cool water when preparing solutions of calcium chloride as dissolution liberates much heat.

STORAGE

The anhydrous salt is hygroscopic and deliquescent. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong oxidising agents, strong acids, zinc, aluminium and ferrous metals.

Store with general inorganic solids.

APPLICATIONS

General science: to demonstrate exothermicity on dissolution and melting of ice; flame test solutions; a source of calcium ions in solution.

Senior chemistry: qualitative inorganic analysis; drying agent/desiccant.

Technical: desiccant

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with dry sand.

Small spill: Scoop up material with a non-sparking tool and add to a large volume of water. Decant the solution down the sink with further dilution. Dispose of solid residue as general waste.

Large spill: Scoop up material and place into a suitable labelled container. Arrange for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Add to a large volume of water. Flush down the sink with dilution.

Large quantity: Store waste or surplus calcium chloride in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water. If skin irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula $\text{Ca}_3(\text{C}_6\text{H}_5\text{O}_7)_2 \cdot 4\text{H}_2\text{O}$

CAS No. 5785-44-4

User Group 7-12

DESCRIPTION

White to off-white, odourless, fine powder.

SOLUBILITY

Very slightly soluble in water. Insoluble in alcohol.

Solubility in water 1 g/L (18°C)

PHYSICAL DATA

Molar mass 570.51

Melting point 120°C (-4H₂O)

Boiling point decomposes

Specific gravity 2.0

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Calcium citrate may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and breathing dust. Avoid contact with skin and eyes.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Place in a suitable labelled container such as for dry organic solid waste and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry place away from heat and light.

Store away from strong oxidising agents.

Store with general organic solids.

APPLICATIONS

General science: food chemistry; precipitated from citrus juice by addition of limewater.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with soap and plenty of water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.



Formula Ca(OH)₂
CAS No. 1305-62-0
User Group 11-12

DESCRIPTION

White to off-white, odourless powder with a bitter taste.

SOLUBILITY

Slightly soluble in water. Soluble in acids, glycerol and ammonium salt solutions. Insoluble in alcohol.

Solubility in water 1.79 g/L (25°C)

PHYSICAL DATA

Molar mass 74.09
Melting point 580°C decomposes
Boiling point -
Specific gravity 2.24 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 3262
Poisons Schedule -
Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation and corrosive effects to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury.

Handle in an operating fume cupboard or well ventilated area. Avoid breathing dust and contact with skin and eyes.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up into a plastic container. Treat as for Waste Disposal. Wash spill area thoroughly with water. Residual calcium salts can be dissolved with dilute hydrochloric acid (0.01M) followed by rinsing with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste calcium hydroxide slowly to a large volume of water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture. Calcium hydroxide absorbs carbon dioxide from the air, forming calcium carbonate.

Store away from acids and light metals.
Store with corrosive solids.

APPLICATIONS

General science: investigations of acids and bases; heat of solution investigations.

Senior chemistry: small-scale preparation of ammonia gas from the reaction with ammonium chloride.

Technical: preparation of limewater.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



Formula n/a
CAS No. n/a
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, odourless liquid. Turns cloudy on absorption of carbon dioxide.	Molar mass -	ADG Class 8
SOLUBILITY Soluble in water.	Melting point -	Packing Group III
Solubility in water Soluble	Boiling point ca. 100°C	UN Number 1719
	Specific gravity -	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract. Dust can be generated in the preparation of limewater.
Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust or vapour and contact with skin and eyes.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
The solution absorbs carbon dioxide from the air, forming poorly soluble calcium carbonate. Storage under a tube of soda lime may extend the life of the solution.
Store away from acids and oxidising agents.
Store with corrosive liquids (non-acids).

APPLICATIONS

General science/Senior chemistry: test for the presence of carbon dioxide.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up into a plastic container. Add material to a large volume of water. Neutralise as for Waste Disposal. Decant the neutral solution down the sink. Dispose of residual solid material as general waste. Wash spill area thoroughly with water. Residual calcium salts can be dissolved with dilute hydrochloric acid (0.01M) followed by rinsing with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Wear PPE and work in a fume cupboard. Neutralise the solution to within pH 6 - 8 by addition of dilute hydrochloric acid (1-2M). Flush the neutral solution down the sink. The concentration of a saturated solution of calcium hydroxide is approximately 0.2%, or 0.02M. Waste solutions are likely to be cloudy due to the formation of poorly soluble calcium carbonate. Theoretically, 20mL of 2M hydrochloric acid is sufficient to neutralise 1L of saturated calcium hydroxide solution.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



calcium hypochlorite

pool chlorine; hypochlorous acid, calcium salt

DANGER

Formula $\text{Ca}(\text{OCl})_2$
CAS No. 7778-54-3
User Group 11-12



DESCRIPTION

White to greyish-white powder, crystalline granules or tablets with a strong odour of chlorine. A component of swimming pool 'chlorine'.

SOLUBILITY

Soluble in water, decomposing and releasing chlorine.

Solubility in water 200 g/L (20°C)

PHYSICAL DATA

Molar mass 142.98
Melting point 100°C
Boiling point 177°C (decomposes)
Specific gravity 2.35 (20°C)
Flammability Non-combustible
oxidising solid

REGULATORY INFORMATION

ADG Class 5.1
Packing Group II
UN Number 1748
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, nitrile). Calcium hypochlorite is a strong oxidising agent. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact with the solid or concentrated solution may cause burns and permanent damage. Repeated or prolonged exposure can cause skin sensitisation.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

Mixing hypochlorite with acid generates toxic chlorine gas. In case of fire, use flooding quantities of water as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. The hypochlorite decomposes slowly, releasing oxygen and chlorine gases. Decomposition is accelerated with exposure to heat, sunlight, air, moisture, metal oxides or other impurities. A small amount of water or other contaminant can generate sufficient heat to cause a runaway decomposition which can lead to an explosion or fire. Protect from air, moisture and sunlight. Store away from heat and all sources of ignition. Inspect container and lid periodically for damage or deterioration. Do not store for prolonged periods.

Store away from reducing agents, acids, organic substances, combustible materials, powdered metals and amines. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: swimming pool chemistry investigations

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation.

Solid spill: Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect with a non-sparking tool. Add material slowly to a large volume of water and reduce the hypochlorite and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water; ensure no hypochlorite residues remain in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid calcium hypochlorite must not be disposed of with general waste. Store waste or surplus solid in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

Small quantity of solution: For concentrations < 0.5%, flush down the sink. Higher concentrations: Treat with a reducing agent. 75mL of 10% sodium bisulfite or sodium metabisulfite solution will reduce 100 mL of 5% calcium hypochlorite solution. Neutralise the resulting solution to within pH 6-8 and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



calcium nitrate, tetrahydrate

calcium saltpeter; nitric acid, calcium salt, tetrahydrate

WARNING



Formula $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$

CAS No. 13477-34-4

User Group 7-12

DESCRIPTION

Colourless, odourless, hygroscopic crystals.

SOLUBILITY

Soluble in water, methanol, ethanol and acetone.

Solubility in water 1470 g/L (0°C)

PHYSICAL DATA

Molar mass	236.149
Melting point	45°C >130°C (-4H ₂ O)
Boiling point	225°C decomposes
Specific gravity	1.82 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	1454
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H319 Causes serious eye irritation
H315 Causes skin irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Symptoms of inhalation or ingestion include nausea and vomiting.

Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

There is a risk of fire or explosion if calcium nitrate is mixed with oxidisable or combustible substances, exposed to heat or subjected to friction or mechanical shock. The preparation of explosive mixtures is not recommended.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture.

Store away from combustible material, organic substances, reducing agents, strong acids and ammonium compounds.

Avoid storage on shelves made from wood or other combustible material.

Store with oxidising substances.

APPLICATIONS

Senior chemistry: source of calcium ions for qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with dry sand. Scoop up material with a dry, non-sparking tool and place into a suitable labelled container. Store for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus calcium nitrate in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula CaO
CAS No. 1305-78-8
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White or grey, odourless, hygroscopic powder or granules.	Molar mass 56.08	ADG Class -
SOLUBILITY Reacts with water. Soluble in acids, glycerol and sugar solution. Practically insoluble in ethanol.	Melting point 2580°C	Packing Group -
Solubility in water 1.65 g/L (20°C) rapid hydrolysis	Boiling point 2850°C	UN Number None
	Specific gravity 3.37 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H318 Causes serious eye damage
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation and corrosive burns to the skin, eyes, respiratory tract and on ingestion. Prolonged or repeated skin contact may cause dermatitis. Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The reaction of calcium oxide with water, giving calcium hydroxide, generates much heat. Avoid inhaling mists or fumes if carrying out this reaction.

STORAGE

Calcium oxide is hygroscopic and becomes 'air-slaked', forming calcium hydroxide and calcium carbonate, with absorption of moisture and carbon dioxide from the air. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture. Store away from acids, alcohols, acids, light metals, and halogenated compounds. Do not store in an aluminium container. Store with general inorganic solids.

APPLICATIONS

General science: to investigate its exothermic reaction with water.

SPILLS

Wear PPE. Ensure good ventilation. Cover spill with dry sand. Scoop up material with a dry, non-sparking tool and place into a suitable labelled container. Store for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus calcium oxide in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE 13 11 26

calcium phosphate, dibasic, dihydrate

calcium hydrogen phosphate dihydrate

Formula CaHPO₄·2H₂O

CAS No. 7789-77-7

User Group 7-12

DESCRIPTION

Colourless, odourless powder or granules.

SOLUBILITY

Practically insoluble in water and alcohol.
Soluble in dilute hydrochloric, nitric and acetic acids.

Solubility in water 0.2 g/L (25°C)

PHYSICAL DATA

Molar mass 172.09

Melting point ca. 100°C (-2H₂O)
370°C decomposes

Boiling point -

Specific gravity 2.89 (20°C; anhydrous)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place.

Store away from strong oxidising agents.

Store with general inorganic solids.

APPLICATIONS

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation occurs, seek medical attention.

IF SWALLOWED: Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin with soap and plenty of water.

IF INHALED: Move patient to fresh air. If respiratory symptoms develop, seek medical advice/attention.



calcium phosphate, monobasic, monohydrate

calcium dihydrogen phosphate monohydrate

WARNING



Formula $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$

CAS No. 10031-30-8

User Group 11-12

DESCRIPTION

Colourless, odourless powder or crystals with a strong acid taste.

SOLUBILITY

Sparingly soluble in water. Soluble in the dilute acids hydrochloric, nitric and acetic.

Solubility in water

18 g/L (30°C) (anhydrous)

PHYSICAL DATA

Molar mass 252.065

Melting point 100°C (-H₂O)
200°C decomposes

Boiling point -

Specific gravity 2.22 (18°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste. Alternatively, if the salt is not contaminated, it can be applied to soil as a fertiliser.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in an operating fume cupboard or well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture.

Store away from strong oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science/Biology: investigations of the effect of nutrients on plant growth.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If symptoms persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula $\text{Ca}_3(\text{PO}_4)_2$

CAS No. 7758-87-4

User Group 7-12

DESCRIPTION

Colourless, odourless powder or crystals. Two crystalline forms: β -form transforms into α -form at 110°C.

SOLUBILITY

Practically insoluble in water, alcohol and acetic acid. Soluble in dilute hydrochloric acid and dilute nitric acid.

Solubility in water 0.02 g/L (20°C)

PHYSICAL DATA

Molar mass 310.18

Melting point 1670°C

Boiling point -

Specific gravity 3.14 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile).

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place.

Store away from strong oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science/Biology: investigations of the minerals found in bones and teeth.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF SWALLOWED: Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water.

IF INHALED: Move patient to fresh air. If respiratory symptoms develop, seek medical advice/attention.



Formula CaSO₄·2H₂O

CAS No. 10101-41-4

User Group 7-12

DESCRIPTION

Colourless, odourless powder or crystals.

SOLUBILITY

Slightly soluble in water. Soluble in ammonium salt solutions and acids. Insoluble in organic solvents.

Solubility in water ca. 2 g/L (20°C)

PHYSICAL DATA

Molar mass 172.17

Melting point 1450°C
130°C (-³/₂H₂O)
163°C (-¹/₂H₂O)

Boiling point -

Specific gravity 2.32 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place.

Store away from strong oxidising agents and acids.

Store with general inorganic solids.

APPLICATIONS

General science/Biology: flocculating agent for soil testing; investigations of the effect of nutrients on plant growth.

Senior chemistry: inorganic displacement reactions; dehydration/rehydration reactions.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Seek medical attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air. If respiratory symptoms develop, seek medical advice/attention.



Formula $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

CAS No. 10034-76-1

User Group 7-12

DESCRIPTION

Colourless, odourless fine powder.

SOLUBILITY

Very slightly soluble in water.

Solubility in water 0.30 g/L (25°C)

PHYSICAL DATA

Molar mass 290.296

Melting point 1450°C
163°C (-1/2H₂O)

Boiling point -

Specific gravity 2.5

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the eyes and respiratory tract. If ingested, Plaster of Paris may harden and lead to an obstruction in the stomach.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin and eyes. Avoid prolonged or repeated exposure.

The salt reacts vigorously with water and acids, generating much heat. Do not attempt to use Plaster of Paris to encase or make a cast of any body part as serious burns may result.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture.

Store away from strong oxidising agents and acids.

Store with general inorganic solids.

APPLICATIONS

General science: preparation of moulds and casts.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste. Alternatively, react with water in a disposable container, allow to set, and dispose of as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection via a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention. Do not attempt to remove hardened plaster particles by mechanical means.

IF SWALLOWED: Rinse mouth. Drinking glycerin or gelatine solution or large volume of water may delay setting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air. If respiratory symptoms develop, seek medical advice/attention.

DANGER

Formula $C_{21}H_{21}N_3 \cdot HCl$
CAS No. 4197-24-4
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green odourless crystals or powder. A mixture of phenol and basic fuchsin.	Molar mass 351.88	ADG Class -
Dye family triarylmethane	Melting point 69-75°C	Packing Group -
Solubility water ¹ 2 mg/mL ethanol ¹ 30 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ_{max}) 547 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H332 Harmful if inhaled
H314 Causes severe skin burns and eye damage
H341 Suspected of causing genetic defects
H351 Suspected of causing cancer
H373 May cause damage to organs through prolonged or repeated exposure

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation and burns by all exposure routes.

Handle only in an operating fume cupboard. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- detects acid-fast bacteria;
- stains mycobacteria

PREPARATION

Dissolve 1 g of fuchsin in 10mL of ethanol. Prepare a 5% aqueous phenol solution by dissolving 5 g of phenol in 100mL distilled water. Add the fuchsin solution to 90 mL of the phenol solution. Allow to stand 24 hours, then filter.²

References: 1. Aldrich Handbook 2. Dungey

STORAGE

Store in a cool, dry, well-ventilated place away from heat. Protect from light. Store away from acids, alkalis and oxidising agents. Store with corrosive solids (DG Class 8).

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a Poisons Centre or doctor.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek immediate medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26



Formula C
CAS No. 7440-44-0
User Group 7-12

DESCRIPTION

Black, odourless blocks (ca. 100 x 25 x 25 mm) or rods (ca. 6 mm dia, 100 mm long).

SOLUBILITY

Insoluble in water, acids or alkalis.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 12.01
Melting point 3550°C
Boiling point -
Specific gravity 18.21
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to dust or small particles may cause irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

The dust can form explosive mixtures with air. Handle away from heat and sources of ignition.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Carbon in bulk form can be disposed of as general waste. Store waste or surplus carbon powder or granules in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Store in a container made from non-combustible material. Ensure that blocks are cool and dry before packing away for storage. Store away from sources of heat or ignition.

Store away from oxidising agents, strong acids, reducing agents, oils and other hydrocarbons, halogens and peroxides.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: blocks: redox reaction to extract a metal from the metal oxide; rods: inert electrode in electrochemical cell.

FIRST AID

IF IN EYES: (dust/small particles) Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: (of dust) Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

Formula C
CAS No. 7440-44-0
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Black, odourless, amorphous powder.	Molar mass 12.01	ADG Class -
SOLUBILITY Insoluble in water, acids or alkalis.	Melting point 3550°C	Packing Group -
Solubility in water Insoluble	Boiling point -	UN Number None
	Specific gravity 18.21	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract, and on ingestion.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The dust can form explosive mixtures with air. Charcoal will burn if exposed to a flame. Burning may produce toxic gases including carbon monoxide from incomplete combustion.

Handle away from heat and sources of ignition. Charcoal can ignite spontaneously in air. The more finely divided the charcoal, the greater the potential for spontaneous ignition. Exposure to heat, oxygen or moisture also increases the chance of spontaneous ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture. Store away from sources of heat or ignition.

Store away from oxidising agents, reducing agents, oils and other hydrocarbons, halogens and peroxides. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: redox reaction to extract a metal from the metal oxide

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Collect material with a non-sparking tool into a suitable labelled container and store for collection. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus carbon powder in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

Formula CO₂
CAS No. 124-38-9
User Group 7-12 (Note A)

DESCRIPTION	PHYSICAL DATA	
Colourless, odourless gas.	Molar mass 44.01	Vapour density (air = 1) 1.52
	Melting point -78.5°C sublimation point	Liquid density (water = 1) -
	Boiling point -56.6°C triple point (5.19 bar)	Flammability Non-combustible
	Solubility in water 2.0 g/L	Flammability Range (% by volume of air) -

HAZARD STATEMENTS

Asphyxiation hazard

WASTE DISPOSAL

Unused carbon dioxide may be safely vented to the atmosphere in an operating fume cupboard or well-ventilated area.
Glassware and other items of apparatus should be rinsed with water.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves. Carbon dioxide is heavier than air and can collect in low-lying areas. Aqueous solutions of the gas are moderately acidic.

At high concentrations there is a risk of asphyxiation due to displacement of air. The victim may be unaware of the asphyxiation. Lower concentrations of the gas can cause headache and increased respiration.

Ensure adequate ventilation when generating the gas.

PREPARATION NOTES

Carbon dioxide can be prepared from the reaction of an acid (e.g. hydrochloric or acetic acid) with an alkali or alkaline earth carbonate (e.g. calcium carbonate).

The gas is collected directly into the receiving vessel by upward displacement of air.

Either the carbonate or the acid can act as the limiting reagent.

APPLICATIONS

General science: the preparation of carbon dioxide gas and investigation of its properties.

FIRST AID

IF IN EYES: Adverse effects to the eyes are not expected.

IF SWALLOWED: Ingestion is considered unlikely.

IF ON SKIN: Adverse effects to the skin are not expected.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. For advice, call the Poisons Information Centre or a doctor.

POISONS CENTRE: 13 11 26

Formula CO₂

CAS No. 124-38-9

User Group Staff (Note A)

DESCRIPTION

A white solid which sublimates to a colourless, odourless gas.

PHYSICAL DATA

Molar mass	44.01	Vapour density (air = 1)	1.52
Melting point	-78.5°C sublimation point	Liquid density (water = 1)	-
Boiling point	-56.6°C triple point (5.19 bar)	Flammability	Non-combustible
Solubility in water	2.0 g/L	Flammability Range (% by volume of air)	-

HAZARD STATEMENTS

Asphyxiation hazard

SPILLS

Ensure adequate ventilation in case of a spill. Sweep up spill material and place in a suitable open container in an operating fume cupboard or well-ventilated area. Allow the dry ice to sublime to the atmosphere.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, loose-fitting cold insulated or leather gloves. Carbon dioxide is heavier than air and can collect in low-lying areas. At high concentrations there is a risk of asphyxiation due to displacement of air. The victim may be unaware of the asphyxiation. Lower concentrations of the gas can cause headache and increased respiration.

Skin contact with dry ice can cause cold burns. Eye exposure can cause permanent eye damage.

Dry ice should only be handled by experienced staff.

The audience should wear safety glasses and should be at least 2 metres away from the demonstration.

If the dry ice is to be transported in a private vehicle, it should be collected in an insulated container with a loose-fitting lid. The container should be placed securely in a compartment of the vehicle which is segregated from the driver's compartment.

WASTE DISPOSAL

Unused dry ice may be safely vented to the atmosphere in an operating fume cupboard or well-ventilated area.

STORAGE

Store dry ice in an insulated container such as a styrofoam cooler box, in a well-ventilated, low-traffic area in a stable position. Store below 45°C.

Ensure that the container has a loose-fitting lid; there is a risk of explosion if the solid gas is stored or heated under containment.

FIRST AID

IF IN EYES: Immediately flush with tepid water (30°C) or sterile saline solution for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Seek immediate medical attention.

IF ON SKIN: Cold burns: Remove contaminated clothing. Irrigate skin with tepid water (30°C) for at least 15 minutes. Apply sterile dressing and treat as for thermal burn. Do not apply hot water or radiant heat. Seek medical attention.

IF INHALED: Move patient to fresh air (avoid becoming a casualty) and keep at rest in a position comfortable for breathing. Apply artificial respiration if not breathing. For advice, call the Poisons Information Centre or a doctor.

POISONS CENTRE: 13 11 26

APPLICATIONS

Demonstration of the properties of dry ice.

See the Science ASSIST *Standard Operating Procedure: Handling dry ice* for further guidance and recommended activities.

Formula $C_{22}H_{20}O_{13}$

CAS No. 1390-65-4

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red to dark purple, odourless powder.	Molar mass 554.41	ADG Class -
Dye family anthraquinone	Melting point 136°C decomposes	Packing Group -
Solubility water ¹ 8 mg/mL ethanol ¹ 0.8 mg/mL Soluble in concentrated sulfuric acid.	Flammability Combustible	UN Number None
	Absorption ² (λ_{max}) 531 nm, 563 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause mild irritation to the skin and eyes.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: nuclear stain
- microscopy: stains protozoa cilia; to observe paramecia feeding

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

PREPARATION

microscopy stain: Dissolve 1 g in 100mL of distilled water.³

References:

1. Aldrich Handbook
2. Sabnis
3. Dungey

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If feeling unwell, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice.



Formula C
CAS No. 64365-11-3
User Group 7-12

DESCRIPTION

Black, odourless, amorphous powder or granules.

SOLUBILITY

Insoluble in water, acids or alkalis.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 12.01
Melting point 3550°C
Boiling point -
Specific gravity 18.21
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract, and on ingestion.

Activated carbon, particularly when wet, absorbs oxygen from the air; a sufficient quantity can deplete the air of oxygen in a confined space.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

The dust can form explosive mixtures with air. Handle away from heat and sources of ignition.

Steam activated carbon is not classified as spontaneously combustible (DG Class 4.2).

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Collect material with a non-sparking tool into a suitable labelled container and store for collection. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus carbon in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Store away from sources of heat or ignition. Protect from moisture.

Store away from oxidising agents, reducing agents, oils and other hydrocarbons, halogens and peroxides.

Store with general inorganic solids.

APPLICATIONS

General science: investigations water purification methods; construction of an air battery.

Senior chemistry: removal of coloured impurities from organic products

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

chlorine, generated from a reaction

chlorine gas; molecular chlorine

DANGER



Formula Cl₂
CAS No. 7782-50-5
User Group Qualified Staff

DESCRIPTION	PHYSICAL DATA			
Greenish-yellow gas with a pungent, irritating odour. Chlorine gas is only visible at high concentrations.	Molar mass	70.91	Vapour density (air = 1)	2.44
	Melting point	-101°C	Liquid density (water = 1)	-
	Boiling point	-34°C	Flammability	Non-combustible oxidising gas
	Solubility in water	8.62 g/L		

HAZARD STATEMENTS

H270 May cause or intensify fire; oxidiser
H331 Toxic if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (chloroprene, nitrile). Chlorine is a very toxic gas and a strong oxidising agent. Aqueous solutions of the gas are acidic. Exposure to low concentrations can cause irritation and inflammation to the skin, eyes and respiratory tract. Exposure to high concentrations can cause severe irritation and chemical burns to the skin, eyes and respiratory tract and possible pulmonary oedema which can be fatal. Eye exposure can cause permanent damage. Detection of the gas by smell is subjective and cannot be relied on to gauge either the presence or the concentration of the gas. Preparation and handling of chlorine gas should only be carried out in an operating fume cupboard by trained staff. Remove any sources of ignition from the work area. Avoid inhaling gas, mist or vapour. Avoid prolonged or repeated exposure. Chlorine can react dangerously with alkalis, reducing agents, organic substances and combustible materials. Ensure that the glassware and other items of apparatus are free from oil and grease. In the presence of water, chlorine is very corrosive to most metals. The gas is heavier than air and may accumulate in low lying confined spaces. The use of microscale techniques in the generation of the gas is recommended.

CHLORINE WATER

Chlorine water is toxic and corrosive. Heating of the solution will release chlorine gas. Avoid contact with skin and eyes. Avoid inhalation of vapour, mist or gas.

APPLICATIONS

Demonstration of the preparation and properties of chlorine.

SPILLS

Accidental release of chlorine gas into the lab:

Evacuate the laboratory. Open external windows. Close internal windows.

Solution spill: Dilute spill with a dilute aqueous solution of sodium hydroxide. Take up with absorbent material and rinse down the sink. Rinse spill area thoroughly with water.

WASTE DISPOSAL

Fill vessels containing unused chlorine with dilute (0.5M) sodium hydroxide solution. Rinse contaminated glassware, tubing and other items of apparatus with the sodium hydroxide solution. Neutralise the rinsing solution and wash down the sink. In alkaline solution, chlorine disproportionates to chloride, Cl⁻, and hypochlorite, ClO⁻, according to the equation Cl₂ + 2OH⁻ → Cl⁻ + ClO⁻ + H₂O

PREPARATION NOTES

Chlorine can be prepared from the reaction of hydrochloric acid with one of sodium hypochlorite solution (household bleach), calcium hypochlorite, manganese dioxide or potassium permanganate.

The gas can be collected by direct delivery into the receiving vessel by upward displacement of air.

The hydrochloric acid is usually the limiting reagent.

The reaction can be quenched by dilution of the reaction mixture with water followed by addition of dilute hydroxide solution.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Ingestion of the gas is considered unlikely. In case of ingestion of chlorine water: Rinse mouth with water. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Flush affected area with water for at least 15 minutes. For burns, apply a dry sterile dressing. Seek medical advice/attention.

IF INHALED: Avoid becoming a casualty. Move patient to fresh air and keep at rest in a position comfortable for breathing. Apply artificial respiration if not breathing. Treat with a glucocorticoid spray. Seek immediate medical advice/attention.
POISONS CENTRE: 13 11 26

Formula Cr
CAS No. 7440-47-3
User Group 7-12

DESCRIPTION

A hard, brittle, lustrous, steel-grey metal which is very resistant to corrosion.

SOLUBILITY

Reacts with dilute hydrochloric and sulfuric acids and strong alkalis.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 52
Melting point 1857°C
Boiling point 2672°C
Specific gravity 7.20 (28°C)
Flammability Non-combustible
Combustible in powder form

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to chromium dust or fumes may cause irritation to the skin, eyes and respiratory tract. Repeated or prolonged skin contact may lead to sensitisation and dermatitis.

Avoid generating and inhaling dust or fumes. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Combustion of chromium generates toxic fumes of chromium oxides. Chromium powder can react dangerously or explosively with oxidising substances, halogens, and carbon dioxide.

In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Chromium is oxidised in air, forming a thin passivating layer of the oxide. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat.

Store away from acids, oxidising agents and halogens.

Store with general inorganic solids or with other bulk metals.

APPLICATIONS

General science: qualitative properties of the metal.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste chromium metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.



chromium (III) chloride hexahydrate

chromic chloride hexahydrate; chromium trichloride hexahydrate

WARNING



Formula CrCl₃·6H₂O
CAS No. 10060-12-5
User Group 11-12S (Note B)

DESCRIPTION

Green or violet crystals or powder with a faint, slightly pungent odour. There are several isomers of the hexahydrate, all of them deliquescent. Dilute aqueous solutions are violet; concentrated solutions are green.

SOLUBILITY

Soluble in water and alcohol. Slightly soluble in acetone.

Solubility in water 590 g/L (20°C)

PHYSICAL DATA

Molar mass 266.45
Melting point 80-83°C
Boiling point >600°C decomposes
Specific gravity 1.76
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, vinyl). Aqueous solutions of the salt are acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Repeated or prolonged skin contact may cause allergic dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

STORAGE

The substance is hygroscopic.
Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.
Store away from oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and place in a suitable labelled container. Store for collection.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for solid spill.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Chromium salts should not be released to the environment. Store waste or surplus chromium (III) chloride in the original container or other suitable labelled container such as for solid chromium or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.
Chromium (III) ions can be precipitated from solution as the hydroxide at approximately pH 8.0.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If skin irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

POISONS CENTRE: 13 11 26

chromium (III) nitrate, nonahydrate

chromic nitrate nonahydrate; chromium trinitrate nonahydrate

WARNING

Formula $\text{Cr}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
CAS No. 7789-02-8
User Group 11-12S (Note B)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Deep violet crystals with an odour of nitric acid. Forms reddish-violet dilute aqueous solutions which become green on heating; concentrated solutions are also green.	Molar mass 400.15	ADG Class 5.1
SOLUBILITY Soluble in water, alcohol, acetone and alkali.	Melting point 60°C	Packing Group III
Solubility in water 810 g/L (20°C)	Boiling point >100°C decomposes	UN Number 2720
	Specific gravity 1.8	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The substance is a strong oxidant. Exposure may cause irritation to the skin, eyes and respiratory tract. Repeated or prolonged skin contact may lead to skin sensitisation and allergic dermatitis. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Handle away from heat and sources of ignition. In case of fire, use water as the extinguishing agent.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from heat and sources of ignition. Store away from reducing agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area. **Solid spill:** Collect spill material with a non-sparking tool and place in a suitable labelled container. Store for collection. **Solution spill:** Cover with absorbent material such as sand, vermiculite or bentonite. Do not use combustible materials (paper, cloth) to clean up spill. Treat as for solid spill. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The substance must not be disposed of with general waste. Store waste or surplus chromium (III) nitrate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor. Solutions may be allowed to evaporate and the sludge stored for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness. Take care not to mix with incompatible waste such as reducing agents, or combustible substances or readily oxidisable materials. Chromium (III) ions can be precipitated from solution as the hydroxide at approximately pH 8.0.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with water and mild soap. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

Formula C₉H₈O₂

CAS No. 621-82-9

User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystalline powder with slight balsamic odour.	Molar mass 148.16	ADG Class -
SOLUBILITY Very slightly soluble in water. Soluble in ethanol, diethyl ether and acetone.	Melting point 134°C	Packing Group -
Solubility in water 500 mg/L	Boiling point decomposes	UN Number None
	Specific gravity 1.2475 (4°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: a substrate for bromination; ester preparation; to practise recrystallisation technique.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Scoop up with a non-sparking tool. Treat as for waste acid.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Scoop up and add to a large volume of water. Neutralise the solution as for Waste Disposal. Decant neutral solution down the sink. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wrap well in paper and dispose of as general waste.

Alternatively, dissolve waste by adding to 5% sodium carbonate solution. Test the pH with pH paper and neutralise the solution to within pH 6-8 by addition of sodium carbonate or dilute hydrochloric acid (0.5M) in portions as necessary. Flush the neutral solution down the sink.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms occur, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water and mild soap. If symptoms occur, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.



Formula $C_6H_8O_7 \cdot H_2O$

CAS No. 5949-29-1

User Group 7-12

DESCRIPTION

Colourless, odourless, slightly deliquescent crystals.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water 750 g/L (20°C)

PHYSICAL DATA

Molar mass 210.14

Melting point 135-152°C

Boiling point 175°C (decomposes)

Specific gravity 1.54 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin and respiratory tract. Skin contact may cause an allergic reaction and dermatitis in some individuals.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes, and clothing. Avoid prolonged or repeated exposure.

STORAGE

The monohydrate is efflorescent in dry air. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light.

Store away from oxidising agents, metals, bases and reducing agents.

Store with general organic solids.

APPLICATIONS

General science: an ingredient (food grade) in sherbet.

Senior chemistry: titration of a triprotic acid.

Technical: preparation of buffer solutions; in spill kit - a neutralising agent for spills of alkaline solutions.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Neutralise as for solid spill. Decant neutral solution down the sink with further dilution. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$
CAS No. 7791-13-1
User Group 11-12S (Note B)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Pink to red, odourless crystals, becoming violet and then blue on heating, with loss of water.	Molar mass 237.93	ADG Class 6.1
SOLUBILITY Soluble in water, alcohols, glycerol, acetone and diethyl ether.	Melting point 52-56°C (-4H ₂ O) 100°C (-H ₂ O) 120-140°C (-H ₂ O) 735°C (anhydrous salt)	Packing Group III
Solubility in water 586 g/L (20°C)	Boiling point 1049°C	UN Number 3288
	Specific gravity 1.92 (25°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed; H317 May cause an allergic skin reaction; H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled; H341 Suspected of causing genetic defects; H350i May cause cancer by inhalation; H360F May damage fertility; H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, neoprene). Cobalt chloride is toxic by ingestion and inhalation. Aqueous solutions of the salt are moderately acidic. Exposure may cause irritation of the skin, eyes and respiratory tract. There is a risk of sensitisation through skin contact or inhalation; an allergic response (dermatitis, asthma) may occur in sensitised individuals. Chronic inhalation exposure may increase the risk of cancer. Cobalt compounds have been evaluated by the IARC as *possibly carcinogenic to humans*.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Strong, prolonged heating may lead to decomposition and release of toxic fumes of hydrogen chloride.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents and alkali metals.

Store with general inorganic solids or with toxic inorganic substances.

APPLICATIONS

Senior chemistry: displacement reactions (microscale only recommended); demo of the catalysis of the oxidation of tartrate by hydrogen peroxide; test for presence of water.

Technical: preparation of cobalt chloride paper.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and place in a suitable labelled container. Store for collection.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for solid spill.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Cobalt salts should not be released to the environment.

Store waste or surplus cobalt (II) chloride in the original container or other suitable labelled container such as for solid cobalt or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

Solutions can be evaporated in an operating fume cupboard with gentle heating.

Cobalt (II) ions can be precipitated from solution as the carbonate by addition of sodium carbonate solution, or as the hydroxide at pH 8.0-8.5.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin with soap and plenty of water. If skin irritation or rash occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

cobalt (II) nitrate, hexahydrate

cobalt dinitrate hexahydrate; cobaltous nitrate hexahydrate

DANGER

Formula $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$

CAS No. 10026-22-9

User Group 11-12S (Note B)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red-brown, deliquescent, odourless crystals.	Molar mass 291.03	ADG Class 5.1
SOLUBILITY Soluble in water, ethanol and acetone.	Melting point 55-57°C	Packing Group II
Solubility in water 1330 g/L (0°C) 2170 g/L (100°C)	Boiling point >74°C decomposes	UN Number 1477
	Specific gravity 1.87 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed; H272 May intensify fire; oxidizer
H317 May cause an allergic skin reaction; H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled; H341 Suspected of causing genetic defects;
H350i May cause cancer by inhalation; H360F May damage fertility; H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, neoprene). The substance is an oxidising agent. Aqueous solutions of the salt are moderately acidic. Exposure may cause irritation of the skin, eyes and respiratory tract. There is a risk of sensitisation through skin contact or inhalation; an allergic response (dermatitis, asthma) may occur in sensitised individuals. Chronic inhalation exposure may increase the risk of cancer. Cobalt compounds have been evaluated by the IARC as *possibly carcinogenic to humans*.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition. In case of fire, use water as the extinguishing agent.

STORAGE

The substance is hygroscopic.
Store in a tightly closed container in a cool, dry place away from light. Protect from moisture. Store away from sources of heat and ignition. Do not store on shelving made from wood or other combustible material.
Store away from reducing agents, combustible material, organic substances, acids and metals.
Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: displacement reactions (microscale).

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area.
Solid spill: Collect spill material with a non-sparking tool and place in a suitable labelled container. Store for collection.
Solution spill: Cover with absorbent material such as sand, vermiculite or bentonite. Do not use combustible materials (paper, cloth) to clean up spill. Treat as for solid spill. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The substance must not be disposed of with general waste. Store waste or surplus cobalt (II) nitrate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor. Solutions may be allowed to evaporate and the sludge stored for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness. Take care not to mix with incompatible waste such as reducing agents, combustible or readily oxidisable materials, or reactive metals.
Cobalt (II) ions can be precipitated from solution as the carbonate by addition of sodium carbonate solution, or as the hydroxide at pH 8.0-8.5.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin with soap and plenty of water. If skin irritation or rash occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Call a POISONS CENTRE or doctor.
POISONS CENTRE: 13 11 26

Formula Cu
CAS No. 7440-50-8
User Group F-12

DESCRIPTION

Reddish, odourless, ductile, malleable metal.

SOLUBILITY

Reacts with nitric acid and hot concentrated sulfuric acid. Reacts slowly with ammonium hydroxide solution.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 63.55
Melting point 1083°C
Boiling point 2567°C
Specific gravity 8.94 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The main hazard is exposure to copper dust which may cause irritation of the skin, eyes and respiratory tract. Inhalation of copper dust or fumes can lead to metal fume fever. Chronic eye exposure to the dust may cause injury and permanent eye damage. Skin contact with copper may induce dermatitis in susceptible individuals. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

On exposure to air and moisture, copper forms a thin passivating layer of basic copper carbonate. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from acids, acid chlorides, halogens and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: observing the properties of the metal.
Senior chemistry: electrochemical cells; redox reactions;

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste copper metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula Cu
CAS No. 7440-50-8
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Reddish, odourless metal powder.</p> <p>SOLUBILITY Reacts with nitric acid and hot concentrated sulfuric acid.</p> <p>Solubility in water Insoluble</p>	<p>Molar mass 63.55</p> <p>Melting point 1083°C</p> <p>Boiling point 2567°C</p> <p>Specific gravity 8.94 (20°C)</p> <p>Flammability Combustible</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to copper dust may cause irritation of the skin, eyes and respiratory tract. Copper powder may be harmful if swallowed, inhaled or absorbed through the skin. Chronic eye exposure to the dust may cause injury and permanent eye damage. Skin contact with copper may induce dermatitis in susceptible individuals.

Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Copper powder can react dangerously with oxidising substances.

In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

On exposure to air and moisture, copper forms a thin passivating layer of basic copper carbonate.

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light.

Protect from moisture.

Store away from acids, acid chlorides, halogens and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Using a non-sparking tool, collect spill material and transfer to a suitable non-reactive container. Treat as for Waste Disposal.

Wipe surfaces with dampened paper towel to remove residual copper dust. Dispose of the paper towel as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula CuCl
CAS No. 7758-89-6
User Group 7-12



DESCRIPTION

White to grey, odourless, hygroscopic crystals. In the presence of moisture, turns blue-green when exposed to air.

SOLUBILITY

Practically insoluble in water. Insoluble in alcohol and acetone. Soluble in aqueous acids, aqueous ammonia and ether.

Solubility in water <0.01 g/L (20°C)

PHYSICAL DATA

Molar mass 98.99
Melting point 430°C
Boiling point ca. 400°C
Specific gravity 4.140 (25°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 2802
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H318 Causes serious eye damage
H410 Very toxic to aquatic life with long lasting effects

STORAGE

Copper (I) chloride is sensitive to air and light. On exposure to air, the salt becomes blue-green with formation of basic copper (II) chloride. Store in a tightly closed container in a cool, dry place away from heat and light; protect from air and moisture. Store away from oxidising agents and alkali metals. Store with corrosive solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause skin, eye and respiratory irritation. Eye contact can lead to eye surface injury. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Scoop up and place in a container and store for collection.
Solution spill: Cover with sand or other inert absorbent such as a 1:1:1 mixture of sodium carbonate, sand and bectonite (cat litter). Scoop up and place in a container and store for collection.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Release of copper salts to the environment should be avoided. Store waste or surplus copper (I) chloride in a suitable labelled container such as for copper waste or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

APPLICATIONS

Senior chemistry: to demonstrate the formation of stable chloro- complexes in concentrated hydrochloric acid solution; in investigations of the oxidation states of copper and the preparation of cuprous chloride; to demonstrate the absorption of carbon monoxide into cuprous chloride solution.

PREPARATIONS

In aqueous solution, if not in a stable complex, copper (I) chloride disproportionates to copper (II) and elemental copper:



FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

WARNING

Formula Cu₂O
CAS No. 1317-39-1
User Group 7-12



DESCRIPTION

Yellow, orange, red, or reddish-brown odourless crystals or powder.

SOLUBILITY

Practically insoluble in water. Soluble in dilute hydrochloric acid, and in aqueous solutions of ammonia and its salts. Insoluble in ethanol.

Solubility in water <0.007 mg/L (25°C)

PHYSICAL DATA

Molar mass 143.09
Melting point 1232°C
Boiling point 1800°C (decomposes)
Specific gravity 6.00 (25°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 9
Packing Group III
UN Number 3077
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes, nose and throat, and respiratory tract. Copper compounds are toxic by ingestion; symptoms include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

Senior chemistry: investigations of the oxidation states of copper and the preparation of cuprous oxide.

PREPARATIONS

In dilute sulfuric or nitric acid, copper (I) oxide disproportionates to copper (II) and elemental copper:
$$2\text{Cu}^+ \rightarrow \text{Cu}^0 + \text{Cu}^{2+}$$

STORAGE

With exposure to moist air, copper (I) oxide will gradually become oxidised to black copper (II) oxide. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light; protect from moisture.

Do not store in an aluminium container as copper (I) oxide is corrosive to aluminium.

Store away from oxidising agents.

Store with general inorganic solids.

SPILLS

Wear PPE. Ensure good ventilation.

Scoop up and place in a suitable labelled container and store for collection.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Release of copper compounds to the environment should be avoided.

Store waste copper (I) oxide in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a waste disposal contractor.

Residual copper (I) oxide can be removed from glassware by rinsing with a minimal quantity of warm dilute acetic acid.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.

IF ON SKIN: Remove contaminated clothing. Wash area thoroughly with water and mild soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If irritation or other symptoms occur: Get medical advice/attention.

POISONS CENTRE: 13 11 26

copper (II) acetate, monohydrate

cupric diacetate monohydrate; copper diacetate hydrate

DANGER

Formula C₄H₆CuO₄.H₂O

CAS No. 6046-93-1

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green crystals or powder with a faint odour of acetic acid.	Molar mass 199.65	ADG Class 8
SOLUBILITY Soluble in water and ethanol. Slightly soluble in glycerol and ether. Slowly soluble in aqueous solutions of ammonia.	Melting point 115°C	Packing Group II
Solubility in water 72 g/L (20°C)	Boiling point 240°C (decomposes)	UN Number 1759
	Specific gravity 1.88 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage
H410 Very toxic to aquatic life with long lasting effects.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Copper acetate is irritating to the skin, eyes, nose and throat and respiratory tract. Copper salts are toxic by ingestion; symptoms include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust and contact with skin, eyes and clothing.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light.
Store away from oxidising agents and strong acids.
Store with corrosive solids.

APPLICATIONS

General science: crystal growing; flame tests
Senior chemistry: electroplating.
Food science: for the determination of tannins in tea.

PREPARATIONS

A concentration 0.5-1M is suitable for flame test solutions.
A concentration of 0.1M is suitable for qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Scoop up and place in a container and store for collection.
Solution spill: Cover with sand or other inert absorbent such as a 1:1:1 mixture of sodium carbonate, sand and bectonite (clay cat litter). Scoop up and place in a container and store for collection.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Release of copper salts to the environment should be avoided. Store waste copper acetate in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.
Waste solutions: waste treatment options:
(i) Evaporate the water from the solution and store the residue as for solid waste.
(ii) Immerse steel wool in the solution, and thus displace the copper ions. Decant the supernatant from the precipitated copper and flush down the sink. Dispose of the copper metal residue as general waste.
(iii) Recrystallise the salt and recycle.
(iv) Precipitate the copper ions as basic copper carbonate by adding the solution to a slight excess of sodium carbonate in solution. Allow the mixture to age over a few days. Collect the precipitate by filtration, allow to dry and store for collection. Dispose of the filtrate down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.
IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.
POISONS CENTRE: 13 11 26



copper (II) carbonate hydroxide

basic copper carbonate; dicopper carbonate dihydroxide

WARNING



Formula $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

CAS No. 12069-69-1

User Group 7-12

DESCRIPTION

Green, odourless powder.

SOLUBILITY

Practically insoluble in water. Soluble in dilute solutions of acids, sodium bicarbonate solution and ammonium hydroxide solution. Insoluble in ethanol.

Solubility in water Practically insoluble

PHYSICAL DATA

Molar mass 221.12

Melting point 200°C (decomposes)

Boiling point -

Specific gravity 4.0

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H332 Harmful if inhaled

H315 Causes skin irritation

H319 Causes serious eye irritation

H410 Very toxic to aquatic life with long lasting effects

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from strong acids and oxidising agents.

Store with general inorganic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause skin, eye and respiratory irritation. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Strong heating will generate irritating fumes of copper oxides.

SPILLS

Wear PPE. Solid spill: Sweep up and place in a container (see Waste Disposal).

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Release of copper salts to the environment should be avoided. Store waste copper carbonate in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

APPLICATIONS

General science: an example of a carbonate in the reactions of carbonates with acid; to simulate the extraction of copper ore.

Senior chemistry: demonstration of its thermal decomposition to copper (II) oxide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

copper (II) chloride, dihydrate

cupric chloride dihydrate; copper dichloride dihydrate

DANGER

Formula CuCl₂·2H₂O

CAS No. 10125-13-0

User Group 7-12S



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Green-blue, odourless, hygroscopic powder.	Molar mass 170.48	ADG Class 8
SOLUBILITY Soluble in water, ethanol, methanol and acetone. Insoluble in ether.	Melting point 100°C (decomposes)	Packing Group III
Solubility in water 1150 g/L (20°C)	Boiling point -	UN Number 2802
	Specific gravity 2.51	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H312 Harmful in contact with skin
H315 Causes skin irritation
H318 Causes serious eye damage
H400 Very toxic to aquatic life
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Copper chloride is irritating to the skin, eyes, nose and throat and respiratory tract. Contact with eyes can cause eye surface injury. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Copper (II) chloride is a mild oxidant; handle away from combustible materials. Heating to the decomposition temperature generates irritating fumes of hydrogen chloride.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Scoop up and place in a container and store for collection.
Solution spill: Cover with sand or other inert absorbent such as a 1:1:1 mixture of sodium carbonate, sand and bentonite (clay cat litter). Scoop up and place in a container and store for collection.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste copper(II) chloride in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.
Waste solutions: waste treatment options:
(i) Evaporate the water from the solution and store the residue as for solid waste.
(ii) Immerse steel wool in the solution, and thus displace the copper ions. Decant the supernatant from the precipitated copper and flush down the sink. Dispose of the copper metal residue as general waste.
(iii) Precipitate the copper ions as basic copper carbonate by adding the solution to a slight excess of sodium carbonate in solution. Allow the mixture to age over a few days. Collect the precipitate by filtration, allow to dry and store for collection. Dispose of the filtrate down the sink.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from alkali metals and strong oxidising agents. Stored with corrosive solids.

APPLICATIONS

General science: a source of copper ions for flame tests.
Senior chemistry: qualitative inorganic analysis; copperplating; demonstration of the equilibrium between the hexaaquacopper(II) and tetrachlorocopper(II) ions in solution.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Get medical advice/attention.
POISONS CENTRE: 13 11 26

copper (II) nitrate, trihydrate

cupric nitrate trihydrate; copper dinitrate trihydrate

DANGER

Formula $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$

CAS No. 10031-43-3

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Blue, odourless, deliquescent crystals.	Molar mass 241.6	ADG Class 5.1
SOLUBILITY Soluble in water and ethanol. Practically insoluble in ethyl acetate.	Melting point 114°C	Packing Group II
Solubility in water 2670 g/L (20°C)	Boiling point 170°C (decomposes)	UN Number 1477
	Specific gravity 2.05 (20°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H318 Causes serious eye damage
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause severe skin, eye and respiratory irritation. Contact with eyes can cause severe eye surface injury. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting. Handle in an operating fume cupboard or well-ventilated area. Avoid generating or inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Copper (II) nitrate is a strong oxidant. Handle away from combustible materials, heat and sources of ignition.

STORAGE

Copper (II) nitrate trihydrate is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light; protect from moisture. Store away from sources of heat or ignition.

Store away from reducing agents, combustible materials, organic substances, finely powdered metals, ammonium compounds, amides and cyanide complexes. There is a risk of explosion when mixed with potassium ferrocyanide. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: a source of soluble copper (II) ion for qualitative inorganic analysis; in displacement and precipitation reactions; in electrochemical cells.

SPILLS

Wear PPE. Remove any combustible material from the spill area. Do not use combustible materials (paper, cloth) to clean up spill. Solid spill: Scoop up with non-sparking tool and place in a container. Store for collection.

Solution spill: Cover with sand or other non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, sand and bectonite (clay cat litter). Scoop up with a non-sparking tool into a container. Store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste copper nitrate in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

Waste solutions: waste treatment options:

- Allow the water to evaporate from the solution and store the residue as for solid waste.
- Immerse steel wool in the solution, and thus displace the copper ions. Decant the supernatant from the precipitated copper and flush down the sink. Dispose of the copper metal residue as general waste.
- Precipitate the copper ions as basic copper carbonate by adding the solution to a slight excess of sodium carbonate in solution. Allow the mixture to age over a few days. Collect the precipitate by filtration, allow to dry and store for collection. Dispose of the filtrate down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Get medical advice/attention.

POISONS CENTRE: 13 11 26

Formula CuO
CAS No. 1317-38-0
User Group 7-12



DESCRIPTION

Fine, black to brownish-black, odourless, amorphous or crystalline powder.

SOLUBILITY

Practically insoluble in water. Soluble in solutions of acids and of ammonium chloride or ammonium carbonate. Dissolves slowly in solutions of ammonia. Insoluble in alcohols.

Solubility in water Practically insoluble

PHYSICAL DATA

Molar mass 79.55
Melting point 1326°C
Boiling point -
Specific gravity 6.3 - 6.5
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 9
Packing Group III
UN Number 3077
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation of the skin, eyes, nose and throat and respiratory irritation. Copper compounds are toxic by ingestion; early symptoms include nausea and vomiting.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating copper (II) oxide to its decomposition temperature will produce copper (I) oxide and oxygen.

APPLICATIONS

Senior chemistry: in investigations of the oxidation states of copper; as a reagent in redox demonstrations.

PREPARATIONS

In the presence of hydrogen, copper (II) oxide is reduced to copper (I) oxide at 150°C and to elemental copper at 250°C. Demonstrations of the reversible reduction-oxidation of CuO-Cu are more safely conducted as microscale experiments.

STORAGE

Copper (II) oxide is sensitive to air and moisture. With exposure to moist air and absorption of carbon dioxide, copper (II) oxide will gradually form copper (II) carbonate. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light; protect from moisture.

Store away from reducing agents, aluminium, alkali metals and finely powdered metals.
Store with general inorganic solids.

SPILLS

Wear PPE. Solid spill: Sweep up and place in a container and store for collection.
Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Release of copper compounds to the environment should be avoided. Store waste copper (II) oxide in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

Residual copper (II) oxide can be removed from glassware by rinsing with a minimal quantity of warm dilute acetic acid.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of water and mild soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

Formula CuSO₄
CAS No. 7758-98-7
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Greyish-white to greenish-white, odourless, hygroscopic powder.	Molar mass 159.61	ADG Class 9
SOLUBILITY Soluble in water and methanol. Soluble in solutions of ammonia. Insoluble in ethanol.	Melting point 200°C (slight decomposition)	Packing Group III
Solubility in water 203 g/L (20°C)	Boiling point 560°C (decomposes)	UN Number 3077
	Specific gravity 3.60 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause skin, eye and respiratory irritation. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting.
Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
The anhydrous salt can be prepared from copper sulfate pentahydrate by heating carefully. Take care not to heat to its decomposition temperature of 560°C; decomposition gives toxic and irritating fumes of copper and sulfur oxides.

STORAGE

Anhydrous copper (II) sulfate is hygroscopic and will gradually turn blue with absorption of water from the air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light; protect from moisture.
Store away from alkalis, phosphates, magnesium, strong reducing agents and powdered metals.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: Investigations of the reversible dehydration-hydration reaction; determination of the number of molecules of water of crystallisation in the hydrate; demonstration of an exothermic hydration reaction.

SPILLS

Wear PPE. Ensure good ventilation.
Scoop up spill material and place into a suitable labelled container. Store for collection.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste anhydrous copper sulfate in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.
Alternatively, the salt can be purified by recrystallisation as the pentahydrate and recycled.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.
IF ON SKIN: Remove immediately all contaminated clothing. Wash area thoroughly with water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Get medical advice/attention.
POISONS CENTRE: 13 11 26

copper (II) sulfate, pentahydrate

cupric sulfate pentahydrate; blue vitriol

WARNING

Formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

CAS No. 7758-99-8

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Blue, odourless, efflorescent crystals or powder with an unpleasant metallic taste.	Molar mass 249.68	ADG Class 9
SOLUBILITY Soluble in water, methanol and glycerol. Slightly soluble in ethanol.	Melting point 30°C (-2H ₂ O) 110°C (-4H ₂ O) 250°C (-5H ₂ O)	Packing Group III
Solubility in water 317 g/L (20°C)	Boiling point 560°C (decomposes)	UN Number 3077
	Specific gravity 2.286 (15.6°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause skin, eye and respiratory irritation. Copper salts are toxic by ingestion; symptoms of ingestion include nausea and vomiting.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating or burning the salt may give rise to toxic fumes of oxides of copper and sulfur which can cause respiratory irritation.

STORAGE

Copper sulfate pentahydrate is efflorescent, slowly losing its water of crystallisation to the air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from finely divided metals, steel, strong oxidising agents and strong reducing agents.
Store with general inorganic solids.

APPLICATIONS

General science: a source of copper (II) ions for precipitation reactions; crystal growing; copper plating.

Senior chemistry: In dilute solution, as a reagent in qualitative inorganic analysis; a component in Fehling's solution and Benedict's solution.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Scoop up and place in a container. Store for collection.

Solution spill: Cover with sand or other non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, sand and bectonite (clay cat litter). Scoop up into a container. Store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste copper sulfate in a suitable labelled container such as for copper or heavy metal waste. Arrange for collection by a licenced waste disposal contractor.

Waste solutions: waste treatment options:

- Evaporate the water from the solution and store the residue as for solid waste.
- Immerse steel wool in the solution, and thus displace the copper ions. Decant the supernatant from the precipitated copper and flush down the sink. Dispose of the copper metal residue as general waste.
- Recrystallise the salt and recycle.
- Precipitate the copper ions as basic copper carbonate by adding the solution to a slight excess of sodium carbonate in solution. Allow the mixture to age over a few days. Collect the precipitate by filtration, allow to dry and store for collection. Dispose of the filtrate down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

If SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately all contaminated clothing. Wash area thoroughly with water. If skin irritation occurs: Get medical advice/attention.

If INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Get medical advice/attention.

POISONS CENTRE: 13 11 26

Formula C₂₁H₁₈O₅S
CAS No. 1733-12-6
User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red-brown crystalline powder.	Molar mass 382.44	ADG Class -
Dye family triarylmethane	Melting point 290°C decomposes	Packing Group -
Solubility water ¹ 1 mg/mL ethanol ¹ 3 mg/mL Soluble in solutions of acids or alkalis.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 570 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- tracking dye for gel electrophoresis

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle; add aqueous solutions to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 0.2	pH 1.8	pH 7.2	pH 8.8
red	yellow	yellow	reddish purple

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice.

PREPARATION

pH indicator: Dissolve 0.1g in 26 mL 0.01M NaOH solution. Make up to 250 mL with distilled water.²

References: 1. Aldrich Handbook 2. Flinn

Formula $C_{25}H_{30}ClN_3$
CAS No. 548-62-9
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green, odourless powder.	Molar mass 407.99	ADG Class -
Dye family triarylmethane	Melting point 215°C decomposes	Packing Group -
Solubility water ¹ 4 mg/mL ethanol ¹ 30 mg/mL Soluble in glycerol.	Flammability Combustible	UN Number None
	Absorption ² (λ_{max}) 590 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage
H351 Suspected of causing cancer
H410 Very toxic to aquatic life with long lasting effects

STORAGE

Store in a cool, dry, well-ventilated place away from heat.
Protect from light.
Store away from acids, oxidising agents and reducing agents.
Store with dyes and indicators or with general organic solids or with toxic organic solids..

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- primary stain in the Gram stain (to differentiate gram-positive and gram-negative bacteria)
- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste. **Solution waste:** Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 0.0	pH 2.0
yellow	blue-violet

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

PREPARATION

Reagent for gram staining: Dissolve 2 g crystal violet in 20 mL of 95% ethanol. Dissolve 0.8 g ammonium oxalate monohydrate in 80 mL distilled water. Mix the two solutions and allow to stand overnight. Filter if required.³

References: 1. Aldrich Handbook 2. Sabnis 3. Flinn

Formula C₆H₁₂
CAS No. 110-82-7
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile liquid with a sweetish odour. Less dense than water.	Molar mass 84.16	ADG Class 3
SOLUBILITY Practically insoluble in water. Miscible with ethanol, diethyl ether, acetone and petroleum ether. Moderately soluble in methanol.	Melting point 7°C	Packing Group II
Solubility in water 0.06 g/L (20°C)	Boiling point 81°C	UN Number 1145
	Specific gravity 0.78 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H336 May cause drowsiness or dizziness
H304 May be fatal if swallowed and enters airways

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of exposure include CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Handle away from heat and other sources of ignition. There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.
Store away from oxidising agents, acids and bases.
Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: comparing the properties of saturated and unsaturated hydrocarbons; solvent for extracting halogens from aqueous solution, in the preparation of nylon and in thin-layer chromatography; a component of synthetic 'crude oil'; extraction solvent for natural products.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Absorb with paper towel. Treat as for Waste Disposal of small quantity.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection. Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with paper towel or place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. Glassware contaminated with cyclohexane can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.
The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula C₆H₁₂O
CAS No. 108-93-0
User Group 11-12

DESCRIPTION

Clear colourless crystals or viscous liquid with a faint camphor-like odour.

SOLUBILITY

Soluble in water, ethanol, diethyl ether, acetone, ethyl acetate and petroleum solvents.

Solubility in water 40 g/L (20°C)

PHYSICAL DATA

Molar mass 100.16
Melting point 24°C
Boiling point 161°C
Specific gravity 0.95 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H332 Harmful if inhaled
H315 Causes skin irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the eyes, nose, throat and respiratory tract and on ingestion. Exposure to high concentrations of the vapour may cause nausea, headache, dizziness and CNS depression.

Prolonged or repeated skin contact can lead to dryness, cracking and dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air if strongly heated. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

Test for peroxides before use, particularly if intending to heat or distill the alcohol.

STORAGE

The alcohol is hygroscopic. With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides, which may become explosive if they are concentrated. Store in a tightly closed container in a cool, dry well-ventilated place away. Protect from moisture and sunlight. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, nitric acid, alkali metals.

Store with flammable and combustible liquids in an AS compliant cabinet.

Mark the bottle with the date received and date opened.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus cyclohexanol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. As the alcohol is a peroxide former, waste or surplus cyclohexanol should not be stored with any other waste.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with plenty of soap and water. Wash contaminated clothing before reuse. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE 13 11 26

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol.

Formula C₆H₁₀
CAS No. 110-83-8
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile liquid with an aromatic odour. Less dense than water.	Molar mass 82.15	ADG Class 3
SOLUBILITY Very slightly soluble in water. Soluble in ethanol, acetone, diethyl ether and petroleum ether.	Melting point -104°C	Packing Group II
Solubility in water 0.21 g/L (20°C)	Boiling point 83°C	UN Number 2256
	Specific gravity 0.81 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H302 Harmful if swallowed
H312 Harmful in contact with skin
H304 May be fatal if swallowed and enters airways
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of exposure include CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Test for peroxides (e.g. with peroxide test strips) periodically and before use. If crystals or a precipitate of peroxide is present, do NOT attempt to open the bottle; arrange for its disposal via a licenced contractor.

STORAGE

May polymerise or form peroxides over time and/or on exposure to air or sunlight. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from heat and all sources of ignition. Store away from oxidising agents, acids, bases, halogens. Store with flammable liquids (DG Class 3). Mark the bottle with the date received and the date opened.

APPLICATIONS

Senior chemistry: observing the properties of saturated and unsaturated hydrocarbons; organic addition reactions.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection. Ventilate spill area then wash area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store surplus or waste cyclohexene in a suitable labelled container such as for non-halogenated organic liquid waste and dispose of via a licenced waste disposal contractor. Glassware contaminated with cyclohexene can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with plenty of soap and water. Call a POISONS CENTRE or doctor if you feel unwell.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula CH₂Cl₂
CAS No. 75-09-2
User Group 11-12

DESCRIPTION

Clear, colourless, volatile liquid with a pleasant, sweet odour. Heavier than water.

SOLUBILITY

Sparingly soluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 13 g/L (25°C)

PHYSICAL DATA

Molar mass 84.93
Melting point -97°C
Boiling point 40°C
Specific gravity 1.33 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 6.1
Packing Group III
UN Number 1593
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H351 Suspected of causing cancer

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton® gloves are recommended; nitrile or butyl rubber gloves provide limited splash protection).

Exposure may cause irritation of the skin, eyes and respiratory tract.

Detection of dichloromethane odour occurs above the TWA. (odour threshold: 205-307ppm; TWA: 50ppm).

Dichloromethane has been evaluated by the IARC as *probably carcinogenic to humans (Group 2A)*.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Open the bottle with care to avoid inhaling the headspace vapour.

Dichloromethane forms a flammable air/vapour mixture above 100°C. Handle away from ignition sources.

This solvent may dissolve some plastics.

STORAGE

Substance is heat- and light-sensitive. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from alkali metals, alkaline earth metals, aluminium, strong acids and bases, strong oxidising agents, amines, vinyl compounds.

Store with general organic liquids.

APPLICATIONS

Senior chemistry: solvent used in ester preparation and extraction of natural products.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Absorb spill with inert material such as dry sand, vermiculite or bentonite. Collect material with a non-sparking tool, place in a suitable labelled container and arrange for collection.

Ventilate the spill area, then wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste in a suitable labelled container such as for halogenated organic waste. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

WARNING

Formula C₁₂H₂₆O
CAS No. 112-53-8
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless liquid or crystals with a sweet odour.	Molar mass 186.33	ADG Class 9
SOLUBILITY Practically insoluble in water. Soluble in ethanol and diethyl ether.	Melting point 24°C	Packing Group III
Solubility in water 4 mg/L (25°C)	Boiling point 261°C	UN Number 3077
	Specific gravity 0.83 (24°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Absorption of a large amount by ingestion, inhalation or via the skin may lead to narcosis. Avoid generating and inhaling dust, mists or vapours. Avoid contact with skin and eyes. Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids and acid chlorides. Store with general organic liquids.

APPLICATIONS

Senior chemistry: preparation of a detergent (sodium lauryl sulfate).

SPILLS

Wear PPE. Eliminate all ignition sources. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand. Collect spill material with a non-sparking tool. Place in a suitable labelled container and arrange for collection. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus alcohol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice if effects persist.
IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air.



Formula H₂O₂

CAS No. 7722-84-1 (H₂O₂)

User Group 7-12

DESCRIPTION

Clear colourless, odourless liquid.

SOLUBILITY

Miscible with water and alcohols. Can react explosively with organic solvents.

Solubility in water

Miscible in all proportions

PHYSICAL DATA

Molar mass 34.01 (H₂O₂)

Melting point -1.6°C

Boiling point 100.4°C (decomposes)

Specific gravity 1.007 (25°C)

Flammability Non-combustible
oxidising liquid

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number -

Poisons Schedule -

Security CSC

HAZARD STATEMENTS

Not classified as hazardous.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, PVC). Exposure may cause skin and respiratory irritation.

Handle in a well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

Bottles may develop pressure over time and therefore the cap should be opened carefully to release any build up of pressure.

Use glass or plastic vessels and pipettes when handling, rather than metal implements and vessels, as the decomposition reaction may be catalysed in contact with a metal surface.

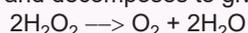
APPLICATIONS

General science, Senior biology: to demonstrate the activity of catalase in animal and plant tissue.

Senior chemistry: as an oxidising agent in organic and inorganic reactions.

PREPARATIONS

Hydrogen peroxide is sensitive to heat and light, especially direct sunlight, and decomposes to give oxygen and water:



Decomposition is also accelerated by soluble and insoluble impurities, contact with metals, and a pH above 4.

Commercial solutions of hydrogen peroxide contain stabilisers which slow their decomposition. However, if the commercial solution is diluted, decomposition is likely to be more rapid due to exposure to catalysts and dilution of the stabilising agent. Solutions are therefore best prepared as required.

STORAGE

Store in an opaque container in a dark, cool and dry place away from heat and light. The container should be stored upright and must have a vented lid to prevent a build up of pressure. The recommended storage temperature is 2-8°C; however, if storing under refrigeration, the refrigerator must be spark-proofed.

Store away from powdered metals, zinc, copper, iron, reducing agents, oxidising agents, combustible or organic materials, acids and bases. Do not store on shelves made from combustible material.

SPILLS

See Laboratory Notes for details of spill treatment methods. Hydrogen peroxide spilt on combustible material can lead to spontaneous combustion, especially if concentrated by evaporation of the water. Therefore, spills of hydrogen peroxide on combustible materials should be diluted with water immediately. Contaminated clothing should be removed and rinsed thoroughly before reuse.

WASTE DISPOSAL

Dilute to 0.5% and dispose of down the sink. Empty hydrogen peroxide containers should be rinsed well with water and disposed of in the general waste. They should not be used for the storage of other substances.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Wash area thoroughly with water. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other symptoms occur: Get medical advice/attention.

POISONS CENTRE: 13 11 26



Formula H₂O₂
CAS No. 7722-84-1 (H₂O₂)
User Group 7-12

DESCRIPTION

Clear, colourless liquid with a weak acrid odour.

SOLUBILITY

Miscible with water and alcohols. Can react explosively with organic solvents.

Solubility in water

Miscible in all proportions

PHYSICAL DATA

Molar mass 34.01 (H₂O₂)
Melting point -6.4°C (10%)
Boiling point 101.5°C
(10%, decomposes)
Specific gravity 1.03 (25°C, 10%)
Flammability Non-combustible
oxidising liquid

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number -
Poisons Schedule S5
Security CSC

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, PVC). Exposure may cause skin irritation and burns, and respiratory irritation. Contact with eyes can cause severe burns.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Handle away from heat and sources of ignition. Open the bottle cautiously in case of a build up of pressure. Use glass or plastic vessels and pipettes when handling, rather than metal implements and vessels, as the decomposition reaction may be catalysed in contact with a metal surface.

APPLICATIONS

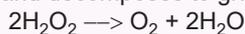
General science: for the preparation of oxygen gas.

Senior biology: to demonstrate the activity of catalase in animal and plant tissue.

Senior chemistry: as an oxidising agent in organic and inorganic reactions.

PREPARATIONS

Hydrogen peroxide is sensitive to heat and light, especially direct sunlight, and decomposes to give oxygen and water.



Decomposition is also accelerated by soluble and insoluble impurities, contact with metals, and a pH above 4.

Commercial solutions of hydrogen peroxide contain stabilisers which slow their decomposition. However, if the commercial solution is diluted, decomposition is likely to be more rapid due to exposure to catalysts and dilution of the stabilising agent. Solutions are therefore best prepared as required.

STORAGE

Store in an opaque container in a dark, cool and dry place away from heat and light. The container should be stored upright and must have a vented lid to prevent a build up of pressure. The recommended storage temperature is 2-8°C; however, if storing under refrigeration, the refrigerator must be spark-proofed.

Store away from powdered metals, zinc, copper, iron, reducing agents, oxidising agents, combustible or organic materials, acids and bases. Do not store on shelves made of combustible material.

SPILLS

See Laboratory Notes for details of spill treatment methods. Hydrogen peroxide spilt on combustible material can lead to spontaneous combustion, especially if concentrated by evaporation of the water. Therefore, spills of hydrogen peroxide on combustible materials should be diluted with water immediately. Contaminated clothing should be removed and rinsed thoroughly before reuse.

WASTE DISPOSAL

Dilute to 0.5% and dispose of down the sink. Empty hydrogen peroxide containers should be rinsed well with water and disposed of in the general waste. They should not be used for the storage of other substances.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.

IF ON SKIN: Wash area thoroughly with water. Remove immediately all contaminated clothing and rinse thoroughly with water before reuse. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other symptoms occur: Get medical advice/attention.
POISONS CENTRE: 13 11 26

Formula H₂O₂
CAS No. 7722-84-1 (H₂O₂)
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless liquid with a slightly acrid odour.	Molar mass 34.01 (H ₂ O ₂)	ADG Class 5.1 (8)
SOLUBILITY Miscible with water and alcohols, glycols and acetone. Can react explosively with organic solvents.	Melting point -33°C	Packing Group II
Solubility in water Miscible in all proportions	Boiling point 107°C (decomposes)	UN Number 2014
	Specific gravity 1.13 (20°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising liquid	Security CSC

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H290 May be corrosive to metals
H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, PVC). Substance is corrosive. Exposure can cause severe burns to skin and eyes, and respiratory irritation. Handle only in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

Open the bottle cautiously in case of a build up of pressure. Use glass or plastic vessels and pipettes when handling, rather than metal implements and vessels, as the decomposition reaction may be catalysed in contact with a metal surface.

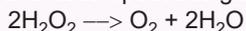
There is a risk of fire or explosion if concentrated hydrogen peroxide solution is mixed with incompatible materials.

APPLICATIONS

General science: in the demonstration of the rapid decomposition of hydrogen peroxide in the presence of a catalyst such as potassium iodide or manganese dioxide (the 'Elephant's Toothpaste' reaction); in the preparation of oxygen gas.

PREPARATIONS

Hydrogen peroxide is sensitive to heat and light, especially direct sunlight, and decomposes to give oxygen and water.



Decomposition is also accelerated by soluble and insoluble impurities, contact with metals, and a pH above 4.

Commercial solutions of hydrogen peroxide contain stabilisers which slow their decomposition. However, if the commercial solution is diluted, decomposition is likely to be more rapid due to exposure to catalysts and dilution of the stabilising agent. Solutions are therefore best prepared as required.

STORAGE

Store in an opaque container in a dark, cool and dry, well-ventilated place away from heat and light. The container should be stored upright and must have a vented lid to prevent a build up of pressure. The recommended storage temperature is 2-8°C; however, if storing under refrigeration, the refrigerator must be spark-proofed. Store away from powdered metals, zinc, copper, iron, reducing agents, oxidising agents, combustible or organic materials, acids and bases. Do not store on shelves made of combustible material.

SPILLS

See Laboratory Notes for details of spill treatment methods. Hydrogen peroxide spilt on combustible material can lead to spontaneous combustion, especially if concentrated by evaporation of the water. Therefore, spills of hydrogen peroxide on combustible materials should be diluted with water immediately. Contaminated clothing should be removed and rinsed thoroughly before reuse.

WASTE DISPOSAL

Small quantities: Dilute to 0.5% and dispose of down the sink. Large quantities: See Laboratory Notes for disposal procedure. Empty hydrogen peroxide containers should be rinsed well with water and disposed of in the general waste, and not used for the storage of other substances.

FIRST AID

Immediately call a POISONS CENTRE or doctor.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

hydrogen peroxide

Formula H₂O₂
CAS No. 7722-84-1 (H₂O₂)
MW 34.01 (H₂O₂)

LABORATORY NOTES

Solubility in water Miscible in all proportions

Units of Concentration

The concentration of hydrogen peroxide solutions is usually specified as weight %, or wt%, which is the mass of hydrogen peroxide in grams per 100 g of aqueous solution. The concentration is also expressed as volume strength or 'volumes', which is the volume of oxygen gas liberated per unit volume of solution. For a 3%, or 10 volume solution, this means that complete decomposition of 5 mL of the solution will liberate 50 mL (10 x 5 mL) of oxygen gas.

The concentration of a hydrogen peroxide solution can be determined by titration with a dilute solution of potassium permanganate.

Procedure for the treatment of hydrogen peroxide spills¹

Wear PPE. Cover the spill with inert, non-combustible material such as a 1:1:1 mixture of sodium carbonate, sand and cat litter. Dampen the mixture with water and transfer it to a plastic container using a plastic scoop. In an operating fume cupboard, add the mixture to a large volume of water.

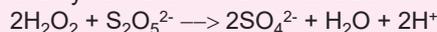
With spills of low H₂O₂ concentration, dilute further as necessary, so that the H₂O₂ concentration is 0.5% or less. Decant the solution down the sink and dispose of the solid residue in the general waste.

With larger spills of more concentrated solutions which cannot easily be diluted to 0.5%, ensure that the H₂O₂ is diluted to approximately 5% and treat with sodium metabisulfite as for waste solutions (see below). Decant the treated solution down the sink and dispose of the solid residue in the general waste.

Rinse the spill area and any contaminated materials thoroughly with water.

Procedure for the treatment of waste concentrated hydrogen peroxide solutions¹

Principle: Hydrogen peroxide is reduced by its reaction with metabisulfite:



Procedure: Wear PPE and work in a fume cupboard. Dilute the hydrogen peroxide solution to a concentration of 5% by careful addition of the peroxide solution to a large volume of water. Prepare a solution of an excess (1.5 x) of sodium metabisulfite (Na₂S₂O₅) and to this, add the hydrogen peroxide solution slowly and with stirring. Monitor the temperature of the reaction; a rise in temperature indicates that the reaction has started. If no temperature increase occurs, acidify the mixture with dilute sulfuric acid. Neutralise the mixture to a pH of 6-8 by addition of sodium carbonate solution and dispose of down the sink.

Example: To treat 100 mL of 35% hydrogen peroxide, dilute the hydrogen peroxide solution by adding it to 600 mL of water. Prepare a metabisulfite solution by dissolving 147 g of sodium metabisulfite in 350 mL of water. Slowly add the peroxide solution to the metabisulfite solution, as described above.

Reference

1. Armour, M.A., Hazardous Laboratory Chemicals Disposal Guide, Third Edition, CRC Press, 2005, Florida, p 297.

Laboratory Notes

INTRODUCTION

Enzymes are biologically active proteins which act as catalysts within cells of living organisms. A catalyst is a substance which increases the rate of a chemical reaction but is not itself changed in the process and does not form part of the final product. Enzymes catalyse biochemical reactions so that they proceed at a rate which is useful to the organism.

The substance on which an enzyme acts is called the substrate. Enzymes bind to the reacting substrate molecule so that the molecule is oriented in a way which will lower the energy barrier to the reaction and increase the chances of it occurring.

An enzyme is usually highly specific for a particular substrate and the reaction it catalyses. This specificity is often explained using the 'lock and key' model wherein the active site on the enzyme is represented as a lock which allows the specific substrate (the key) to fit perfectly.

Environmental conditions affect the activity of an enzyme. For each enzyme, there is a temperature and pH at which it is most active. These optimal conditions vary depending on the source of the enzyme, its structure and form.

Due to the high demand for enzymes and the limitations of extracting enzymes from their natural sources, many enzymes are now produced from genetically modified fungi or bacteria using recombinant DNA techniques. These products are expected to be free from GM material.

HAZARDS OF ENZYMES

Enzymes may cause non-allergic irritation to the eyes, respiratory system, mucous membranes and skin. Proteolytic enzymes (those which act on proteins and polypeptides) are more likely to cause irritation than other enzymes.

Many enzymes are respiratory sensitisers and are classified as Respiratory Sensitiser Category 1 under the Globally Harmonised System of Classification and Labelling of Chemicals, (the GHS). Repeated inhalation of dust or mist containing these enzymes may lead to a respiratory allergy in some individuals.

The hazard classification of an enzyme may vary with the manufacturer and will depend on such factors as the source of the enzyme, its form (solid or in solution) and the particle size, if a solid. Fine powders will be present a higher level of hazard than granulated solids or enzymes in solution.

Under the GHS, the cut-off concentration which will trigger the classification of Respiratory Sensitiser Category 1 is 0.1% w/v, i.e. below a concentration of 0.1%, the substance would not meet the criteria for this classification.

SAFE HANDLING

Safe handling of enzyme preparations can be accomplished through proper work practices, engineering controls, and use of personal protective equipment. Always wear safety glasses and gloves (nitrile). Always use practices which do not generate dust or aerosols. Avoid inhalation of enzyme dust or aerosols, so as to avoid sensitisation and allergic reactions.

Many enzymes in powder form are hazardous substances, however in dilute aqueous solution they are considered to be of low hazard. When working with powdered enzymes, wear a dust mask or work in a fume cupboard that is not turned on to minimise exposure to any dust. If working outside a fume cupboard, make sure you are in a draft free area.

Weighing enzyme powders:

- If the enzyme powder has been stored in the refrigerator or freezer, allow it to warm to room temperature before opening the bottle. This will minimise condensation forming inside the bottle.
- Wear PPE. Wear a dust mask, or work in a fume cupboard that is not turned on, with the sash lowered, to minimise exposure to any dust. Position an electronic balance in the fume cupboard. If working outside a fume cupboard, make sure you work in a draft free area.
- Carry out any transfers of the powder in a shallow tray in the fume cupboard. The tray will contain any spills of the powder.
- After the solution has been prepared, switch the fume cupboard on. With damp paper towel, wipe down any surfaces which may be contaminated with the powder.
- Wash the paper towel thoroughly with water and dispose of as general waste. Wash any tools and glassware thoroughly with water and/or dilute bleach to remove any traces of enzyme powder.

A site-specific risk assessment should be conducted to assess and control the risks and to determine how to safely prepare, handle and dispose of the solution.

PREPARATION

Enzymes are usually made up as a percentage concentration. A 0.5% to 1% w/v solution is generally suitable for enzyme digestion practicals carried out in schools. It is always best to use the lowest concentration and smallest amount possible.

Enzyme activity is affected by concentration, temperature, pH, substrate concentration, the presence of inhibitors or activators and the age of the reagents. The conditions for optimum activity can be different for each enzyme. The protocol for the procedure that you are following should indicate the conditions required. This may mean that the enzyme is dissolved in a dilute acid or buffer solution, rather than water.

It is always advisable to check that the enzyme reaction is working as required and make adjustments to the conditions and concentrations as necessary before any practical class.

It is important to keep enzymes stable and prevent them from denaturing. Never froth an enzyme solution as it can denature.

SENSITISATION

The process of sensitisation occurs in two stages. In the first stage, an individual is initially exposed to the enzyme. If a sufficient amount of the enzyme is inhaled, the body produces antibodies in response to the enzyme. In the second stage, the individual is re-exposed to the enzyme. The body may then exhibit an inflammation response, with symptoms similar to hayfever. When exposure to the enzyme ceases, so should the symptoms.

STORAGE

Most enzymes need to be stored at cool or cold temperatures, in the fridge or freezer. Some enzymes lose their activity rapidly, even under optimal conditions, and may have a shelf life of only a few months. More thermally stable enzymes may remain active indefinitely when stored at room temperature. The manufacturer's safety data sheet should be consulted for the storage requirements of a specific product.

In general, enzymes in solution are less stable than in solid form and can lose their activity in a matter of hours. Solutions should be freshly prepared as required and kept on ice during practical activities.

SPILLS

Powder spill: Wear PPE. Take measures to reduce air circulation. Use a fine mist spray of water to dampen powder. Wipe up the powder with a damp paper towel into a bucket of water. Flush solution down the drain. Rinse the paper towel thoroughly in water and dispose of as general waste. Do not sweep up an enzyme powder spill with a broom or brush as this risks generating dust.

Dilute solution spill: Clean up spill as soon as practicable to avoid the solution drying out. Wear PPE. Absorb spill with paper towel and dilute with water. Flush down the drain. Rinse paper towel thoroughly and dispose of as general waste.

Concentrated solution spill: Cover spill with absorbent material such as sand or vermiculite. Scoop up and transfer to a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

Wash spill area with dilute bleach. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dissolve in a large volume of water and flush down the sink.

Large quantity: Store bottles of hazardous enzymes for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Call a POISON CENTER/doctor if you feel unwell.

IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER/doctor.

IF ON SKIN: Wash with plenty of soap and water. Remove contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.

POISONS CENTRE: 13 11 26

REFERENCES

- The Comprehensive Enzyme Information System, BRENDA, <http://www.brenda-enzymes.org/>
- Worthington Enzyme Manual, Worthington Biochemical Corporation website, <http://www.worthington-biochem.com/index/manual.html>
- Working Safely with Enzymes, Enzyme Technology Association website, <http://www.enzymeassociation.org/wp-content/uploads/2013/09/Working-Safely-With-Enzymes-English.pdf>
- Guidelines for the safe handling of enzymes in detergent manufacturing, Enzyme Technology Association website, <http://www.enzymeassociation.org/wp-content/uploads/2012/04/AISE-Allegren-Guidance-Document-8-February-2002.pdf>
- Enzyme overview, Southern Biological website, <http://file.southernbiological.com/Assets/Products/Chemicals/Enzymes/EnzymeOverview.pdf>
- Enzyme FAQ, Southern Biological website, <http://www.southernbiological.com/page/enzyme-faq>

amylase

diastase; α -amylase; β -amylase; γ -amylase

DANGER



CAS No's 9000-92-4 (diastase);
9000-92-2 (α -amylase);
9000-91-3 (β -amylase)

DESCRIPTION

White or tan, hygroscopic powder, or brown aqueous solution.

NATURAL OCCURRENCE

α -Amylase is produced in the pancreas of animals and in the saliva of some mammals, including humans.

β -Amylase is found in germinating seeds and sweet potatoes. Both α - and β -amylases are found in honey.

ACTION

Hydrolyses linkages in amylopectin and amylose in starch, and in glycogen. α -Amylase produces maltose and dextrins. β -Amylase produces maltose.

NOTES

Diastase is a generic name and can refer to any of α -, β - or γ -amylase. Amylases often require Ca and/or Cl ions for stability.

HAZARD STATEMENTS

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

APPLICATIONS

Investigations of the effect of amylase on starch, breaking it down into simple sugars detectable with Benedict's solution. Extend the investigation by varying the pH, temperature and/or substrate concentration.

catalase

CAS No. 9001-05-2

DESCRIPTION

Available in solution. Can be sourced from plant and animal cells (liver, capsicum, potato).

NATURAL OCCURRENCE

Found in most animals and many plants and micro-organisms. Liver has a high concentration of the enzyme.

ACTION

An oxidoreductase; catalyses the decomposition of hydrogen peroxide to give oxygen and water.

NOTES

Most forms of catalase are tetramers, with each subunit incorporating a heme (Fe-containing) group. Inhibited by the presence of Na or K ions.

HAZARD STATEMENTS

Not classified as hazardous

APPLICATIONS

Investigations of the action of the enzyme in liver or potato on hydrogen peroxide, detecting the presence of the oxygen gas formed. Extend the investigation by varying the pH, temperature and/or substrate concentration.

cellulase

DANGER



CAS No. 9012-54-8

DESCRIPTION

Powder or amber, aqueous solution.

NATURAL OCCURRENCE

Fungi and micro-organisms; termites; symbiotic bacteria in the gut of herbivorous animals.

ACTION

Catalyses the hydrolysis of cellulose, a polysaccharide in plant cell walls, to give glucose.

NOTES

'Cellulase' refers to several enzymes which, acting together, decompose cellulose.

HAZARD STATEMENTS

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

APPLICATIONS

Investigations of the effect of cellulase on cellulose fibres (e.g. in filter paper), breaking it down into simple sugars detectable with Benedict's solution.

invertase

saccharase; invertin; sucrase

DANGER



CAS No. 9001-57-4

DESCRIPTION

White to tan powder.

NATURAL OCCURRENCE

Produced by a range of microorganisms and fungi which utilise sucrose as a nutrient source; bees.

ACTION

Catalyses the hydrolysis of sucrose, to give an equimolar mixture of fructose and glucose. This mixture is called 'invert sugar'.

NOTES

Optimum pH of 4.5.

HAZARD STATEMENTS

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

APPLICATIONS

Investigations of the action of invertase (from yeast) on sucrose to produce fructose and glucose, detectable with Benedict's solution.

lipase

triacylglycerol lipase; pancreatic lipase

WARNING



CAS No. 9001-62-1

DESCRIPTION

Off-white powder.

NATURAL OCCURRENCE

Pancreas, liver and stomach of animals; yeast; fungi; bacteria.

ACTION

Catalyses the hydrolysis of triacylglycerides, giving diacylglycerides, monoglycerides, and carboxylic acids.

NOTES

Requires Ca ions for activity.

HAZARD STATEMENTS

H335 May cause respiratory irritation

APPLICATIONS

Investigations of the action of lipase on fats in food (e.g. milk). The course of the reaction is followed by observing the lowering of the pH as fatty acids are produced.

pectinase

polygalacturonase

DANGER



CAS No. 9032-75-1

DESCRIPTION

Pale brown, hygroscopic powder or clear to light brown aqueous solution.

NATURAL OCCURRENCE

Fungi; bacteria; ripening fruit

ACTION

Hydrolyses and depolymerises plant pectins (polysaccharides).

NOTES

Three main types of pectinases, based on their mode of action: polygalacturonase, pectinesterase and pectin lyase.

HAZARD STATEMENTS

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

APPLICATIONS

Investigations of the action of pectinase on the production of juice from fruit.

pepsin

digestive enzyme; digestive protease

DANGER



CAS No. 9001-75-6

DESCRIPTION

Off-white, hygroscopic powder.

NATURAL OCCURRENCE

Found in many organisms. Pepsin A is the main proteolytic enzyme in vertebrates. The proenzyme, pepsinogen, is produced in the stomach mucosa.

ACTION

Hydrolyses peptide linkages in proteins, giving amino acids.

NOTES

Four forms of pepsin: A, B, C and D. Pepsin A is the predominantly-occurring enzyme.

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

H335 May cause respiratory irritation

APPLICATIONS

Investigations of the action of pepsin on albumin protein in a coagulated egg white suspension.

rennin

chymosin; rennet

DANGER



CAS No. 9001-98-3

DESCRIPTION

Yellow, hygroscopic powder.

NATURAL OCCURRENCE

Produced in the stomach of infant mammals for the digestion of milk.

ACTION

Clots milk by cleaving a peptide bond of the κ -chain of casein (milk protein).

NOTES

Secreted as the proenzyme, prochymosin, which is activated by acid in the stomach. 'Rennet' is a generic name which refers to any preparation of proteases which clots milk.

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

H335 May cause respiratory irritation

APPLICATIONS

Investigations of the action of the enzyme in coagulating the milk protein casein. Compare the rate of reaction at different temperatures and rennin concentrations.



trypsin

serine protease; proteolytic enzyme

DANGER



CAS No. 9002-07-7

DESCRIPTION

Off-white to yellow powder.

NATURAL OCCURRENCE

A digestive enzyme of many vertebrates. The proenzyme, trypsinogen, forms in the pancreas and is activated in the small intestine.

ACTION

A serine protease. Catalyses the cleavage of proteins to give amino acids.

NOTES

Stabilised by Ca ions.

HAZARD STATEMENTS

- H315 Causes skin irritation
- H319 Causes serious eye irritation
- H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H335 May cause respiratory irritation

APPLICATIONS

Investigations of the action of trypsin in breaking down the milk protein, casein, into amino acids.

urease

urea amidohydrolase

DANGER



CAS No. 9002-13-5

DESCRIPTION

Off-white to yellow powder.

NATURAL OCCURRENCE

Bacteria; yeast; higher plants.

ACTION

Catalyses the hydrolysis of urea to give ammonia and carbon dioxide.

NOTES

The progress of the reaction can be observed by monitoring the increase of the pH with the production of ammonia.

HAZARD STATEMENTS

- H315 Causes skin irritation
- H319 Causes serious eye irritation
- H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H335 May cause respiratory irritation

APPLICATIONS

Investigations of the action of urease on a urea solution to produce ammonia.

Formula C₂₀H₆Br₄O₅.2Na

CAS No. 17372-87-1

User Group 11-12 (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Reddish-brown, odourless crystals or powder.</p> <p>Dye family xanthene</p> <p>Solubility water 300 g/L (20°C) ethanol soluble Soluble in acetic acid.</p>	<p>Molar mass 691.86</p> <p>Melting point 295-296°C >300°C decomposes</p> <p>Flammability Combustible</p> <p>Absorption¹ (λ_{max}) 517 nm</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

H319 Causes serious eye irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents and reducing agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion. Eosin Y has been evaluated by the IARC as *not classifiable as to its carcinogenicity to humans*.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: stains collagen, muscle fibres; counterstain to haematoxylin in H&E staining
- fluorescent pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 0.0

yellow

pH 3.0

fluorescent green

PREPARATION

Dissolve 1g in 100mL of distilled water or ethanol.²

References: 1. Sabnis 2. Protocols Online

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If recovery is not rapid, seek medical advice/attention.

Formula C₂₀H₁₂N₃O₇S.Na

CAS No. 1787-61-7

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Brownish-black crystalline powder with a faint odour.	Molar mass 461.38	ADG Class -
Dye family azo	Melting point -	Packing Group -
Solubility water ¹ 80 mg/mL ethanol ¹ 10 mg/mL Soluble in concentrated sulfuric acid.	Flammability Combustible	UN Number None
	Absorption (λ_{max}) -	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE:safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- complexometric indicator: red when complexed to a metal for determination of total Ca and Mg (water hardness)

COLOUR CHANGE

FREE	CHELATED
blue	red

PREPARATION

(i) 1% (w/v) in ethanol: Dissolve 1.0 g of Eriochrome Black T in 80 mL 95% ethanol. Make up to 100 mL with 95% ethanol.² (ii) In ethanolamine/ethanol: Dissolve 0.2 g of Eriochrome Black T in 15 mL of triethanolamine and then add 5 mL of absolute ethanol.³

References:

1. Aldrich Handbook 2. CLEAPSS 3. Canterbury

STORAGE

The substance is hygroscopic and light sensitive. Store in a cool, dry, well-ventilated place away from heat. Protect from light and moisture. Store away from oxidising agents. Store with dyes and indicators or with general organic solids.

SPILLS

ear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₂H₆O
CAS No. 64-17-5
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless highly volatile liquid with a sweet, fragrant odour.	Molar mass 46.07	ADG Class 3
SOLUBILITY Miscible with water, methanol, diethyl ether and acetone.	Melting point -117°C (100%) -114°C (95%)	Packing Group II
Solubility in water Miscible	Boiling point 78°C	UN Number 1170
	Specific gravity 0.79 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security IDM Cat 3

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; neoprene for splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of ingestion include inebriation, dizziness, headache, nausea and narcosis. Prolonged or repeated skin contact can lead to dryness and cracking. Handle in a well-ventilated area. Avoid inhalation of vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Ethanol (100%) is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, strong acids, acid chlorides and alkali metals. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations; solvent for chromatography or extraction of organic compounds.
Technical: solvent for preparation of solutions; cleaning and disinfecting agent.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste. Alternatively, treat as for Waste Disposal of a small quantity.
Large spill: Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.
Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice.
IF ON SKIN: Remove contaminated clothing. Rinse skin with plenty of water. If irritation occurs, seek medical advice.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms develop, seek medical attention.

DANGER

Formula C₂H₆O
CAS No. 64-17-5
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless highly volatile liquid with an ethereal odour.	Molar mass 46.07 (ethanol)	ADG Class 3
SOLUBILITY Miscible with water, methanol, diethyl ether and acetone.	Melting point -114°C (ethanol)	Packing Group II
Solubility in water Miscible	Boiling point 78°C (ethanol)	UN Number 1170
	Specific gravity 0.79 (20°C) (ethanol)	Poisons Schedule S5
	Flammability Highly flammable	Security IDM Cat 3

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; neoprene for splash protection). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion may lead to inebriation, dizziness, headache, nausea, narcosis and blindness. Prolonged or repeated skin contact can cause dryness and cracking. Handle in a well-ventilated area. Avoid inhalation of vapour. Avoid contact with skin, eyes and clothing. Do not ingest. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. Denaturing agents, present in low concentration, may include methyl isobutyl ketone, methanol and denatonium benzoate (a bitterant).

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, strong acids, acid chlorides and alkali metals. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

General science: disinfecting agent; solvent for chromatography.
Technical: solvent for preparation of solutions; cleaning and disinfecting agent.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Treat as for Waste Disposal.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing. Rinse skin with plenty of water. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms develop, seek medical attention.

DANGER

Formula C₄H₈O₂
CAS No. 141-78-6
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile liquid with a fruity odour.	Molar mass 88.11	ADG Class 3
SOLUBILITY Miscible with ethanol and diethyl ether. Soluble in water and acetone.	Melting point -83°C	Packing Group II
Solubility in water 85.3 g/L (20°C)	Boiling point 77°C	UN Number 1173
	Specific gravity 0.90 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause irritation to the skin, eyes, nose and throat and respiratory tract. Inhalation or ingestion may cause headache, dizziness or drowsiness. Prolonged or repeated skin exposure may lead to dermatitis. Handle in an operating fume cupboard. Avoid breathing vapour and contact with skin and eyes. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage.
Store away from oxidising agents, strong acids, strong alkalis and alkali metals.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: solvent for extraction of organic compounds and thin layer chromatography; a product of the esterification reaction between acetic acid and ethanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical advice.
IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₉H₁₀O₂

CAS No. 93-89-0

User Group 11-12

DESCRIPTION

Clear, colourless liquid with a fruity odour.

SOLUBILITY

Very slightly soluble in water. Miscible with ethanol, diethyl ether and petroleum ether.

Solubility in water 0.5 g/L (20°C)

PHYSICAL DATA

Molar mass 150.18

Melting point -34°C

Boiling point 213°C

Specific gravity 1.05 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber, Viton®). Exposure may cause irritation to the skin, eyes, nose and throat and respiratory tract. Inhalation or ingestion may cause headache, dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The vapour is heavier than air and will collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from strong oxidising agents and bases.

Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: hydrolysis of an ester; product of the esterification reaction between benzoic acid and ethanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ester in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if feeling unwell.

IF ON SKIN: Take off immediately all contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.



Formula C₆H₁₂O₂
CAS No. 105-54-4
User Group 11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with a pineapple-like odour.

SOLUBILITY

Slightly soluble in water. Miscible with ethanol, diethyl ether and petroleum ether.

Solubility in water 6.2 g/L (20°C)

PHYSICAL DATA

Molar mass 116.16
Melting point -93°C
Boiling point 120-121°C
Specific gravity 0.88 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 1180
Poisons Schedule -
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; butyl for splash contact). Exposure may cause irritation to the skin, eyes, nose and throat and respiratory tract. Inhalation or ingestion may cause headache, dizziness or drowsiness.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from oxidising agents, bases and acids.

Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between butyric acid and ethanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if feeling unwell.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.



Formula C₁₁H₁₂O₂

CAS No. 103-36-6

User Group 11-12

DESCRIPTION

Colourless, oily liquid with a fruity, balsamic odour.

SOLUBILITY

Very slightly soluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 178 mg/L (25°C)

PHYSICAL DATA

Molar mass 176.21

Melting point 6..8°C

Boiling point 271°C

Specific gravity 1.049 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves. Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from oxidising agents, bases, acids and reducing agents.

Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between cinnamic acid and ethanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ester in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse eyes cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms occur or if feeling unwell, seek medical attention.



Formula C₂H₆O₂
CAS No. 107-21-1
User Group 7-12

DESCRIPTION

Clear, colourless, viscous liquid with a sweet taste.

SOLUBILITY

Miscible with water. Soluble in alcohol, acetic acid, acetone and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 62.07
Melting point -13°C
Boiling point 197°C
Specific gravity 1.11 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Inhalation of vapour or mist from the heated glycol may cause respiratory irritation. Symptoms of ingestion or inhalation include nausea, vomiting, headache and CNS effects. Repeated or prolonged skin contact may cause mild irritation and may have a degreasing effect. Eye contact may lead to irritation and eye damage.

Avoid generating and inhaling vapour or mist. If mists or vapours are being generated, work in an operating fume cupboard or well-ventilated area. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition.

STORAGE

The glycol is hygroscopic and light sensitive. With prolonged storage, explosive peroxides may form. Store in a tightly closed container in a cool, dry well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, alkalis, aldehydes and aluminium.

Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

General science/Senior physics: to observe its physical properties (density, viscosity, refractive index, 'antifreeze' properties).

SPILLS

Wear PPE. Eliminate all ignition sources. Cover spill with sand, or other inert material such as vermiculite or bentonite. Scoop up with a non-sparking tool. Place in a suitable labelled container and store for collection. Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ethylene glycol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of soap and water. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms develop, seek medical attention.

POISONS CENTRE 13 11 26

DANGER



Formula C₅H₁₀O₂
CAS No. 105-37-3
User Group 11-12

DESCRIPTION

Colourless, highly volatile liquid with a pineapple-like odour.

SOLUBILITY

Sparingly soluble in water. Soluble in acetone. Miscible with ethanol and diethyl ether.

Solubility in water 17 g/L (20°C)

PHYSICAL DATA

Molar mass 102.13
Melting point -73.9°C
Boiling point 99°C
Specific gravity 0.89 (20°C)
Flammability Highly flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group II
UN Number 1195
Poisons Schedule -
Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; nitrile for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from oxidising agents, bases and acids.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between propionic acid and ethanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms appear: Seek medical advice/attention.

Formula C₂₀H₁₀O₅·2Na

CAS No. 518-47-8

User Group 11-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Orange-red to dark red, odourless powder.	Molar mass 376.27	ADG Class -
Dye family xanthene	Melting point 320°C	Packing Group -
Solubility water ¹ 40 mg/mL ethanol ¹ 70 mg/mL	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 491 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

The substance is hygroscopic.
Store in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tracts.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- Senior physics: investigations of fluorescence

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 4 colourless	pH 4.5 fluorescent green
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PREPARATION

0.1% alcoholic: Dissolve 0.1 g in 75 mL of ethanol. Make up to 100 mL with distilled water.²

References: 1. Aldrich Handbook 2. Flinn

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

Formula C₂₀H₂₀ClN₃
CAS No. 632-99-5
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Metallic green, odourless crystals or powder.	Molar mass 337.85	ADG Class -
Dye family triarylmethane; magenta	Melting point ca 235°C decomposes	Packing Group -
Solubility water ¹ 4 mg/mL ethanol ¹ 30 mg/mL	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 549 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H351 Suspected of causing cancer

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin. Skin exposure may lead to sensitisation. The substance has been evaluated by the IARC as *possibly carcinogenic to humans*.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- microscopy: bacteria stain;
- component of the bacterial stains Basic Fuchsin and Ziehl-Neelsen.
- component of Schiff Reagent, for detection of aldehydes

PREPARATION

pH indicator: Dissolve 1 g in 100mL of distilled water.²

References: 1. Aldrich Handbook 2. Flinn

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture.
Store away from acids and oxidising agents.
Store with dyes and indicators or with general organic solids or with toxic organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.



Formula C₄H₄O₄
CAS No. 110-17-8
User Group 11-12

DESCRIPTION

Colourless, odourless powder or crystals.
Geometric isomer of maleic acid.

SOLUBILITY

Slightly soluble in water. Soluble in ethanol, diethyl ether, acetone and concentrated sulfuric acid.

Solubility in water 4.9 g/L (20°C)

PHYSICAL DATA

Molar mass 116.07
Melting point 287°C (decomposes)
Boiling point -
Specific gravity 1.64 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents and bases. Store with general organic solids.

APPLICATIONS

Senior chemistry: investigations of the properties of the *cis,trans*-isomers, maleic and fumaric acid.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Neutralise as for solid spill. Decant neutral solution down the sink with further dilution. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute the waste by adding slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

Formula Ga
CAS No. 7440-55-3
User Group Staff



DESCRIPTION

Soft, silvery-white metal, liquid at just above room temperature. A brittle grey solid when cooled. The liquid is more dense than the solid.

SOLUBILITY

Reacts with acid or alkali.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 69.74
Melting point 29.8°C
Boiling point 2403°C
Specific gravity 5.904 (25°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 2803
Poisons Schedule -
Security -

HAZARD STATEMENTS

H290 May be corrosive to metals

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure to gallium may cause irritation to the skin and eyes. The oxide which forms on the surface of the metal is toxic by inhalation.

Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Gloves should be worn to protect the skin but also to prevent the metal becoming contaminated.

Gallium is corrosive to most metals, particularly aluminium and its alloys. The metal can react dangerously with oxidising agents and halogens.

STORAGE

Gallium tarnishes in moist air.

Store in a tightly closed, plastic (e.g. polyethylene) container in a cool, dry well-ventilated place away from heat and light.

Protect from air and moisture.

Protect from high temperatures.

Store away from acids, alkalis, halogens and oxidising agents.

Storage in the refrigerator is recommended as the metal is less likely to tarnish when cool.

APPLICATIONS

General science: demonstration of the physical properties of the element. Further guidance and suggested activities for using gallium can be found here.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. If the gallium is molten, pour iced water over the spill; this will freeze the metal. Scoop up with a non-sparking tool and transfer to a suitable labelled plastic (e.g. polyethylene) container. Arrange for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled plastic container or sealed plastic bag. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation develops or persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

Formula n/a
CAS No. 51811-82-6
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green powder. A mixture of Methylene Blue, Eosin and Azure.	Molar mass 291.8	ADG Class -
Dye family	Melting point 300°C	Packing Group -
Solubility water ¹ 7 mg/mL ethanol ¹ 5 mg/mL	Flammability Combustible	UN Number None
	Absorption (λ_{\max}) 630-645 nm, 520-525 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- mixed histology dye: for visualising chromosomes.

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from alkalis, oxidising agents and reducing agents.

Store with dyes and indicators or with general organic solids.

Reference: 1. Aldrich Handbook

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.



Formula C₃H₈O₃

CAS No. 56-81-5

User Group F-12

DESCRIPTION

Oily, colourless, odourless, hygroscopic liquid with a sweet taste.

SOLUBILITY

Miscible with water and alcohol. Insoluble in diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 92.09

Melting point 18°C

Boiling point 290°C

Specific gravity 1.26 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Eye contact may cause mild irritation. Inhalation of vapour or mist from the heated substance may cause respiratory irritation. Repeated or prolonged skin contact may lead to irritation and dermatitis. Ingestion of a large amount may cause gastric irritation and CNS effects. Avoid generating and inhaling vapour or mist. If mists or vapours are being generated, work in an operating fume cupboard or well-ventilated area. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition.

STORAGE

Glycerol is hygroscopic. With prolonged storage, explosive peroxides may form. Store in a tightly closed container in a cool, dry well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, strong bases, halogens and acetic anhydride. Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

General science/Senior physics: to observe its physical properties (density, viscosity, refractive index, 'antifreeze' properties).

Senior chemistry: demonstration of its exothermic reaction with permanganate; surfactant in electroplating activities.

Technical: heating bath medium.

SPILLS

Wear PPE. Eliminate all ignition sources. Cover spill with sand, or other inert material such as vermiculite or bentonite. Scoop up with a non-sparking tool.

Small spill: Seal material in a plastic bag and dispose of as general waste.

Large spill: Place in a suitable labelled container and store for collection.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with non-combustible material. Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms develop, seek medical attention.

Formula C₁₆H₁₄O₆
CAS No. 517-28-2
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to yellowish crystals or crystalline powder with a characteristic sweet odour. Turns red on exposure to light. Solutions become red on standing. Dye family flavone Solubility water ¹ 30 mg/mL ethanol ¹ 30 mg/mL Soluble in glycerol and alkali hydroxide solutions.	Molar mass 302.28 Melting point 100-120°C 200°C decomposes Flammability Combustible Absorption ² (λ _{max}) 292 nm	ADG Class - Packing Group - UN Number None Poisons Schedule - Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
 H332 Harmful if inhaled
 H315 Causes skin irritation
 H319 Causes serious eye irritation
 H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- histology: general stain for cells and tissues, stains nuclear chromatin; usually combined with counterstain Eosin
- pH indicator

COLOUR CHANGE

pH 0.0	pH 1.0	pH 5.0	pH 6.0
red	yellow	yellow	violet

PREPARATION

Gill's formula: Mix 50 mL ethylene glycol with 150 mL distilled water. Add 0.4g haematoxylin followed by 0.04g sodium iodate. Add 3.5g aluminium sulfate (Al₂(SO₄)₃·18 H₂O) and 4 mL acetic acid. Stir for 1h at room temperature, then filter. This solution should be stable for 1 year.³

References: 1. Aldrich Handbook 2. Sabnis 3. StainsFile

STORAGE

Haematoxylin becomes oxidised to the dye haematein on exposure to air and light. Store in a cool, dry, well-ventilated place away from heat. Protect from light. Store away from alkalis and oxidising agents. Store with dyes and indicators or with general organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula C₇H₁₆O
CAS No. 111-70-6
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with a fragrant odour.	Molar mass 116.2	ADG Class -
SOLUBILITY Slightly soluble in water. Miscible with ethanol and diethyl ether.	Melting point -34°C	Packing Group -
Solubility in water 1 g/L (18°C)	Boiling point 175°C	UN Number None
	Specific gravity 0.82 (20°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H319 Cause serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the eyes and respiratory tract and mild skin irritation. Symptoms of exposure include cough, nausea, headache, dizziness and drowsiness. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure to the liquid may cause severe irritation. Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air if heated strongly. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids and acid halides. Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Heptan-1-ol is harmful to aquatic life. Avoid release to the environment. Store waste or surplus heptan-1-ol in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.
IF ON SKIN: Remove immediately all contaminated clothing. Wash skin thoroughly with soap and plenty of water. Wash contaminated clothing before reuse. If irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₇H₁₆
CAS No. 142-82-5
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.	Molar mass 100.2	ADG Class 3
SOLUBILITY Practically insoluble in water. Miscible with diethyl ether, and petroleum ether. Soluble in ethanol. Immiscible with methanol.	Melting point -91°C	Packing Group II
Solubility in water 2.2 mg/L (25°C)	Boiling point 98°C	UN Number 1206
	Specific gravity 0.68 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H336 May cause drowsiness or dizziness
H304 May be fatal if swallowed and enters airways
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion or inhalation may cause CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents.

Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: comparing the properties of saturated and unsaturated hydrocarbons; solvent for extracting halogens from aqueous solution, in the preparation of nylon and in thin-layer chromatography; a component of synthetic 'crude oil'.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Absorb with paper towel. Treat as for Waste Disposal of small quantity.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection. Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with paper towel or place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

Glassware contaminated with heptane can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₆H₁₂
CAS No. 592-41-6
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.	Molar mass 84.16	ADG Class 3
SOLUBILITY Practically insoluble in water. Soluble in ethanol, diethyl ether and petroleum ether.	Melting point -140°C	Packing Group II
Solubility in water 0.05 g/L (20°C)	Boiling point 63°C	UN Number 2370
	Specific gravity 0.67 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H304 May be fatal if swallowed and enters airways

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of exposure include cough, and CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Test for peroxides (e.g. with peroxide test strips) periodically and before use. If crystals or a precipitate is present, do NOT attempt to open the bottle; arrange for its disposal via a licenced contractor.

STORAGE

May polymerise or form peroxides over time and/or on exposure to air or sunlight. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from heat and all sources of ignition. Store away from oxidising agents, acids and halogens. Store with flammable liquids (DG Class 3) in an AS compliant cabinet. Mark the bottle with the date received and the date opened.

APPLICATIONS

Senior chemistry: comparing the properties of saturated and unsaturated hydrocarbons; organic addition reactions.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection. Ventilate spill area, then wash area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store surplus or waste hexene in a suitable labelled container such as for non-halogenated organic liquid waste and dispose of via a licenced waste disposal contractor.

Glassware contaminated with hexene can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26



WARNING

Formula C₁₆H₃₄O
CAS No. 36653-82-4
User Group 11-12



DESCRIPTION

White, waxy solid with a faint, rancid odour and bland taste.

SOLUBILITY

Practically insoluble in water. Soluble in diethyl ether and acetone. Slightly soluble in ethanol.

Solubility in water <0.1 mg/L (25°C)

PHYSICAL DATA

Molar mass 242.44
Melting point 49°C
Boiling point 344°C
Specific gravity 0.82 (50°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation
H315 Causes skin irritation
H413 May cause long lasting harmful effects to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Absorption of a large amount by ingestion, inhalation or via the skin may lead to narcosis.

Avoid generating and inhaling dust, mists or vapours. Avoid contact with skin and eyes.

Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents and strong acids.

Store with general organic liquids or with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

General science: surfactant used in the preparation of hand cream; to test its efficacy as an evaporation-reducing film over water.

Senior physics: preparing a heating/cooling curve.

SPILLS

Wear PPE. Eliminate all ignition sources. Collect spill with a non-sparking tool. Seal material in a plastic bag or place in a suitable labelled container such as for organic solid waste and arrange for collection.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus alcohol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water.

IF INHALED: Move patient to fresh air.

Formula C₆H₁₂N₄
CAS No. 100-97-0
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White hygroscopic powder or crystals with a mild ammonia odour.	Molar mass 140.19	ADG Class 4.1
SOLUBILITY Soluble in water, ethanol and acetone. Slightly soluble in diethyl ether.	Melting point 280°C	Packing Group III
Solubility in water 490 g/L (20°C)	Boiling point 263°C (sublimes, with partial decomposition)	UN Number 1328
	Specific gravity 1.33 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H228 Flammable solid
H317 May cause an allergic skin reaction

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Prolonged exposure to the vapour or solid can lead to respiratory allergies and dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating dust. Avoid inhalation and ingestion and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

The reaction with acid generates formaldehyde (a sensitiser and probable human carcinogen).

STORAGE

Hexamine is moisture-sensitive and decomposes slowly to ammonia and formaldehyde when wet. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from heat and any sources of ignition. Store in the original unopened packaging until required for use.

Store away from oxidising agents, acids, halogenated hydrocarbons, nitric acid, acetic anhydride and iodine. Store with flammable solids (DG Class 4.1).

APPLICATIONS

General science: fuel for model steam engines.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Scoop up with a non-sparking tool. Treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash contaminated clothing before reuse.

WASTE DISPOSAL

Hexamine is biodegradable and is not expected to bioaccumulate.

Small quantity: Dissolve in a large volume of water and flush down the sink.

Alternatively, place in a steel crucible or similar fireproof vessel, in an operating fume cupboard. Set alight and allow to burn until consumed.

Large quantity: Store in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

WARNING

Formula C₆H₁₄O
CAS No. 111-27-3
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless flammable liquid with a sweet, fruity odour.	Molar mass 102.18	ADG Class 3
SOLUBILITY Slightly soluble in water. Miscible with diethyl ether. Soluble in ethanol and acetone.	Melting point -45°C	Packing Group III
Solubility in water 5.9 g/L (20°C)	Boiling point 157°C	UN Number 2282
	Specific gravity 0.82 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H319 Cause serious eye irritation
H302 Harmful if swallowed
H312 Harmful in contact with skin

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; neoprene, nitrile for splash protection). Exposure may cause irritation to the eyes, nose, throat and respiratory tract and on ingestion. Symptoms of exposure include nausea, headache, dizziness and CNS effects. Prolonged or repeated skin contact may cause irritation and dermatitis. Eye exposure to the liquid may cause severe irritation and burns. Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids, halogens, alkali metals, alkaline earth metals and aluminium. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Hexan-1-ol is slightly toxic for aquatic life. The alcohol is readily biodegradable and bioaccumulation is not expected. However, the degradation products may be more toxic. Avoid release to the environment. Store waste or surplus hexan-1-ol in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₆H₁₄
CAS No. 110-54-3
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.	Molar mass 86.18	ADG Class 3
SOLUBILITY Practically insoluble in water. Soluble in ethanol, diethyl ether and petroleum ether. Immiscible with methanol.	Melting point -95°C	Packing Group II
Solubility in water 10 mg/L (20°C)	Boiling point 69°C	UN Number 1208
	Specific gravity 0.66 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H361 Suspected of damaging fertility or the unborn child
H336 May cause drowsiness or dizziness
H373 May cause damage to organs through prolonged or repeated exposure
H304 May be fatal if swallowed and enters airways
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion or inhalation may cause CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents and halogens.
Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: comparing properties of saturated and unsaturated hydrocarbons; solvent for extracting halogens from aqueous solution, in thin-layer chromatography, in the preparation of nylon; a component of synthetic 'crude oil'.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Absorb with paper towel. Treat as for Waste Disposal of small quantity.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with paper towel or place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor. Glassware contaminated with hexane can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

POISONS CENTRE: 13 11 26



DANGER

Formula C₆H₁₆N₂
CAS No. 124-09-4
User Group 11-12



DESCRIPTION

White hygroscopic crystalline solid with a strong amine odour.

SOLUBILITY

Soluble in water and ethanol.

Solubility in water 800 g/L (20°C)

PHYSICAL DATA

Molar mass 116.21
Melting point 41°C
Boiling point 204°C
Specific gravity 0.89 (25°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 2280
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H312 Harmful in contact with skin
H314 Causes severe skin burns and eye damage
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (neoprene, butyl rubber; nitrile for splash protection). Exposure may cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in permanent eye damage. Skin contact may result in an allergic response and dermatitis in some individuals.

Handle only in an operating fume cupboard or well-ventilated area. Avoid generating dust. Avoid inhalation and ingestion and contact with skin, eyes and clothing. Handle away from heat and sources of ignition.

STORAGE

The substance is sensitive to air and light, is hygroscopic and absorbs water and carbon dioxide from the air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture; storage in a desiccator is preferable. Store away from heat and any sources of ignition.

Store away from oxidisers, acids, acid chlorides, acid anhydrides and acid halides.
Store with corrosive solids.

APPLICATIONS

Senior chemistry: a reagent in the preparation of nylon.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Scoop up with a non-sparking tool. Treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash contaminated clothing before reuse.

WASTE DISPOSAL

Hexane-1,6-diamine is biodegradable and is not expected to bioaccumulate. Forms a corrosive mixture with water.

Small quantity: Dissolve in a large volume of water. Neutralise the solution to within pH 6-8 by addition of dilute (0.5M or ~2%) hydrochloric acid (test with pH paper) and flush down the sink.

Large quantity: Store in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove immediately contaminated clothing. Rinse skin with water/shower. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

DANGER

Formula C₆H₁₂O₂
CAS No. 142-62-1
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless to pale yellow, oily liquid with characteristic unpleasant odour.	Molar mass 116.16	ADG Class 8
SOLUBILITY Slightly soluble in water. Soluble in ethanol and diethyl ether.	Melting point -4°C	Packing Group III
Solubility in water 9.7 g/L (20°C)	Boiling point 206°C	UN Number 2829
	Specific gravity 0.9212 (25°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H302 Harmful if swallowed
H312 Harmful in contact with skin
H332 Harmful if inhaled
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage.
Handle only in an operating fume cupboard. Avoid inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage.
Store away from oxidising agents.
Store with corrosive liquids (organic acids).

APPLICATIONS

Senior chemistry: ester preparation.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Decant the neutral solution down the sink with further dilution. Dispose of the residual solids as general waste.
Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute the waste by adding slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.
Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with plenty of water and mild soap. Immediately call a POISONS CENTRE or doctor. Wash contaminated clothing before reuse.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE: 13 11 26.

DANGER

Formula HCl
CAS No. 7647-01-0
User Group 11-12



DESCRIPTION

Clear to light yellow, fuming, corrosive liquid with a sharp, suffocating odour. An aqueous solution of hydrogen chloride gas, available in concentrations of up to 36% w/w.

SOLUBILITY

Soluble in water, alcohols and diethyl ether. Insoluble in hydrocarbons.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 34.46
Melting point -42°C (32%)
-30°C (36%)
Boiling point 79°C (32%)
61°C (36%)
Specific gravity 1.159 (32%)
1.179 (36%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group II
UN Number 1789
Poisons Schedule S6
Security CSC IDM Cat 3

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile, neoprene, butyl, Viton®). The concentrated acid is highly corrosive and should be handled with care. Exposure can cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury. Handle only in an operating fume cupboard. Do not breathe vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. When diluting, add the concentrated acid slowly to water. Never add water to the concentrated acid.

STORAGE

Store in a tightly closed, labelled container in a cool, dry, well-ventilated place away from heat and light. Ensure the container is kept upright to prevent leakage. Store away from heat and any ignition sources. Store away from oxidising agents, alkalis, metals, organic substances. Store with corrosive liquids (inorganic acids).

APPLICATIONS

General science: in dilute solution as an example of a strong inorganic acid; for the preparation of the gases hydrogen and carbon dioxide.
Senior chemistry: acid-base titrations; inorganic analysis.
Technical: to remove rust from glassware.

SPILLS

Wear PPE. Ensure good ventilation. Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water. Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.

Large spill: Place material in a suitable labelled container. Arrange for collection by a licenced contractor.

Wash spill area thoroughly with water.

Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift.

Small quantity: Wear PPE and work in a fume cupboard. Add the waste acid slowly to a large volume of water. Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.

Large quantity: Store in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula H₂
CAS No. 1333-74-0
User Group 7-12

DESCRIPTION

Colourless, odourless gas.
Hydrogen burns with an invisible flame.

PHYSICAL DATA

Molar mass	2.02	Vapour density (air = 1)	0.07
Melting point	-259°C	Liquid density (water = 1)	-
Boiling point	-253°C	Flammability	Extremely flammable
Solubility in water	1.6 mg/L (20°C)	Flammability Range (% by volume of air)	4-77%

HAZARD STATEMENTS

H220 Extremely flammable gas

WASTE DISPOSAL

Residual hydrogen may be safely vented into the lab.
Spent reaction mixtures should be neutralised to within pH 6-8 before washing to waste.
Unreacted zinc granules can be rinsed, dried and stored for future use.
Magnesium residues can be destroyed by the reaction with hydrochloric acid and the mixture neutralised to within pH 6-8 and washed down the sink.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Hydrogen is extremely flammable and can form explosive mixtures with air. It is a weak reducing agent. Hydrogen is not toxic but at high concentrations can act as an asphyxiant due to displacement of air.
The preparation and handling of hydrogen should be conducted in a well-ventilated area away from hot surfaces, sparks, open flames, static discharges and other heat and ignition sources. Avoid inhalation of the gas.
Hydrogen can react violently or explosively with oxidising substances, peroxides, metal catalysts and active metals. The exploding of hydrogen filled balloons can be very loud. It is recommended that this activity be conducted outdoors. It is recommended that exploding of stoichiometric mixtures of hydrogen and oxygen be conducted on a small scale only (e.g. as bubbles on the surface of soapy water) due to the intensity of the explosion.

PREPARATION NOTES

Hydrogen is generated from the reaction of hydrochloric acid with an active metal such as zinc or magnesium. The gas can be collected over water or into an inverted vessel by downward displacement of air. The receiving vessel filled with hydrogen should be kept inverted until capped or sealed.
The acid is usually the limiting reagent.
The reaction can be quenched by dilution of the reaction mixture with water.

APPLICATIONS

General science: the preparation of hydrogen gas and investigation of its properties.

FIRST AID

IF IN EYES: Adverse effects to the eyes are not expected.
IF SWALLOWED: Ingestion is considered unlikely.
IF ON SKIN: Adverse effects to the skin are not expected.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. For advice, call the Poisons Information Centre or a doctor.
POISONS CENTRE: 13 11 26



hydrogen sulfide, generated from a reaction

hydrogen sulphide; rotten egg gas

DANGER

Formula H₂S
CAS No. 7783-06-4
User Group Qualified Staff



DESCRIPTION

Colourless gas with an odour of rotten eggs.
Hydrogen sulfide burns in air with a blue flame.

PHYSICAL DATA

Molar mass	34.08	Vapour density (air = 1)	1.2
Melting point	-86°C	Liquid density (water = 1)	-
Boiling point	-60°C	Flammability	Extremely flammable
Solubility in water	4 g/L (20°C)	Flammability Range (% by volume of air)	3.9-45.5%

HAZARD STATEMENTS

H220 Extremely flammable gas
H330 Fatal if inhaled
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber, nitrile). Hydrogen sulfide is a very toxic gas and a reducing agent. Aqueous solutions of the gas are acidic. Exposure to low concentrations can cause irritation to the eyes, nose, throat and respiratory system. Exposure to high concentrations can cause rapid loss of consciousness and can be fatal. The sense of smell cannot be relied on to detect either the presence or concentration of the gas: at low concentrations the ability to smell H₂S fades rapidly whereas at high concentrations the olfactory nerve becomes rapidly paralysed.

Preparation and handling of hydrogen sulfide should only be carried out in an operating fume cupboard by trained staff. Remove any sources of ignition from the work area. Avoid inhaling gas, mist or vapour. Avoid prolonged or repeated exposure.

The gas is heavier than air and may accumulate in low-lying, confined areas. It can form explosive mixtures with air and can react violently with oxidising agents.

The use of microscale techniques in the generation of the gas is recommended.

HYDROGEN SULFIDE SOLUTION

Solutions of hydrogen sulfide are weakly acidic. Heating of the solution will release hydrogen sulfide gas. Avoid contact with skin and eyes. Avoid inhalation of vapour, mist or gas. Hydrogen sulfide in solution undergoes air-oxidation over time, forming a yellow precipitate of sulfur.

APPLICATIONS

Demonstration of the preparation and properties of hydrogen sulfide gas.

SPILLS

Accidental release of H₂S into the lab: Evacuate the laboratory. Open external windows. Close internal windows.

Solution spill: Wear PPE. Ensure good ventilation. Dilute spill with a solution of bleach (sodium hypochlorite solution). Absorb spill and wash down the sink.

Rinse spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Wear PPE. Work in an operating fume cupboard. Discharge residual H₂S gas or solution into a dilute solution of bleach. A solution prepared from 25 mL of bleach (5.25% sodium hypochlorite) in a large volume of water is sufficient to oxidise 50 mL of H₂S. Immerse contaminated glassware in the bleach solution. Allow the reaction mixture to stand for 1h and then wash to waste.

PREPARATION NOTES

Hydrogen sulfide can be prepared by gently heating a mixture of iron sulfide and dilute hydrochloric acid. The gas can be collected over warm water or directly into the receiving vessel by upward displacement of air.

The acid is usually the limiting reagent.

To stop the reaction, remove the heat source. Dilute the reaction mixture with water.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Ingestion of the gas is considered unlikely. In case of ingestion of H₂S solution: Give water to drink. Do NOT induce vomiting. Get immediate medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Skin which has been exposed to H₂S solution should be irrigated with plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice/attention.

POISONS CENTRE: 13 11 26

Formula C₁₆H₈N₂O₈S₂.2Na

CAS No. 860-22-0

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark blue-violet powder with a coppery lustre and faint odour. Aqueous solutions are blue, the colour fading on standing.	Molar mass 466.35	ADG Class -
Dye family indole	Melting point > 300°C 340°C decomposes	Packing Group -
Solubility water ¹ 3 mg/mL ethanol ¹ 3 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 608 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H317 May cause an allergic skin reaction

STORAGE

The substance is light sensitive.
Store in a cool, dry, well-ventilated place away from heat.
Protect from light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin. Eye exposure may lead to permanent damage. May cause an allergic response in susceptible individuals.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: contrast dye; stains cytoplasm
- pH indicator
- redox indicator
- 'chemical traffic light' demonstration

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 11.4 blue	pH 13 yellow	OXIDISED blue	REDUCED yellow
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FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

pH indicator: Dissolve 0.1 g in 50mL of ethanol. Make up to 100mL with distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Gabb & Latchem

Formula I₂
CAS No. 7553-56-2
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Heavy, violet-black crystals or granules with a metallic lustre and a pungent odour.	Molar mass 253.81	ADG Class 8 (6.1)
SOLUBILITY Very slightly soluble in water. Soluble in ethanol, diethyl ether, cyclohexane, glycerol and aqueous alkaline iodide solutions.	Melting point 114°C	Packing Group III
Solubility in water 340 mg/L (20°C)	Boiling point 184°C	UN Number 3495
	Specific gravity 4.93 (25°C)	Poisons Schedule S6
	Flammability Non-combustible	Security IDM Cat 2

HAZARD STATEMENTS

H312 Harmful in contact with skin
H332 Harmful if inhaled
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Iodine is corrosive and readily sublimates to a violet vapour. Exposure to the vapour may cause irritation to the skin, eyes and respiratory tract. Symptoms of ingestion or high inhalation exposure include severe irritation, metallic taste, headache, fever and gastric upset. Skin or eye contact with the solid or concentrated solution may result in severe irritation and burns. Sensitive individuals may show symptoms of iodism on exposure to small amounts.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust, vapour or mist. Avoid contact with skin, eyes and clothing.

STORAGE

Iodine is hygroscopic and light-sensitive. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight and moisture. Inspect lid periodically for damage. Consider bundling in a secondary lidded container. Do not stored in the refrigerator as the vapours may build up and corrode refrigerator components. Store away from alkali metals, alkali oxide, metal powders, ammonia, ammonium compounds.

Store the solid and solutions with Class 8 Corrosive substances (acids).

The concentration of iodine solution will change over time due to (i) loss of the volatile iodine from the solution, and (ii) air-oxidation of iodide ion to iodine, a reaction promoted by heat and light.

APPLICATIONS

General science: demonstration of sublimation.

Biology: (in solution) to indicate the presence of starch.

Forensic science: visualisation agent for fingerprinting.

SPILLS

Small spill: Collect material and treat as for Waste Disposal.

Solution spill: Treat spills of iodine solution, and iodine stains on benches/floors, with a minimal quantity of dilute sodium thiosulfate solution (0.1-0.2 M) and wash residues down the sink with dilution.

Large spill: Cover with dry sand or other non-combustible material. Collect material and place in a plastic bag contained within another plastic bag. Place into a labelled plastic container and store for collection. Wash the spill area with dilute thiosulfate solution and then with water.

WASTE DISPOSAL

Small quantity: Treat small quantities of waste iodine or iodine solution by dropwise/portionwise addition of dilute sodium thiosulfate solution (0.1-0.2 M) until the brown colour of the iodine is discharged. Flush the solution down the sink with further dilution.

Large quantity: Large amounts of waste or surplus solid iodine and large volumes of concentrated aqueous or ethanolic iodine should be stored for collection by a licenced waste disposal contractor.

Residual iodine on instruments and glassware can be removed by treating with sodium thiosulfate solution (0.1-0.2M) prior to washing.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Senior chemistry: (in solution) iodometric titrations; visualisation agent for thin layer chromatography; Iodine-Clock reaction.

Formula Fe
CAS No. 7439-89-6
User Group F-12

<p>DESCRIPTION Silver-grey metal.</p> <p>SOLUBILITY Reacts with organic acids, dilute mineral acids, cold dilute nitric acid, hot concentrated sulfuric acid and hot concentrated nitric acid.</p> <p>Solubility in water Insoluble</p>	<p>PHYSICAL DATA</p> <p>Molar mass 55.85 Melting point 1535°C Boiling point 2750°C Specific gravity 7.86 (20°C) Flammability Non-combustible</p>	<p>REGULATORY INFORMATION</p> <p>ADG Class - Packing Group - UN Number None Poisons Schedule - Security -</p>
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HAZARD STATEMENTS
Not classified as hazardous

SAFE HANDLING
Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to iron dust or fumes may cause irritation of the skin, eyes and respiratory tract. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Iron is oxidised in moist air to form a red rust, iron (III) oxide. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from sources of heat and ignition. Store away from acids, halogens and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: qualitative properties of the element; investigations of magnetic fields.
Senior chemistry: electrochemical cells; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantities may be disposed of a general waste. Large quantity: Store in a suitable labelled container for waste iron metal. Arrange for collection by a a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

iron (II) chloride tetrahydrate

ferrous chloride tetrahydrate; iron dichloride tetrahydrate

DANGER

Formula FeCl₂·4H₂O

CAS No. 13478-10-9

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Light green crystals with a slight odour of hydrogen chloride.	Molar mass 198.81	ADG Class 8
SOLUBILITY Soluble in water and alcohol.	Melting point 105-110°C (-4H ₂ O) 670-677°C (anhydrous)	Packing Group III
Solubility in water 1600 g/L (10°C)	Boiling point -	UN Number 3260
	Specific gravity 1.93	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause irritation and burns to the skin and eyes, and respiratory and gastrointestinal tracts. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is hygroscopic and air-sensitive and becomes oxidised on exposure to air and moisture. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Do not store in a metal container. Store away from alkali metals and oxidising agents. Store with corrosive substances (DG Class 8).

APPLICATIONS

General science: preparation of ferrofluid.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store waste or surplus iron (II) chloride in a suitable labelled container such as for waste heavy metals and arrange for collection by a licenced waste disposal contractor.

Solution waste: Alternatives: (i) Neutralise to within pH 6-8 and store in a suitable labelled container such as for waste heavy metal salt solutions. (ii) Neutralise to within pH 6-8 and evaporate the water. Dispose of the solid residue as solid waste. (iii) The Fe(II) ions can be precipitated as the hydroxide at approximately pH 9. On exposure to air, the green Fe(II) hydroxide will become oxidised to the brown Fe(III) hydroxide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

iron (III) chloride hexahydrate

ferric chloride hexahydrate; iron trichloride hexahydrate

ANGER

Formula FeCl₃·6H₂O

CAS No. 10025-77-1

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Brownish-yellow or orange crystals or powder with a slight odour of hydrogen chloride.	Molar mass 270.3	ADG Class 8
SOLUBILITY Soluble in water, alcohol and acetone.	Melting point ca 37°C	Packing Group III
Solubility in water 920 g/L (20°C)	Boiling point 280-285°C	UN Number 3260
	Specific gravity 1.82 (25°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H302 Harmful if swallowed
H319 Causes skin irritation
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are strongly acidic. Exposure may cause irritation and burns to the skin and eyes, and respiratory and gastrointestinal tracts. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The reaction with water may generate toxic and corrosive fumes of hydrochloric acid.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Do not store in a metal container. Store away from alkali metals and oxidising agents. Store with corrosive substances (DG Class 8).

APPLICATIONS

General science: preparation of ferrofluid.
Senior chemistry: redox reactions;
qualitative inorganic analysis.
Technical: preparation of fake blood;
component of Bial's Reagent.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in a suitable labelled container such as for waste heavy metals and arrange for collection by a licenced waste disposal contractor.

Solution waste: Neutralise to within pH 6-8 and store with waste heavy metal salt solutions, or evaporate the water and dispose of the solid residue as solid waste. Alternatively, Fe(III) ions can be precipitated as the hydroxide at approximately pH 4-5 by addition of sodium hydroxide solution. Allow the precipitate to age for 2-3 days and collect by filtration or by decanting the supernatant. Neutralise the supernatant solution to within pH 6-8 and wash down the sink. Allow the solid precipitate to dry and store for collection.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula FeSO₄·7H₂O

CAS No. 7782-63-0

User Group 7-12

DESCRIPTION

Pale bluish-green, odourless crystals or granules with an astringent taste.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 400 g/L (20°C)

PHYSICAL DATA

Molar mass 278.02

Melting point 60-300°C (-7 H₂O)

Boiling point > 400°C decomposes

Specific gravity 1.89 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H315 Causes skin irritation

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a weak reducing agent. Aqueous solutions of the salt are acidic. Exposure may cause irritation to the skin and eyes, and respiratory and gastrointestinal tracts. Ingestion of large amounts may lead to toxic effects on the liver and kidneys.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition forms the anhydrate with loss of water of crystallisation. With further heating, iron (III) oxide and toxic fumes of sulfur oxides are produced.

STORAGE

The substance is hygroscopic and sensitive to air and light. On exposure to air and moisture, ferrous sulfate becomes oxidised, forming a brown coating of corrosive 'basic ferric sulfate'.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture.

Store away from alkalis, carbonates, acids and oxidising substances.

Store with general inorganic substances.

APPLICATIONS

Senior chemistry: redox reactions;
qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in a suitable labelled container such as for waste heavy metals and arrange for collection by a licenced waste disposal contractor.

Solution waste: Neutralise to within pH 6-8 and store in a suitable labelled container such as for waste heavy metal salt solutions. Alternatively, the neutralised solution can be evaporated down, and the residue treated as solid waste. Fe(II) ions can also be precipitated from solution as the hydroxide at approximately pH 9 and the precipitate treated as solid waste. On exposure to air, the green Fe(II) hydroxide precipitate will become oxidised to brown Fe(III) hydroxide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula FeS

CAS No. 1317-37-9

User Group 7-12

DESCRIPTION

Dark brown or dark grey, odourless pieces, sticks or granular powder. Forms colourless hexagonal crystals when pure.

SOLUBILITY

Practically insoluble in water.

PHYSICAL DATA

Molar mass 87.91

Melting point 1195°C

Boiling point -

Specific gravity 4.84 (20°C)

Flammability Non-combustible
when pure and dry

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mechanical irritation to the skin and eyes. Exposure may irritate and damage the respiratory and gastrointestinal tracts. Ingestion may lead to generation of hydrogen sulfide in the stomach, which may cause CNS and cardiovascular effects. Inhalation of fumes may lead to metal fume fever. Ingestion of large amounts may lead to toxic effects on the liver and kidneys.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

The reaction with acids may generate highly toxic hydrogen sulfide gas.

STORAGE

Over time, on exposure to moist air, the substance becomes oxidised, forming iron (III) hydroxide and sulfur.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, peroxides and oxidising agents.

Store with general inorganic substances.

APPLICATIONS

Senior chemistry: product of the reaction of iron and sulfur (small scale is recommended); to demonstrate the preparation and properties of hydrogen sulfide (microscale is recommended).

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids or waste heavy metals and arrange for collection by a licenced waste disposal contractor. Small quantities may be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. If symptoms persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula Fe₃O₄
CAS No. 1317-61-9
User Group 7-12

DESCRIPTION

Black, amorphous, odourless, ferrimagnetic powder.

SOLUBILITY

Insoluble in water and alcohol. Dissolves slowly in hydrochloric acid.

PHYSICAL DATA

Molar mass 231.54
Melting point 1538°C
Boiling point -
Specific gravity 4.8-5.18
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mechanical irritation to the skin and eyes. Exposure may irritate and damage the respiratory and gastrointestinal tracts. Inhalation of fumes may lead to metal fume fever. Ingestion of large amounts may lead to toxic effects on the liver and kidneys. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The substance is oxidised to iron (III) oxide, Fe₂O₃, on heating in air.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from acids, peroxides and oxidising agents. Store with general inorganic substances.

APPLICATIONS

General science: investigations of magnetism; properties of ferrofluid.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids or waste heavy metals and arrange for collection by a licenced waste disposal contractor. Small quantities may be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

iron (III) nitrate, nonahydrate

ferric nitrate nonahydrate; iron trinitrate nonahydrate

DANGER

Formula $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$

CAS No. 7782-61-8

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Pale violet crystals with a faint odour of nitric acid.	Molar mass 404.00	ADG Class 5.1
SOLUBILITY Soluble in water, alcohol and acetone. Slightly soluble in cold concentrated nitric acid.	Melting point 47°C ca 100°C (-9H ₂ O)	Packing Group III
Solubility in water 1500 g/L (20°C)	Boiling point ca 125°C decomposes	UN Number 1466
	Specific gravity 1.68 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H315 Causes skin irritation
H318 Causes serious eye damage
H335 May cause respiratory irritation
Some products are not classified as oxidising.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is an oxidising agent. Aqueous solutions of the salt are strongly acidic. Exposure may cause irritation and burns to the skin and eyes and respiratory and gastrointestinal tracts.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources.

Mixing of the substance with reducing agents and/or combustible material may result in fire or explosion, liberating toxic oxides of nitrogen.

In case of fire, use water as the extinguishing agent.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from heat and sources of ignition. Do not store in a metal container. Do not store on wooden surfaces.

Store away from alkali metals, powdered metals, organic substances, reducing agents and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; investigations of equilibria and Le Chatelier's principle; catalysis of its reaction with thiosulfate ion.

Technical: preparation of fake blood.

SPILLS

Wear PPE. Ensure good ventilation. Remove combustible material and ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent, non-combustible material such as sand, vermiculite or bentonite. Collect with a non-sparking tool and transfer to a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.

Solution waste: Small volumes of dilute solutions (concentration < 1%) may be washed down the sink. Concentrated solutions may be allowed to evaporate and the sludge stored in a labelled container for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness. Alternatively, Fe(III) ions can be precipitated as the hydroxide at approximately pH 4-5 by addition of sodium hydroxide solution. Allow the precipitate to age for 2-3 days and collect by filtration or by decanting the supernatant. Neutralise the supernatant solution to within pH 6-8 and wash down the sink. Allow the solid precipitate to dry and store as solid waste for collection.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula Fe₂O₃
CAS No. 1309-37-1
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Reddish-brown, odourless powder.	Molar mass 159.7	ADG Class -
SOLUBILITY Insoluble in water. Soluble in acids.	Melting point 1539°C	Packing Group -
	Boiling point -	UN Number None
	Specific gravity 5.25	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mechanical irritation to the skin and eyes. Exposure may irritate and damage the respiratory and gastrointestinal tracts. Inhalation of fumes may lead to metal fume fever. Ingestion of large amounts may lead to toxic effects on the liver and kidneys. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from acids, peroxides and oxidising agents.
Store with general inorganic substances.

APPLICATIONS

Senior chemistry: redox reactions;
qualitative inorganic analysis.
Technical: demonstration of the thermite reaction.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus iron (III) oxide in a suitable labelled container such as for waste inorganic solids or waste heavy metals and arrange for collection by a licenced waste disposal contractor.

Small quantities may be disposed of as general waste.

Glassware coated with iron oxide: Cover with dilute hydrochloric acid (~1M) and allow to stand for hours or days, depending on the level of contamination. Then rinse (scrub if necessary), and wash glassware as usual.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. If recovery is not rapid, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula C₇H₁₄O₂
CAS No. 123-92-2
User Group 11-12

DESCRIPTION

Colourless to yellow liquid with a banana- or pear-like odour.

SOLUBILITY

Slightly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone.

Solubility in water 2.19 g/L (19.4°C)

PHYSICAL DATA

Molar mass 130.19
Melting point -79°C
Boiling point 142°C
Specific gravity 0.87 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 1104
Poisons Schedule -
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; nitrile for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from strong oxidising agents, strong acids, strong bases, alkali metals and alkali hydroxides.

Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between acetic acid and isoamyl alcohol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.

Formula C₃₀H₃₁ClN₆

CAS No. 2869-83-2

User Group 11-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Blue to black powder. Forms green to blue solutions.	Molar mass 511.07	ADG Class -
Dye family phenazine	Melting point	Packing Group -
Solubility water ¹ 30 mg/mL ethanol ¹ 5 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 660 nm, 395 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- redox indicator for indicating the presence of oxygen
- histology: vital stain; stains mitochondria

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

OXIDISED

blue

REDUCED

pink

PREPARATION

Dissolve 0.1g in 2-3 mL ethanol. Make up to 100 mL with distilled water.³

References:

1. Aldrich Handbook
2. Sabnis
3. Carolina

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula n/a
CAS No. 8008-20-6
User Group 7-12



DESCRIPTION

Clear, blue or colourless liquid with a strong odour. Mixture of aliphatic and aromatic hydrocarbons, mainly with carbon number in the range C9-C16. Less dense than water.

SOLUBILITY

Miscible with other petroleum solvents.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass -
Melting point -
Boiling point 175-325°C
Specific gravity ca. 0.80
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 1223
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H315 Causes skin irritation
H336 May cause drowsiness or dizziness
H304 May be fatal if swallowed and enters airways
H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Kerosene is flammable and has a low flash point. Exposure may cause irritation to the skin, eyes, respiratory tract and on ingestion. Symptoms of inhalation or ingestion include drowsiness, dizziness and nausea. Prolonged or repeated skin exposure can lead to dryness, cracking and dermatitis. There is a risk of aspiration into the lungs if ingested.

Handle in an operating fume cupboard or well-ventilated area. Avoid inhalation of vapour or mist. Avoid contact with skin, eyes and clothing.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, bases and amines. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

General science: solvent for extracting non-polar substances.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition.

Small spill: Absorb with paper towel. Allow the solvent to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large spill: Cover with non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter). Place material in a suitable labelled container and store for collection. Ventilate the spill area and wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Kerosene is toxic to aquatic life and should not be released to drains or waterways.

Small quantity: Absorb onto paper towel or place in a shallow vessel. Allow the solvent to evaporate in an operating fume cupboard.

Large quantity: Store in original container or other suitable labelled container, such as for non-halogenated organic liquid waste, and arrange for collection by a licenced waste disposal contractor.

Empty containers can contain explosive vapours. Empty containers should be rinsed thoroughly with water and the rinsings absorbed onto inert material and treated as for spills. Washed empty containers can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

lactic acid, aqueous solution

2-hydroxypropionic acid; milk acid

DANGER

Formula C₃H₆O₃
CAS No. 50-21-5 (n.o.s.); 598-82-3 (DL)
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless or yellowish, odourless, hygroscopic, syrupy liquid. Available as an 85-90%w/w aqueous solution.	Molar mass 90.078	ADG Class -
SOLUBILITY Soluble in water, ethanol and diethyl ether.	Melting point 16.8°C (DL)	Packing Group -
Solubility in water Soluble	Boiling point 122°C (DL)	UN Number None
	Specific gravity 1.2060 (21°C, DL)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage.

Handle in a well-ventilated area. Avoid inhaling vapour or mist. Avoid ingestion and contact with skin, eyes, and clothing. Avoid prolonged or repeated exposure.

STORAGE

The acid is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents, reducing agents, bases and iodides.

Store with corrosive liquids (organic acids).

APPLICATIONS

General science: preparation of polylactic acid.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Decant the neutral solution down the sink with further dilution.

Dispose of the residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water and soap. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

Formula Pb
CAS No. 7439-92-1
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Buish-white, silver-grey soft and malleable metal. Lustrous when freshly cut and tarnishes on exposure to air.	Molar mass 207.2	ADG Class 9
SOLUBILITY Reacts with mineral acids: hydrochloric acid, sulfuric acid and nitric acid.	Melting point 327.4°C	Packing Group III
Solubility in water Insoluble	Boiling point 1740°C	UN Number 3077
	Specific gravity 11.3	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H332 Harmful if inhaled
H360 May damage fertility or the unborn child
H373 May cause damage to organs through prolonged or repeated exposure
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to lead powder, dust or fumes may cause irritation to the skin, eyes and respiratory tract. Lead particles may cause mechanical irritation of the eyes and skin. Inhalation of fumes may lead to metal fume fever. Lead is poorly absorbed via the skin. The effects of lead exposure are cumulative. Children are more sensitive than adults to the toxic properties of lead. Elemental lead has been evaluated by the IARC as *probably carcinogenic to humans*. Avoid generating and inhaling dust or fumes. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Lead pieces should be wrapped (e.g. with plastic film) before being handled by students. Finely divided lead reacts with acids, generating flammable hydrogen gas. Heating to decomposition will generate toxic fumes of lead oxide. In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Freshly cut lead surfaces are oxidised rapidly in air, forming a passivating layer of basic lead carbonate. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from sources of heat and ignition. Store away from acids and oxidising agents. Store with general inorganic solids or toxic solids.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste lead metal. Arrange for collection by a licenced waste disposal contractor or a metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention

IF ON SKIN: Remove contaminated clothing. Brush particles off skin. Wash skin thoroughly with soap and plenty of water. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 26 11

APPLICATIONS

General science: qualitative properties of the element.

Senior chemistry: electrochemical cells; redox reactions.

Formula $\text{Pb}(\text{NO}_3)_2$
CAS No. 10099-74-8
User Group 7-12S (Note C)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to off-white, almost odourless crystals.	Molar mass 331.20	ADG Class 5.1 (6.1)
SOLUBILITY Soluble in water. Slightly soluble in ethanol and methanol.	Melting point 470°C decomposes	Packing Group II
Solubility in water 486 g/L (20°C)	Boiling point -	UN Number 1469
	Specific gravity 4.49 (20°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H332 Harmful if inhaled
H318 Causes serious eye damage
H360 May damage fertility or the unborn child
H373 May cause damage to organs through prolonged or repeated exposure
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile). The substance is toxic and is a strong oxidising agent. Aqueous solutions of the salt are acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Acute or chronic exposure can lead to blood, CNS, kidney, cardiovascular and reproductive system disorders. The effects of lead exposure are cumulative. Children are more sensitive than adults to the toxic properties of lead. Inorganic lead compounds have been evaluated by the IARC as *probably carcinogenic to humans*. Handle only in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.
In case of fire, use water as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from sources of heat or ignition.
Store away from reducing agents, combustible materials and organic substances.
Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: as a dilute solution, in displacement reactions (microscale only recommended).

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area.
Solid spill: Collect spill material with a non-sparking tool and place in a suitable labelled container. Store for collection.
Solution spill: Cover with absorbent material such as sand, vermiculite or bentonite. Do not use combustible materials (paper, cloth) to clean up spill. Treat as for solid spill. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The substance must not be disposed of with general waste. Store waste or surplus lead (II) nitrate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor. Solutions may be allowed to evaporate and the sludge stored for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness.
Take care not to mix with incompatible waste such as reducing agents, combustible substances, readily oxidisable materials or reactive metals.
Lead ions can be precipitated from solution as the carbonate at pH 7-8 by addition of a solution of sodium carbonate.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with plenty of water. Seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.
POISONS CENTRE: 13 11 26

Formula PbO
CAS No. 1317-36-8
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Yellow to reddish, very dense, odourless crystals or powder.	Molar mass 223.20	ADG Class 6.1
SOLUBILITY Practically insoluble in water. Soluble in acetic acid, dilute nitric acid and warm alkali hydroxide solutions. Insoluble in ethanol.	Melting point 888°C	Packing Group III
Solubility in water 0.017 g/L (20°C)	Boiling point 1470°C	UN Number 2291
	Specific gravity 9.53 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H332 Harmful if inhaled
H360 May damage fertility or the unborn child
H373 May cause damage to organs through prolonged or repeated exposure
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Lead oxide is toxic by inhalation or ingestion. Exposure may cause mild irritation to the skin and eyes. Acute or chronic exposure can lead to blood, CNS, kidney, cardiovascular and reproductive system disorders. The effects of lead exposure are cumulative. Children are more sensitive than adults to the toxic properties of lead. Inorganic lead compounds have been evaluated by the IARC as *probably carcinogenic to humans*. Handle only in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from oxidising agents and metal powders. Store with general inorganic solids or with toxic inorganic substances.

APPLICATIONS

Senior chemistry: demonstration of the reduction of lead (II) oxide to elemental lead.

SPILLS

Wear PPE. Ensure good ventilation. Spill can be covered with damp sand to avoid dust formation. Collect spill material and place in a suitable labelled container. Store for collection.
Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Lead compounds should not be released to the environment. Store waste or surplus lead (II) oxide in the original container or other suitable labelled container such as for lead or heavy metal waste solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with plenty of water. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26

Formula Li

CAS No. 7439-93-2

User Group Staff



<p>DESCRIPTION Silvery-white, ductile, light, soft metal; becomes yellowish on exposure to air and moisture.</p> <p>SOLUBILITY Reacts readily with water, releasing flammable hydrogen gas. Soluble in liquid ammonia, giving a blue solution.</p> <p>Solubility in water Reacts with water</p>	<p>PHYSICAL DATA</p> <p>Molar mass 6.94</p> <p>Melting point 180.5°C</p> <p>Boiling point 1342°C</p> <p>Specific gravity 0.534 (20°C)</p> <p>Flammability Flammable solid</p>	<p>REGULATORY INFORMATION</p> <p>ADG Class 4.3</p> <p>Packing Group I</p> <p>UN Number 1415</p> <p>Poisons Schedule</p> <p>Security IDM Cat 2</p>
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HAZARD STATEMENTS

H260 In contact with water releases flammable gases which may ignite spontaneously.

H314 Causes severe skin burns and eye damage.

AUH014 Reacts violently with water.

SAFE HANDLING
Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Lithium is corrosive and a strong reducing agent. Contact with lithium can cause severe irritation and burns to the skin and eyes. Fumes of burning lithium are highly irritating. The reaction with water generates flammable hydrogen gas and caustic lithium hydroxide.

Avoid contact with skin and eyes. Ensure that all tools used in handling are dry. Handle away from open flames and other ignition sources.

In case of fire, smother with dry sand or use approved Class D extinguisher; do not use water, foam or CO₂ extinguisher.

APPLICATIONS
Senior chemistry: In the demonstration of the reaction of an alkali metal with water.

PREPARATIONS
For detailed safety notes and procedure, see Science ASSIST Standard Operating Procedure: Demonstrating the reaction of alkali metals with water.

STORAGE
Lithium is air and moisture sensitive. Store in a tightly closed container in a cool, dry place away from heat and light. Ensure that metal is stored under paraffin oil. Lithium is less dense than paraffin oil, however a thin film of oil will cover the surface of the metal and protect it from the air. Alternatively, lithium can be stored covered in petroleum jelly (petrolatum). Lithium reacts readily with water; keep away from contact with water. Store away from heat and sources of ignition. Store away from acids, heavy metals, halogenated hydrocarbons, oxidising agents and phosphorus. Store with DG Class 4.3 Dangerous When Wet substances.

SPILLS
See Laboratory Notes

WASTE DISPOSAL
Small quantity: See Laboratory Notes
Large quantity of waste: Store under mineral oil in a suitable container and arrange for collection by a licenced waste disposal contractor.

FIRST AID
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Brush off loose particles from skin. Rinse skin with water/shower. If skin irritation or a rash occurs: Get medical advice/attention.
IF INHALED- metal oxide fumes (unlikely) or hydrogen gas: Move patient to fresh air and keep at rest in a position comfortable for breathing.
POISONS CENTRE: 13 11 26



Formula LiCl
CAS No. 7447-41-8
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder with a sharp saline taste.

SOLUBILITY

Soluble in water, alcohols, ether and acetone.

Solubility in water 832 g/L (20°C)

PHYSICAL DATA

Molar mass 42.39
Melting point 610°C
Boiling point 1360°C
Specific gravity 2.07 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The salt is toxic by ingestion or inhalation. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of large amounts of lithium ion may cause CNS and neuromuscular effects; chronic exposure may lead to impaired kidney or thyroid function. Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is hygroscopic and deliquescent. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from acids, alkali metals, halogen-halogen compounds and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: flame test.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

Solution: Transfer to a container for aqueous inorganic waste and arrange for collection. Alternatively, allow the water to evaporate and store the solid residue as for solid waste. Small volumes of dilute solutions (<1%) of lithium chloride can be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

ANGER

Formula LiOH
CAS No. 1310-66-3
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 23.95	ADG Class 8
SOLUBILITY Soluble in water.	Melting point 450-471°C	Packing Group II
Solubility in water 71 g/L (20°C)	Boiling point 924°C decomposes	UN Number 2680
	Specific gravity 2.54	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The salt is corrosive and is toxic by ingestion or inhalation. Aqueous solutions of the salt are strongly alkaline. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Ingestion of large amounts of lithium ion may cause CNS and neuromuscular effects; chronic exposure may lead to impaired kidney or thyroid function.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating the substance to decomposition will generate hazardous fumes of lithium oxides. The substance can react with active metals (aluminium, zinc), generating flammable hydrogen gas.

STORAGE

The substance is hygroscopic and absorbs carbon dioxide from the air, forming lithium carbonate.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture.

Store away from acids and oxidising agents.
Store with corrosive substances (DG Class 8).

APPLICATIONS

General science: properties of acids and bases.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with non-combustible material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

Solution: Neutralise to within pH 6-8 and transfer to a container for aqueous inorganic waste. Arrange for collection. Small volumes of neutral dilute solutions (<1%) of lithium ions can be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If symptoms develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26

Formula LiNO₃
CAS No. 7790-69-4
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless powder or granules.	Molar mass 68.95	ADG Class 5.1
SOLUBILITY Soluble in water, ethanol, methanol and acetone.	Melting point 255°C	Packing Group III
Solubility in water 522 g/L (20°C)	Boiling point > 600°C decomposes	UN Number 2722
	Specific gravity 2.38	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The salt is a strong oxidising agent and is toxic by ingestion or inhalation. Exposure may cause severe irritation to the skin and eyes, and the respiratory and digestive tracts. Ingestion of large amounts of lithium ion may cause CNS and neuromuscular effects; chronic exposure may lead to impaired kidney or thyroid function. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

There is a risk of fire and explosion if mixed with combustible or readily oxidisable materials. In case of fire, use water as the extinguishing agent. The preparation of explosive mixtures is not recommended.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from heat and ignition sources. Do not store on wooden surfaces. Store away from acids, alkalis, metal powders, reducing agents, oxidising agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

General science: flame test.
Senior chemistry: qualitative inorganic analysis; combustion of sugar demonstration.

SPILLS

Wear PPE. Ensure good ventilation. Remove any combustible material and ignition sources from the spill area.
Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.
Solution spill: Cover spill with non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor. Do not mix with any other waste.
Solution: Neutralise to within pH 6-8 and transfer to a container for aqueous inorganic waste. Arrange for collection. Small volumes of neutral dilute solutions (<1%) of lithium ions can be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek immediate medical attention.
POISONS CENTRE: 13 11 26

Formula n/a
CAS No. 1393-92-6
User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Blue powder; a mixture of dyes extracted from various lichens. Dye family Solubility water ¹ 50 mg/mL ethanol ¹ 3 mg/mL	Molar mass - Melting point - Flammability Combustible Absorption ¹ (λ_{\max}) 575 nm	ADG Class Packing Group UN Number None Poisons Schedule Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat. Protect from light and moisture. Store away from acids, alkalis and oxidising agents. Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful if swallowed or absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 4.5 red	pH 8.3 blue
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PREPARATION

Add 4 g to 100mL of distilled water.²

References:

- Aldrich Handbook
- Chem-Supply Product SDS

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula Mg
CAS No. 7439-95-4
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Light silvery-white, odourless metal strips.	Molar mass 24.31	ADG Class 4.1
Solubility in water Slowly decomposes	Melting point 651°C	Packing Group III
	Boiling point 1107°C	UN Number 1869
	Specific gravity 1.75 (20°C)	Poisons Schedule -
	Flammability Combustible Poorly flammable	Security IDM Cat 2

HAZARD STATEMENTS

H228 Flammable solid
H261 In contact with water releases flammable gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to dust or fumes may cause irritation to the eyes or respiratory tract. High acute exposure to dust or fumes may result in metal fume fever.

Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Handle away from heat or other ignition sources.

Magnesium burns with an intense white light which extends into the UV region and can be damaging to the eyes. The light cannot be observed safely without the protection of welding-standard safety glasses. Students should be instructed not to look directly at burning magnesium. The reaction with water or acid generates flammable hydrogen gas. Magnesium can react dangerously with oxidising agents, metal oxides, methanol, silver nitrate and if heated with sulfur.

In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Magnesium slowly becomes oxidised in moist air; in dry air it forms a passivating surface layer, a mixture of the oxide and the nitride. Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture.

If supplied in combustible packaging, magnesium ribbon should be re-packaged into a labelled non-reactive container, such as a glass jar.

Store away from oxidising agents, acids, acid chlorides, halogens and halogenated solvents.

Store with flammable solids (DG Class 4.1).

APPLICATIONS

General science: observations of the reactivity of the metal; preparation of hydrogen.

Senior chemistry: determination of an empirical formula (MgO); electrochemistry; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Collect material with a non-sparking tool. If it is uncontaminated, it can be stored for future use. Otherwise, treat as for Waste Disposal.

Wipe surfaces with dampened paper towel to remove residual magnesium dust. Rinse paper towel with water and dispose of as general waste. If the amount of residual magnesium dust is significant, ensure that it is destroyed by treating the paper towel with dilute hydrochloric acid (0.1M), then rinse the paper towel with water and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Add waste magnesium to dilute hydrochloric acid (1M) in the ratio of about 1 g of Mg to 100mL of acid. Allow the magnesium to react between additions. When all the magnesium has been consumed, neutralise the solution to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal company. Do not mix with other waste.

FIRST AID

IF IN EYES: Immediately rinse with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Remove particles from mouth. Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush off visible particles. Wash skin thoroughly with plenty of water. Immerse in cool water/ wrap in wet bandages. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.



Formula $\text{Mg}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$

CAS No. 16674-78-5

User Group F-12

DESCRIPTION

Colourless, odourless powder or crystalline powder.

SOLUBILITY

Soluble in water.

Solubility in water 1200 g/L (15°C)

PHYSICAL DATA

Molar mass 214.45

Melting point 80°C

Boiling point >135°C decomposes

Specific gravity 1.45

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large amount may cause gastric upset.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Heating the salt releases the water of crystallisation; further heating to decomposition yields magnesium oxide.

STORAGE

The salt is hygroscopic and deliquescent. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from acids, bases and oxidising agents.

Store with general inorganic substances.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in a suitable labelled container such as for waste inorganic solids. Small quantities may be disposed of as general waste.

Solution waste: Store in a suitable labelled container such as for waste inorganic salt solutions. Magnesium ions can be precipitated from solution as the hydroxide above pH 10 and the precipitate treated as solid waste. Small volumes of dilute solutions (concentration <1%) may be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms persist, seek medical advice/attention.



magnesium carbonate basic, hydrate

magnesium carbonate hydroxide;
magnesium hydroxide carbonate light;
magnesium hydroxide carbonate heavy

Formula composition varies, e.g.
3MgCO₃(OH)₂·3H₂O (light)
3.2MgCO₃(OH)₂·3.2H₂O (heavy)

CAS No. 39409-82-0

User Group F-12

DESCRIPTION

Odourless, bulky white powder.

SOLUBILITY

Very slightly soluble in water. Soluble in acids. Insoluble in alcohol and acetone.

Solubility in water 0.106 g/L
(20°C, anhydrous)

PHYSICAL DATA

Molar mass 365.31 (light)
383.32 (heavy)
Melting point 700°C decomposes (l)
350°C decomposes (h)
Boiling point -
Specific gravity 1.45 (light)
2.95 (heavy)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large amount may cause gastric upset. Chronic inhalation exposure may lead to lung damage.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Heating to decomposition generates harmful fumes of oxides of magnesium and carbon.

The reaction of the salt with acids liberates carbon dioxide.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids. Small quantities may be disposed of as general waste.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from acids and oxidizing agents.

Store with general inorganic substances.

APPLICATIONS

General science: investigations of antacids.

Senior chemistry: qualitative inorganic analysis; displacement reactions.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persists, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



magnesium chloride, hexahydrate

magnesium dichloride hexahydrate

Formula MgCl₂·6H₂O

CAS No. 7791-18-6

User Group 7-12

DESCRIPTION

Colourless, odourless flakes or crystals.

SOLUBILITY

Soluble in water and alcohol.

Solubility in water 1670 g/L (20°C)

PHYSICAL DATA

Molar mass 203.3

Melting point 117°C -6H₂O

Boiling point -

Specific gravity 1.57 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Inhalation of large amounts may lead to metal fume fever. Absorption of large quantities may lead to muscle weakness and cardiovascular effects. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Heating to decomposition generates toxic and corrosive fumes of hydrogen chloride gas and magnesium oxychloride.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from oxidising agents. Store with general inorganic substances.

APPLICATIONS

General science: flame tests.

Senior chemistry: qualitative inorganic analysis; displacement reactions; demonstration of Le Chatelier's principle.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in a suitable labelled container such as for waste inorganic solids.

Solution waste: Neutralise to within pH 6-8 and store in a suitable labelled container such as for waste inorganic salt solutions. Magnesium ions can be precipitated from solution as the hydroxide above pH 10 and the precipitate treated as solid waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula Mg(OH)₂
CAS No. 1309-42-8
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless powder.	Molar mass 58.33	ADG Class -
SOLUBILITY Practically insoluble in water. Soluble in dilute acids and ammonium salt solutions. Insoluble in alcohol.	Melting point 350°C decomposes	Packing Group -
Solubility in water 0.009 g/L (18°C)	Boiling point -	UN Number None
	Specific gravity 2.36 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation
Not classified as hazardous according to some suppliers

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Absorption of large quantities may lead to muscle weakness and cardiovascular effects. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Heating to decomposition generates harmful fumes of magnesium oxide.

STORAGE

The substance is hygroscopic and absorbs carbon dioxide from the air, forming magnesium carbonate. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from acids, oxidizing agents and powdered metals. Store with general inorganic substances.

APPLICATIONS

General science: investigations of antacids.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

magnesium nitrate, hexahydrate

magnesium dinitrate hexahydrate

DANGER

Formula Mg(NO₃)₂·6H₂O

CAS No. 13446-18-9

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystalline solid.	Molar mass 256.41	ADG Class -
SOLUBILITY Soluble in water and alcohol.	Melting point 89°C >90°C -6H ₂ O	Packing Group -
Solubility in water 420 g/L (20°C)	Boiling point 330°C decomposes	UN Number None
	Specific gravity 1.46 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation and burns to the skin, eyes and respiratory tract. Eye contact may lead to permanent damage. Inhalation of large amounts may lead to metal fume fever.

Handle in a well-ventilated area. Avoid generating an inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Handle away from heat and sources of ignition. Mixing of the substance with reducing agents and/ or combustible material may result in fire or explosion, liberating irritating, toxic fumes of nitrogen and magnesium oxides.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from heat and sources of ignition.

Store away from reducing agents, organic substances, metal powders and combustible materials.

Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; displacement reactions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container. Do not mix with other waste.

Solution waste: Store in a suitable labelled container such as for waste inorganic salt solutions. Solutions may be evaporated in an operating fume cupboard and the residue treated as solid waste. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness. Magnesium ions can be precipitated from solution as the hydroxide above pH 10 and the precipitate treated as solid waste. Small volumes of dilute solutions (concentration <1%) may be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula MgO
CAS No. 1309-48-4
User Group 7-12

DESCRIPTION

Fine, white odourless powder. Available as heavy or light depending on its density, as determined by the preparation method.

SOLUBILITY

Practically insoluble in water. Soluble in acids and ammonium salt solutions.
Insoluble in alcohol.

Solubility in water 0.086 g/L (30°C)

PHYSICAL DATA

Molar mass 40.30
Melting point ca 2800°C
Boiling point 3600°C
Specific gravity 3.58 (25°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause minor irritation of the skin, eyes and respiratory tract. Ingestion of a large amount may cause gastric upset. Inhalation of large amounts may lead to metal fume fever.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. The reaction with strong acids may be exothermic and violent.

STORAGE

Magnesium oxide absorbs carbon dioxide and moisture from the air. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from acids and oxidising agents.
Store with general inorganic substances.

APPLICATIONS

Senior chemistry: a product in the burning of magnesium, to determine the formula of magnesium oxide.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus magnesium oxide in a suitable labelled container such as for waste inorganic solids. Small quantities may be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



magnesium sulfate heptahydrate

magnesium(II) sulphate heptahydrate; epsom salts

Formula MgSO₄·7H₂O

CAS No. 10034-99-8

User Group F-12

DESCRIPTION

Colourless, odourless crystals or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol and glycerol.

Solubility in water 710 g/L (20°C)

PHYSICAL DATA

Molar mass 246.48

Melting point 120°C -6H₂O
250°C -7H₂O

Boiling point 1124°C decomposes

Specific gravity 1.68 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause minor irritation to the skin and respiratory tract and mechanical irritation to the eyes. Ingestion of a large amount may cause gastric upset. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Heating to decomposition generates toxic fumes of sulfur and magnesium oxides

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light; protect from moisture.
Store away from oxidising agents.
Store with general inorganic substances.

APPLICATIONS

General science: crystal growing;
investigations of 'hard' water.
Senior chemistry: electrochemistry;
determining the formula of a hydrate.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in a suitable labelled container such as for waste inorganic solids. Small quantities may be disposed of as general waste.

Solution waste: Store in a suitable labelled container such as for waste inorganic salt solutions. Magnesium ions can be precipitated from solution as the hydroxide above pH 10 and the precipitate treated as solid waste. Small volumes of dilute solutions (concentration <1%) may be washed down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₁₂H₉N₃O₄

CAS No. 74-39-5

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red to dark red crystals or powder.	Molar mass 259.22	ADG Class -
Dye family azo	Melting point 195-200°C	Packing Group -
Solubility water 1 g/L ethanol soluble Soluble in glycerol and solutions of alkali hydroxides.	-	UN Number None
	Flammability Combustible	Poisons Schedule -
	Absorption (λ_{\max}) 432 nm	Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from alkalis and oxidising agents.

Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- indicates the presence of magnesium in alkaline medium.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle; add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 11	pH 13	FREE	CHELATED
yellow	violet	red-violet	blue

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If feeling unwell, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

Reagent to detect Mg (e.g. in tap water): Dissolve 0.001 g of the dye in 100mL 2M sodium hydroxide solution. Add 1-2 drops of reagent solution to 1 drop of test solution on a dropping tile.



Formula $C_{46}H_{50}N_4 \cdot 2C_2HO_4 \cdot C_2H_2O_2$

CAS No. 2437-29-8

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Green, odourless crystalline powder.	Molar mass 927.02	ADG Class 6.1
Dye family triarylmethane	Melting point ca 159°C 164°C decomposes	Packing Group III
Solubility water ¹ 40 mg/mL ethanol ¹ 50 mg/mL	Flammability Combustible	UN Number 2811
	Absorption ² (λ_{max}) 614 nm, 425 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H301 Toxic if swallowed
H318 Causes serious eye damage
H361 Suspected of damaging fertility or the unborn child
H410 Very toxic to aquatic life with long lasting effects

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids or with toxic organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- microscopy: stains plant cytoplasm; stains bacterial endospores
- redox indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 0.2	pH 1.8	pH 11.5	pH 13.2
yellow	green	green	colourless

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If feeling unwell, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

Indicator or stain: Dissolve 1 g in 50 mL distilled water. Make up to 100 mL with distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Flinn



manganese (II) acetate, tetrahydrate

manganese diacetate, tetrahydrate; manganous acetate tetrahydrate

WARNING



Formula $\text{Mn}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$

CAS No. 6156-78-1

User Group 7-12

DESCRIPTION

Pale pink crystalline powder with an odour of acetic acid.

SOLUBILITY

Soluble in water and ethanol.

Solubility in water 233 g/L (25°C)

PHYSICAL DATA

Molar mass 245.09

Melting point 80°C

Boiling point 323°C decomposes

Specific gravity 1.59

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Chronic inhalation exposure to manganese compounds may lead to CNS effects.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents.

Store with general inorganic substances.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Store in a bottle for waste heavy metal salt solutions and arrange for collection. Alternatively, allow the water to evaporate and store the solid residue as heavy metal waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.



manganese (II) chloride, tetrahydrate

manganese dichloride, tetrahydrate; manganous chloride tetrahydrate

WARNING

Formula $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$

CAS No. 13446-34-9

User Group 7-12



DESCRIPTION

Pink, odourless crystals, which become pale blue with loss of water of crystallisation.

SOLUBILITY

Soluble in water and alcohol. Insoluble in diethyl ether.

Solubility in water 1980 g/L (20°C)

PHYSICAL DATA

Molar mass	197.91
Melting point	58°C 106-198°C (-4H ₂ O)
Boiling point	1190°C (anhydrous)
Specific gravity	2.01 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	9
Packing Group	III
UN Number	3077
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

H302 Harmful if swallowed

H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Chronic inhalation exposure may lead to inflammation of the respiratory tract and CNS effects. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Heating to decomposition may generate toxic and corrosive hydrogen chloride gas.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from acids, oxidising agents and active metals. Store with general inorganic substances.

APPLICATIONS

General science: crystal growing.

Senior chemistry: qualitative inorganic analysis; demonstration of the oxidation states of manganese.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Store in a bottle for waste heavy metal salt solutions and arrange for collection. Alternatively, allow the water to evaporate and store the solid residue as heavy metal waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.



manganese (II) sulfate, hydrate

manganese disulphate, monohydrate; manganous sulfate hydrate

WARNING

Formula $\text{MnSO}_4 \cdot \text{H}_2\text{O}$

CAS No. 10034-96-5

User Group 7-12



DESCRIPTION

Pink, odourless, slightly efflorescent crystals.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 762 g/L (20°C)

PHYSICAL DATA

Molar mass	169.02
Melting point	400-500°C (- H ₂ O) 700°C (anhydrate)
Boiling point	850°C (anhydrate)
Specific gravity	2.95 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	9
Packing Group	III
UN Number	3077
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

H373 May cause damage to organs through prolonged or repeated exposure

H411 Toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Chronic inhalation exposure may lead to inflammation of the respiratory tract and CNS effects. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust and aerosols. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from acids, oxidising agents and active metals. Store with general inorganic substances.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; demonstration of the oxidation states of manganese.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Store in a bottle for waste heavy metal salt solutions and arrange for collection. Alternatively, allow the water to evaporate and store the solid residue as heavy metal waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Get medical advice/attention if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap. If effects persist, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

POISONS CENTRE: 13 11 26

WARNING

Formula MnO₂
CAS No. 1313-13-9
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Brownish-black, odourless crystals or powder.	Molar mass 86.94	ADG Class
SOLUBILITY Practically insoluble in water. Insoluble in alcohol, nitric acid and cold sulfuric acid. Dissolves slowly in cold hydrochloric acid, with evolution of heat and chlorine.	Melting point 535°C decomposes	Packing Group
Solubility in water < 0.001 g/L (20°C)	Boiling point -	UN Number
	Specific gravity 5.21 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H332 Harmful if inhaled
H373 May cause damage to organs through prolonged or repeated exposure

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Chronic inhalation exposure may lead to inflammation of the respiratory tract and CNS effects. Some products may contain a low concentration of respirable crystalline silica which has been evaluated by the IARC as *known to be carcinogenic to humans*. (Chronic inhalation exposure to respirable crystalline silica may also lead to silicosis.)
Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Heating to decomposition gives Mn(III) oxide and Mn(II,III) oxide with evolution of oxygen gas. The reaction of MnO₂ with cold hydrochloric acid generates highly toxic chlorine gas.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light.
Store away from combustible materials, acids, oxidising agents, reducing agents and active metals.
Store with general inorganic substances.

APPLICATIONS

General science: catalyst for the decomposition of hydrogen peroxide.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources and any combustible material from the spill area.
Solid spill: Collect spill material and treat as for Waste Disposal.
Solution (slurry) spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.
Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus manganese oxide in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. Do not mix with incompatible waste. To clean glassware contaminated with manganese dioxide: immerse the glass in dilute hydrochloric acid (0.1M) add a reducing agent such as sodium sulfite. Allow to stand until the dark precipitate of MnO₂ has dissolved. This should reduce the Mn(IV) oxide to the soluble Mn(II). Rinse glassware with water.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Call a POISONS CENTRE or doctor if you feel unwell
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap. If skin irritation occurs, seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.
POISONS CENTRE: 13 11 26

WARNING



Formula C₄H₄O₄
CAS No. 110-16-7
User Group 11-12

DESCRIPTION

Colourless crystals with a faint acidulous odour and a characteristic astringent taste. Geometric isomer of fumaric acid.

SOLUBILITY

Soluble in water, ethanol, acetone, diethyl ether and glacial acetic acid.

Solubility in water 441 g/L (25°C)

PHYSICAL DATA

Molar mass 116.07
Melting point 138-139°C (from water)
Boiling point -
Specific gravity 1.59 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 3261
Poisons Schedule -
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H317 May cause an allergic skin reaction
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Skin contact may cause an allergic reaction and dermatitis in some individuals. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes, and clothing. Avoid prolonged or repeated exposure. When heated to above 287°C, maleic acid is partially transformed into its isomer, fumaric acid.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents and bases. Store with corrosive solids.

APPLICATIONS

Senior chemistry: to demonstrate its isomerisation to fumaric acid and observe the properties of the two isomers.
Technical: preparation of buffer solutions

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Neutralise as for solid spill. Decant neutral solution down the sink with further dilution. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and mild soap. If skin irritation or rash occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₃H₄O₄
CAS No. 141-82-2
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystals or crystalline powder.	Molar mass 104.06	ADG Class -
SOLUBILITY Soluble in water, ethanol and diethyl ether.	Melting point 135°C (decomposes)	Packing Group -
Solubility in water 1390 g/L 20°C)	Boiling point -	UN Number None
	Specific gravity 1.63 (20°C)	Poisons Schedule -
	Flammability Combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes and clothing.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from heat and any sources of ignition. Store away from oxidising agents, reducing agents and bases. Store with general organic solids.

APPLICATIONS

Senior chemistry: a reagent in the Briggs-Rauscher oscillating reaction; titration of a diprotic acid.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Neutralise as for solid spill. Decant neutral solution down the sink with further dilution. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

Formula Mn
CAS No. 7439-96-5
User Group Staff

<p>DESCRIPTION Steel-grey, lustrous, hard, brittle metal.</p> <p>SOLUBILITY Reacts with dilute acid.</p> <p>Solubility in water decomposes</p>	<p>PHYSICAL DATA</p> <p>Molar mass 54.94 Melting point 1244°C Boiling point 1962°C Specific gravity 7.2 Flammability Non-combustible</p>	<p>REGULATORY INFORMATION</p> <p>ADG Class - Packing Group - UN Number None Poisons Schedule - Security -</p>
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HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to manganese dust or fumes may cause irritation of the skin, eyes and respiratory tract. Chronic or high exposure to manganese compounds may lead to CNS effects.

Avoid generating and inhaling dust/fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Manganese reacts with water and dilute acids, with evolution of flammable hydrogen gas.

In case of fire, use sand or dry powder as the extinguishing agent.

STORAGE

Manganese rusts on exposure to moist air.

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light.

Protect from moisture. Store away from sources of heat and ignition.

Store away from acids, oxidising agents, reducing agents and halogens.

Store with general inorganic solids.

APPLICATIONS

General science: qualitative properties of the element.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal.

Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste manganese metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention

IF ON SKIN: Remove contaminated clothing. Brush particles off skin. Wash skin thoroughly with soap and plenty of water. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

Formula Hg
CAS No. 7439-97-6
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Shiny, silvery, odourless, heavy, metallic liquid.	Molar mass 200.59	ADG Class 8
SOLUBILITY Reacts with dilute and concentrated nitric acid, aqua regia, and warm concentrated hydrochloric acid. Soluble in lipids.	Melting point -38.9°C	Packing Group III
Solubility in water 0.06 mg/L (20°C)	Boiling point 357°C	UN Number 2809
	Specific gravity 13.55 (20°C)	Poisons Schedule S7
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H330 Fatal if inhaled; H360 May damage fertility or the unborn child; H372 Causes damage to organs through prolonged or repeated exposure; H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, PVC, neoprene). The main route of exposure to mercury is by inhalation. Elemental mercury is poorly absorbed by ingestion or via the skin. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye exposure may cause permanent eye damage. Prolonged or repeated exposure may lead to respiratory and/or skin sensitisation and dermatitis. Chronic exposure may lead to cumulative effects. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. If opening the container to transfer the substance, work only in an operating fume cupboard. Ensure that any work and storage surfaces are non-porous. Avoid using metal tools or vessels for handling or storage: many metals are corroded on contact with mercury.

STORAGE

Store only a small quantity of mercury (up to 25 mL), and only for demonstration purposes. Store in a tightly sealed container in a cool, dry, well-ventilated place. Protect from sunlight and moisture. Store away from any source of heat or ignition. Store away from oxidising agents, alkali metals, active metals, ammonia solution, amines and halogens. Store with secondary containment, such as in a tightly sealed glass vessel within a sealed polycarbonate container. Store with corrosive substances (DG Class 8).

APPLICATIONS

Senior chemistry and physics: demonstration of the physical properties of the element.

SPILLS

Wear PPE. Isolate spill area. Ensure good ventilation. Open external windows. Close internal windows. Turn off any air conditioning or heating systems. Collect any droplets of mercury using a pipette or absorbent sponge. Cover spill area with a suitable decontaminant such as a 1:1 mixture of lime and sulfur, zinc powder or commercial mercury absorbent. Leave for 24 hours to allow the reaction to take place. Collect material with a piece of card. Transfer spilled material to a suitable container and label as 'DANGER Elemental Mercury Spill'. Store for collection by a licenced waste disposal contractor. Wash the spill area thoroughly with detergent and water. Discard or decontaminate any contaminated clothing; do not wash contaminated clothing in washing machine. DO NOT vacuum up a mercury spill as this will contaminate the vacuum cleaner. See Science ASSIST Spill Response Procedure for more detailed guidance.

WASTE DISPOSAL

Store in a suitable labelled container and arrange for collection by a licence waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth thoroughly. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention
IF ON SKIN: Remove contaminated clothing and dispose of or decontaminate before reuse. Blot or brush away drops of metal from skin. Wash skin thoroughly with plenty of water and soap. Seek medical attention.
IF INHALED: Rescuer should not put themselves at risk. Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

Formula CH₄O
CAS No. 67-56-1
User Group 11-12



DESCRIPTION

Clear, colourless, highly volatile liquid with a mild alcohol odour.

SOLUBILITY

Miscible with water, alcohols, diethyl ether, esters, ketones and most other organic solvents. Immiscible with hexane, heptane and cyclohexane.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 32.04
Melting point -98°C
Boiling point 65°C
Specific gravity 0.79 (20°C)
Flammability Highly flammable

REGULATORY INFORMATION

ADG Class 3 (6.1)
Packing Group II
UN Number 1230
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H301 Toxic if swallowed
H311 Toxic in contact with skin
H331 Toxic if inhaled
H370 Causes damage to organs

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; neoprene for splash protection). Exposure may cause mild to moderate irritation to the skin, eyes and respiratory tract. Methanol is toxic by all routes of exposure. Symptoms of exposure include CNS depression, nausea, headache and dizziness. In severe cases, exposure may lead to potentially irreversible CNS effects, vision disturbances and blindness. Symptoms may be delayed. Prolonged or repeated skin contact can lead to dryness and cracking.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid contact with skin and eyes. Do not ingest. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, acid chlorides, reducing agents, alkali metals and metal powders. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: preparation of esters; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste. Alternatively, treat as for Waste Disposal of a small quantity.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. Call a POISONS CENTRE or doctor if you feel unwell.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

DANGER

Formula C₃H₆O₂
CAS No. 79-20-9
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile liquid with a fruity odour.	Molar mass 74.08	ADG Class 3
SOLUBILITY Soluble in water. Miscible with ethanol and diethyl ether.	Melting point -98°C	Packing Group II
Solubility in water 240-250 g/L (20°C)	Boiling point 57°C	UN Number 1231
	Specific gravity 0.93 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness.
Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.
Store away from strong oxidising agents, strong acids and strong bases.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between acetic acid and methanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Take off immediately all contaminated clothing. Rinse skin thoroughly with water/shower.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₈H₈O₂

CAS No. 93-58-3

User Group 11-12

DESCRIPTION

Clear, colourless, oily liquid with a fragrant odour.

SOLUBILITY

Slightly soluble in water. Miscible with ethanol, methanol and diethyl ether.

Solubility in water 2 g/L (25°C)

PHYSICAL DATA

Molar mass 136.15

Melting point -12°C

Boiling point 199°C

Specific gravity 1.09 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H227 Combustible liquid

H302 Harmful if swallowed

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber, Viton®; nitrile for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from strong oxidising agents, strong acids and strong bases.

Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: hydrolysis of an ester; product of the esterification reaction between benzoic acid and methanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ester in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell..

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26.



Formula $C_{37}H_{27}N_3O_9S_3 \cdot 2Na$

CAS No. 28983-56-4

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark blue or dark brown powder.	Molar mass 799.80	ADG Class -
Dye family triarylmethane	Melting point >250°C	Packing Group -
Solubility water ¹ 70 mg/mL ethanol ¹ 0.4 mg/mL	Flammability Combustible	UN Number None
	Absorption ¹ (λ_{max}) 600 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- histology: stains collagen

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids.

PREPARATION

Dissolve 0.1 g in 100mL of distilled water.²

References: 1. Aldrich Handbook 2. Flinn

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula C₅H₁₀O₂

CAS No. 623-42-7

User Group 11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with an apple-like odour.

SOLUBILITY

Sparingly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 16 g/L (20°C)

PHYSICAL DATA

Molar mass 102.13

Melting point -85.8°C

Boiling point 103°C

Specific gravity 0.90 (20°C)

Flammability Highly flammable

REGULATORY INFORMATION

ADG Class 3

Packing Group II

UN Number 1237

Poisons Schedule -

Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; butyl for splash contact). Exposure may cause irritation to the skin, eyes, nose and throat and respiratory tract. Inhalation or ingestion may cause headache, dizziness or drowsiness.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from oxidising agents, bases, acids, alkali metals and acid halides.

Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between butyric acid and methanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Evaporate as for Waste Disposal.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.

Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if feeling unwell.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.

Formula $C_{27}H_{35}N_3 \cdot Br \cdot Cl \cdot ZnCl_2$

CAS No. 7114-03-6

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green to dark brown powder with a weak characteristic odour.	Molar mass 653.23	ADG Class 8
Dye family triarylmethane	Melting point 300°C	Packing Group II
Solubility water ¹ 70 mg/mL ethanol ¹ 1 mg/mL	Flammability Combustible	UN Number 3261
	Absorption ² (λ_{max}) 629 nm, 423 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H351 Suspected of causing cancer
H411 Toxic to the aquatic environment with long lasting effects

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids or with toxic organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation and burns to the skin, eyes, and respiratory and gastrointestinal tracts. Eye exposure may cause permanent eye damage.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: fluorescent DNA stain
- tracking dye for gel electrophoresis

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 0.1	pH 2.3
yellow	greenish-blue

PREPARATION

Dissolve 0.5g in 100mL of 0.1M acetate buffer solution (pH 4.2).³

References:

1. Aldrich Handbook 2. Sabnis 3. IHC World

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula C₁₄H₁₄N₃O₃S.Na

CAS No. 547-58-0

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Orange powder or crystals with a faint characteristic odour.	Molar mass 327.33	ADG Class 6.1
Dye family azo	Melting point > 300°C	Packing Group II
Solubility water ¹ 4 mg/mL ethanol ¹ 0.3 mg/mL	Flammability Combustible	UN Number 2811
	Absorption ² (λ _{max}) 507 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H301 Toxic if swallowed

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids or with toxic organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful or toxic by ingestion or inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste. **Solution waste:** Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

APPLICATIONS

- pH indicator

COLOUR CHANGE

pH 3.1

red

pH 4.4

yellow

PREPARATION

Dissolve 0.1 g in 50mL of ethanol. Make up to 250 mL with distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula C₁₅H₁₅N₃O₂

CAS No. 493-52-7

User Group 11-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Violet or red crystals with a weak odour.	Molar mass 269.3	ADG Class -
Dye family azo	Melting point 178-182°C	Packing Group -
Solubility water ¹ 0.1 mg/mL ethanol ¹ 2 mg/mL Soluble in acetic acid and lipids.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 410 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H411 Toxic to aquatic life with long lasting effects

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile).

Methyl red has been evaluated by the IARC as *not classifiable as to its carcinogenicity to humans*.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste. **Solution waste:** Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

APPLICATIONS

- pH indicator

COLOUR CHANGE

pH 4.2 pink/red	pH 6.2 yellow
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PREPARATION

Dissolve 0.1 g in 75 mL of ethanol. Make up to 250 mL with distilled water.²

References: 1. Aldrich Handbook 2. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If feeling unwell, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.



Formula C₈H₈O₃
CAS No. 119-36-8
User Group 11-12

DESCRIPTION

Colourless or yellow to red, oily liquid with an odour of wintergreen.

SOLUBILITY

Very slightly soluble in water. Soluble in diethyl ether. Miscible with ethanol and glacial acetic acid.

Solubility in water 0.74 g/L (30°C)

PHYSICAL DATA

Molar mass 152.15
Melting point -8°C
Boiling point 223°C
Specific gravity 1.18 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber, Viton®; nitrile for splash contact). Exposure may cause skin, eye or respiratory irritation. Prolonged or repeated skin contact may lead to sensitisation and dermatitis.

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.

Store away from strong oxidising agents and strong bases. Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: hydrolysis of an ester; product of the esterification reaction between salicylic acid and methanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus ester in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. If symptoms develop, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26.

Formula $C_{24}H_{28}ClN_3$
CAS No. 8004-87-3; 603-47-4
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green, odourless crystals with a metallic lustre. Mixture of the hydrochloride salts of N-methylated-pararosanilines, mainly that with CAS no. 603-47-4.	Molar mass 393.97	ADG Class 9
Dye family triarylmethane	Melting point 137°C decomposes -	Packing Group III
Solubility water ¹ 50 mg/mL ethanol ¹ 60 mg/mL	Flammability Combustible	UN Number 3077
	Absorption ² (λ_{max}) 584 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage
H351 Suspected of causing cancer
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion. Eye exposure may lead to permanent damage due to staining of the cornea. When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- pH indicator
- histology: stains blood cells
- microscopy: stain for bacteria

COLOUR CHANGE

pH 0.15

yellow

pH 3.2

violet

PREPARATION

pH indicator: Dissolve 0.1g in 250 mL of distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Flinn

STORAGE

The substance is hygroscopic and light sensitive. Store in a cool, dry, well-ventilated place away from heat and light. Protect from light and moisture. Store away from oxidising agents and reducing agents. Store with dyes and indicators or with general organic solids or with toxic organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice/attention.

Formula C₁₆H₁₈ClN₃S

CAS No. 61-73-4

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Dark green, odourless crystals or powder with a bronze lustre. Aqueous solutions are deep blue.</p> <p>Dye family phenothiazine</p> <p>Solubility water¹ 50 mg/mL ethanol¹ 70 mg/mL Soluble in acetic acid and glycerol.</p>	<p>Molar mass 319.85</p> <p>Melting point 100-110°C decomposes</p> <p>Flammability Combustible</p> <p>Absorption² (λ_{\max}) 661 nm</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

H302 Harmful if swallowed

STORAGE

Store in a cool, dry, well-ventilated place away from heat. Protect from light. Store away from acids, alkalis, oxidising agents and reducing agents. Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The reaction with strong acid can generate toxic hydrogen sulfide gas.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- redox indicator: blue bottle experiment
- simple stain for animal cells and tissue, bacteria, plant sections, fungi, yeast.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

oxidised

reduced

blue

colourless

PREPARATION

Stock solution: Dissolve 1.5 g in 100 mL ethanol.

Working solution: Take 10 mL of stock solution. Make up to 100mL with distilled water.

References:

1. Aldrich Handbook
2. Sabnis
3. Dungey

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula n/a
CAS No. mixture: 64742-82-1, 64742-95-6
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with an aromatic odour. A mixture of aliphatic and aromatic hydrocarbons. Less dense than water.	Molar mass -	ADG Class 3
SOLUBILITY Miscible with other petroleum solvents.	Melting point -	Packing Group III
Solubility in water Insoluble	Boiling point 135-210°C	UN Number 1300
	Specific gravity ca. 0.78-0.82 (25°C)	Poisons Schedule S5
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H304 May be fatal if swallowed and enters airways
H336 May cause drowsiness or dizziness
H412 Harmful to aquatic life with long lasting effects
AUH066 Repeated exposure may cause skin dryness or cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Mineral turpentine is highly flammable and has a low flash point. Inhalation exposure may cause respiratory irritation, drowsiness and dizziness. Skin or eye contact may cause mild irritation. Prolonged or repeated skin exposure can cause dryness, cracking and dermatitis. Prolonged or repeated exposure may lead to hearing loss. There is a risk of aspiration into the lungs if ingested.

Handle in an operating fume cupboard or well-ventilated area. Avoid inhalation of vapour or mist. Avoid contact with skin, eyes and clothing.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids and bases. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

General science: solvent for extracting non-polar substances; solvent for chromatography.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition.

Small spill: Absorb with paper towel or cover with non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter), collect with a non-sparking tool and place in a shallow vessel. Allow the solvent to evaporate in an operating fume cupboard. Dispose of the absorbent material as general waste.

Large spill: Cover with non-combustible absorbent (see above). Scoop up with a non-sparking tool. Place in a suitable labelled container and store for collection. Ventilate the spill area and wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or place in a shallow vessel. Allow the solvent to evaporate in an operating fume cupboard.

Large quantity: Store in original container or other suitable labelled container, such as for non-halogenated organic liquid waste, and arrange for collection by a licenced waste disposal contractor.

Empty containers can contain explosive vapours. Empty containers should be rinsed thoroughly with water and the rinsings absorbed onto inert absorbent material and treated as for spills. Washed empty containers can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula Mo
CAS No. 7439-98-7
User Group Staff

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Silver-white, lustrous metal, or dark grey or black powder with a metallic lustre.	Molar mass 95.94	ADG Class -
SOLUBILITY Reacts with concentrated nitric acid or hot concentrated sulfuric acid.	Melting point 2623°C	Packing Group -
Solubility in water Insoluble	Boiling point 4639°C	UN Number None
	Specific gravity 10.2	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to molybdenum dust may cause mild mechanical irritation of the skin, eyes or respiratory tract. Ensure adequate ventilation. Avoid generating or inhaling dust or fumes. Avoid contact with skin and eyes. Molybdenum in powder form is flammable and can form explosive mixtures with air. Combustion produces toxic fumes of molybdenum oxides. Molybdenum reacts with mineral acids, generating flammable hydrogen gas. The reaction with cold, dilute hydrochloric acid is slow, but proceeds readily with hot concentrated sulfuric or nitric acid. Molybdenum may react violently with oxidising agents. In case of a powder fire, use sand or dry chemical as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Store away from heat and sources of ignition. Store away from acids, oxidising agents and halogens. Store with general inorganic solids.

APPLICATIONS

General science: qualitative properties of the element.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste molybdenum metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention
IF ON SKIN: Remove contaminated clothing. Brush particles off skin. Wash skin thoroughly with soap and plenty of water. If skin irritation persists, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical attention.

Formula C₁₀H₈
CAS No. 91-20-3
User Group 11-12



DESCRIPTION

Colourless to yellow or brown, volatile, crystalline flakes, powder or pellets with an unpleasant mothball odour.

SOLUBILITY

Practically insoluble in water. Soluble in ethanol, methanol, diethyl ether and acetone.

Solubility in water 32 mg/L (25°C)

PHYSICAL DATA

Molar mass 128.17
Melting point 80.3°C
Boiling point 218°C
Specific gravity 1.14 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 4.1
Packing Group III
UN Number 1334
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H228 Flammable solid
H302 Harmful if swallowed
H351 Suspected of causing cancer
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Naphthalene is a volatile solid which will sublime at room temperature. Naphthalene is classified by the IARC as possibly carcinogenic to humans (Group 2B). Exposure may cause irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of ingestion and inhalation include headache, nausea and dizziness. Chronic skin exposure may lead to dermatitis in sensitive individuals. Handle only in an operating fume cupboard or well-ventilated area. Avoid generating dust. Avoid ingestion and inhalation of dust or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The vapour or dust can form explosive mixtures with air. Handle away from heat and other sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light; protect from moisture. Store away from heat and all sources of ignition. Store away from oxidising agents and halogens. Store with flammable solids (DG Class 4.1).

APPLICATIONS

Senior chemistry: an example of a low-melting solid; in qualitative analysis and melting point determinations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Wipe down spill area with paper towel wetted with ethanol/methylated spirits. Allow the solvent to evaporate from the paper towel, then transfer to the waste container. Ventilate the spill area, then wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste naphthalene in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If concerned: Get medical advice/attention.

POISONS CENTRE: 13 11 26

Formula C₂₂H₁₄N₆O₉S₂.2Na

CAS No. 1064-48-8

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark brown, odourless powder.	Molar mass 616.49	ADG Class -
Dye family azo	Melting point >350°C	Packing Group -
Solubility water ¹ <0.1 mg/mL ethanol ¹ 3 mg/mL	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 618 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H317 May cause an allergic skin reaction
H373 May cause damage to organs (blood) through prolonged or repeated exposure

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. Skin exposure may cause sensitisation and an allergic reaction on re-exposure.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

APPLICATIONS

- histology: stains protein.

PREPARATION

Stain for protein: Dissolve 0.1 g in 70 mL distilled water. Add 10 ml glacial acetic acid and make up to 100 mL with distilled water.²

References: 1. Aldrich Handbook 2. Protocol Online

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents and reducing agents.

Store with dyes and indicators or with general organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If symptoms of irritation develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₁₅H₁₇ClN₄
CAS No. 553-24-2
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green or brownish-black, odourless powder.	Molar mass 288.78	ADG Class -
Dye family phenazine	Melting point 290°C decomposes	Packing Group -
Solubility water ¹ 50 g/L (25°C) ethanol - Soluble in ethylene glycol.	Flammability Combustible	UN Number none
	Absorption ¹ (λ_{\max}) 540 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H301 Toxic if swallowed

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator
- histology: stains nuclear material; cell vacuole stain
- differentiates lactose fermenting from non-lactose fermenting bacteria
- vital stain

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 6.8 red	pH 8 yellow
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FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a Poisons Centre or doctor.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If symptoms of irritation develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

PREPARATION

pH indicator and vital stain: Dissolve 0.1 g in 60 mL of ethanol and make up to 100 mL with distilled water.²

References: 1. Aldrich Handbook 2. Flinn

ANGER

Formula Ni
CAS No. 7440-02-0
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Lustrous, silver-white, hard, malleable metal.	Molar mass 58.69	ADG Class -
SOLUBILITY Insoluble in water. Reacts with dilute nitric acid, and hydrochloric acid and sulfuric acid.	Melting point 1455°C	Packing Group -
Solubility in water Insoluble	Boiling point 2730°C	UN Number None
	Specific gravity 8.9 (25°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H317 May cause an allergic skin reaction
H351 Suspected of causing cancer
H372 Causes damage to organs through prolonged or repeated exposure
H412 Harmful to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, PVC, neoprene). Nickel is harmful by ingestion, inhalation or if absorbed through the skin. Exposure to nickel dust or fumes may cause irritation to skin, eyes and respiratory and gastrointestinal tracts. Skin exposure may cause dermatitis, asthma and hypersensitivity. Nickel metal has been evaluated by the IARC as *possibly carcinogenic to humans*. Nickel compounds have been evaluated by the IARC as *carcinogenic to humans*. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Nickel reacts with acids with evolution of flammable hydrogen gas.

STORAGE

Nickel is very resistant to corrosion in air. Store in a tightly closed container in a cool, dry place away from heat and light. Store away from acids, halogens, oxidising agents and reducing agents. Store with general inorganic solids or toxic solids.

APPLICATIONS

Demonstration of the qualitative physical properties of the element.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste nickel metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush particles off skin. Wash skin thoroughly with plenty of water. If symptoms develop or persist, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical attention.



Formula C₉H₆O₄
CAS No. 485-47-2
User Group 11-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to yellowish crystals or powder with a faint characteristic odour.	Molar mass 178.14	ADG Class -
Dye family indanone	Melting point 250-258°C decomposes	Packing Group -
Solubility water 20 g/L (20°C) ethanol soluble	Flammability Combustible	UN Number None
		Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation effects.

STORAGE

Decomposes on exposure to light. Store in a cool, dry, well-ventilated place away from heat and light. Protect from light. Store away from acids and oxidising agents. Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May be irritating to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- indicates the presence of ammonia, amines;
- for fingerprint detection.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

Reacts with ammonia and primary amines to give a deep blue-purple colour, and with secondary amines to give a yellow-orange colour.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If symptoms of irritation develop, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

0.1% aqueous for indicating amino acids: Dissolve 0.1 g in 100mL of distilled water. Visualise by heating treated sample at 110°C.¹

Reference: 1. CLEAPSS; Gabb & Latchem

Formula HNO₃
CAS No. 7697-37-2
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Clear, colourless to slightly yellow liquid with a sharp, pungent, suffocating odour. Concentrated nitric acid usually refers to a 68% w/w aqueous solution.</p> <p>SOLUBILITY Miscible with water. Reacts with many organic solvents.</p> <p>Solubility in water Miscible</p>	<p>Molar mass 63.01</p> <p>Melting point -47°C (65%)</p> <p>Boiling point 122°C (69%)</p> <p>Specific gravity 1.4 (20°C, 65%)</p> <p>Flammability Non-combustible oxidising liquid</p>	<p>ADG Class 8 (5.1)</p> <p>Packing Group II</p> <p>UN Number 2031</p> <p>Poisons Schedule S6</p> <p>Security CSC</p>

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, butyl, neoprene). The concentrated acid is highly corrosive and a powerful oxidant and should be handled with care. Exposure may cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury.

Handle only in an operating fume cupboard. Do not breathe vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

When diluting, add the concentrated acid slowly to water. Never add water to the concentrated acid.

STORAGE

Store in a tightly closed, labelled amber glass bottle in a cool, dry, well-ventilated place away from heat and light. Store on a low shelf, and ensure container is kept upright to prevent leakage. Check container and lid periodically for damage.

Nitric acid becomes yellow with exposure to light due to the formation of toxic nitrogen dioxide; discard solutions which are markedly yellow in colour.

Store away from reducing agents, organic acids, combustible materials, oxidising agents, alkalis, metals and organic substances.

Concentrated nitric acid should be stored separately from all other chemicals, on a low shelf, with secondary containment.

APPLICATIONS

General science: an example of a strong inorganic acid.

Senior chemistry: to demonstrate oxidation of Cu to Cu(II).

Technical: cleaning glassware, eg removal of silver mirrors.

SPILLS

Wear PPE. Ensure good ventilation. Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water. Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.

Large spill: Place material in a suitable labelled container. Arrange for collection by a licenced contractor.

Wash spill area thoroughly with water.

Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift.

Small quantity: Wear PPE and work in a fume cupboard. Add the waste acid slowly to a large volume of water.

Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.

Large quantity: Store in a suitable labelled container.

Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. Immediately call a POISONS CENTRE or doctor.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26



Formula N₂
CAS No. 7727-37-9
User Group Qualified Staff

DESCRIPTION

Colourless, odourless liquid or gas. A spill of liquid nitrogen will appear as a fog, due to condensation of atmospheric water vapour.

PHYSICAL DATA

Molar mass	28.01	Vapour density (air = 1)	0.97
Melting point	-210°C	Liquid density (water = 1)	0.8
Boiling point	-196°C	Flammability	Non-combustible
Solubility in water	20 mg/L	Flammability Range (% by volume of air)	-

HAZARD STATEMENTS

H281 Contains refrigerated gas; may cause cryogenic burns or injury
AUH044 Risk of explosion if heated under confinement

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, long-sleeved shirt, long trousers, loose-fitting cold insulated or leather gloves. A face shield over safety glasses is recommended to avoid splashes to the face when transferring the liquid and when conducting a demonstration.

Nitrogen is a fairly unreactive gas. At high concentrations there is a risk of asphyxiation due to displacement of air. The victim may be unaware of the asphyxiation. Nitrogen gas is slightly lighter than air, however, liquid nitrogen is more dense than air and therefore has the potential to collect in low-lying, confined areas. Skin contact with liquid nitrogen may cause cryogenic burns. Eye exposure can cause permanent eye damage.

Liquid nitrogen should only be handled by trained staff. Do not handle liquid nitrogen in isolation; ensure that a second person is on standby.

Audience members should wear safety glasses and should be at least 3 metres away from the demonstration.

Transfer the liquid nitrogen from the dewar into a suitable vessel such as a stainless steel bowl or polystyrene cup. Use tongs for placing items into and removing them from the liquid nitrogen.

SPILLS

Ensure adequate ventilation in case of a spill. Spillages may cause embrittlement of surface materials.

WASTE DISPOSAL

Unused liquid nitrogen may be vented to the atmosphere in a well-ventilated area or operating fume cupboard.

STORAGE

Store dewars of liquid nitrogen securely in a well-ventilated, low-traffic area in an upright, stable position. Store below 45°C. Store away from sources of heat and ignition. Due to the low temperature near to the LN dewar, there is a risk that oxygen from the air will condense, and therefore, the area should be kept free of combustible materials.

Contact with liquid nitrogen can cause embrittlement or changes to the physical properties of some materials, including metals.

Liquid nitrogen will vaporise to almost 700 times its volume. Ensure that the dewar is loosely capped; there is a risk of explosion if the liquid gas is stored or heated under containment.

Unused liquid nitrogen should not be returned to the dewar as it may contain condensed oxygen.

APPLICATIONS

Demonstration of the properties of liquid nitrogen. See the Science ASSIST *Standard Operating Procedure: Handling liquid nitrogen* for further guidance and recommended activities.

FIRST AID

IF IN EYES: Immediately flush with tepid water (30°C) or sterile saline solution for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Ingestion is considered unlikely.

IF ON SKIN: Cold burns: Remove contaminated clothing. Apply warm water to clothing before removing, so as to avoid causing skin damage. Irrigate skin with tepid water (30°C) for at least 15 minutes. Apply sterile dressing and treat as for thermal burn. Do not apply hot water or radiant heat. Seek immediate medical attention.

IF INHALED: Asphyxiation risk in high concentrations. Avoid becoming a casualty. Move patient to fresh air and keep at rest in a position comfortable for breathing. Apply artificial respiration if not breathing. For advice, call the Poisons Information Centre or a doctor.

POISONS CENTRE: 13 11 26

nitrogen dioxide, generated from a reaction

nitrogen(IV) oxide; (dinitrogen tetroxide)

DANGER

Formula NO₂; (N₂O₄)
CAS No. 10102-44-0
User Group Qualified Staff



DESCRIPTION

Red-brown gas with a pungent, acrid odour. NO₂ is in equilibrium with dinitrogen tetroxide, N₂O₄; at lower temperatures the equilibrium shifts toward the dimer. When cooled, the mixture of gases becomes a pale yellow liquid. Below -11.2°C, N₂O₄ crystallises as a colourless solid.

PHYSICAL DATA

Molar mass	46.01	Vapour density (air = 1)	1.58
Melting point	-11.2°C (N ₂ O ₄)	Liquid density (water = 1)	-
Boiling point	21.1°C (N ₂ O ₄)	Flammability	Non-combustible oxidising gas
Solubility in water	hydrolyses	Flammability Range (% by volume of air)	-

HAZARD STATEMENTS

H270 May cause or intensify fire; oxidiser
H330 Fatal if inhaled
H314 Causes severe skin burns and eye damage

SPILLS

Accidental release of NO₂ into the lab: Evacuate the laboratory. Open external windows. Close internal windows.

WASTE DISPOSAL

Fill vessels containing nitrogen dioxide with dilute sodium hydroxide solution (0.5M). Rinse contaminated glassware, tubing and other items of apparatus with the sodium hydroxide solution. Neutralise the rinsing solution and wash down the sink.

Residual copper turnings can be rinsed, dried and stored for future use.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (protection from concentrated nitric acid: Viton®, butyl, neoprene, nitrile for splash protection). Nitrogen dioxide is a toxic, corrosive gas and a strong oxidising agent and supports combustion. Exposure may cause severe irritation to the skin, eyes and respiratory tract. Inhalation of low concentrations can cause lung damage. Inhalation of high concentrations can lead to pulmonary oedema which can be fatal; the effects can be delayed. Inhalation of NO₂ can aggravate respiratory conditions such as asthma. The preparation and handling of nitrogen dioxide should only be conducted in an operating fume cupboard by trained staff.

Avoid inhalation and contact with skin, eyes and clothing. The gas can be readily taken up by damp clothing. Avoid prolonged or repeated exposure.

Nitrogen dioxide hydrolyses in water in an exothermic reaction to form nitric acid, HNO₃, and nitric oxide, NO. Nitrogen dioxide can react dangerously with reducing agents, organic substances, combustible materials, alkaline earth metals, finely divided metals and ammonia. The use of microscale techniques in the generation of the gas is recommended.

PREPARATION NOTES

Nitrogen dioxide can be prepared by dropping concentrated nitric acid onto copper turnings. The reaction initially gives nitric oxide, NO, which is rapidly oxidised on exposure to air, giving reddish-brown nitrogen dioxide, NO₂. There is a delay in the production of the brown gas, after which it can be produced in voluminous quantities.

The gas may be collected directly into the receiving vessel by upward displacement of air.

The nitric acid is usually the limiting reagent.

When sufficient gas has been collected, water should be added to the reaction vessel to quench the reaction.

FIRST AID

IF IN EYES: Immediately flush with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Ingestion of the gas is considered unlikely. In case of ingestion of dilute nitric acid: Give water to drink. Do NOT induce vomiting. Seek immediate medical advice/attention.

IF ON SKIN: Remove damp or contaminated clothing and wash before reuse. Rinse affected area with water for at least 15 minutes. Seek medical attention.

IF INHALED: Avoid becoming a casualty. Move patient to fresh air and keep at rest in a position comfortable for breathing. Treat with a glucocorticoid spray. Seek immediate medical advice/attention.

POISONS CENTRE: 13 11 26

APPLICATIONS

Demonstration of the preparation and properties of nitrogen dioxide gas.

Formula C₈H₁₆
CAS No. 111-66-0
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, volatile liquid with a petrol-like odour. Less dense than water.	Molar mass 112.22	ADG Class 3
SOLUBILITY Practically insoluble in water. Miscible with ethanol. Soluble in diethyl ether, acetone and petroleum ether.	Melting point -102°C	Packing Group II
Solubility in water 4.1 mg/L (25°C)	Boiling point 121°C	UN Number 3295
	Specific gravity 0.71 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H304 May be fatal if swallowed and enters airways
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of inhalation include cough, and CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Test for peroxides (e.g. with peroxide test strips) periodically and before use. If crystals or a precipitate is present, do NOT attempt to open the bottle; arrange for its collection via a licenced waste contractor.

STORAGE

May polymerise or form peroxides over time and/or on exposure to air or sunlight. Store in a tightly closed container in a cool, dry, well-ventilated place away from light; protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and all sources of ignition. Store away from oxidising agents, acids and halogens. Store with flammable liquids (DG Class 3) in an AS compliant cabinet. Mark the bottle with the date received and date opened.

APPLICATIONS

Senior chemistry: observing the properties of saturated and unsaturated hydrocarbons; organic addition reactions.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite or bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection. Ventilate spill area, then wash area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store surplus or waste octene in a suitable labelled container such as for non-halogenated organic liquid waste and dispose of via a licenced waste disposal contractor. Glassware contaminated with octene can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

Formula C₁₈H₃₈O

CAS No. 112-92-5

User Group 11-12

DESCRIPTION

White flakes or granules with a mild, soapy odour.

SOLUBILITY

Practically insoluble in water. Soluble in ethanol, methanol, diethyl ether and acetone.

Solubility in water <0.01 g/L

PHYSICAL DATA

Molar mass 270.5

Melting point 59°C

Boiling point 340-355°C

Specific gravity 0.81 (59°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Absorption of a large amount by ingestion, inhalation or via the skin may lead to narcosis.

Avoid generating and inhaling dust, mists or vapours. Avoid contact with skin and eyes.

Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents and strong acids.

Store with general organic liquids or with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

General science: surfactant used in the preparation of hand cream; to test its efficacy as an evaporation-reducing film over water.

Senior physics: preparing a heating/cooling curve.

SPILLS

Wear PPE. Eliminate all ignition sources. Collect spill with a non-sparking tool.

Small spill: Seal material in a plastic bag and dispose of as general waste.

Large spill: Place in a suitable labelled container and arrange for collection.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water.

IF INHALED: Move patient to fresh air.



WARNING



Formula C₈H₁₈O
CAS No. 111-87-5
User Group 11-12

DESCRIPTION

Clear, colourless oily liquid with an orange-rose odour.

SOLUBILITY

Very slightly soluble in water. Miscible with ethanol, diethyl ether and mineral oil.

Solubility in water 0.3 g/L (20°C)

PHYSICAL DATA

Molar mass 102.18
Melting point -16°C
Boiling point 195°C
Specific gravity 0.82 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the eyes and respiratory tract and mild skin irritation. Symptoms of exposure include cough, headache, dizziness and drowsiness. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure to the liquid may cause severe irritation and burns.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air if heated strongly. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, bases and acid halides.

Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus octan-1-ol in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists or if concerned, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula C₈H₁₈O
CAS No. 123-96-6
User Group 11-12

DESCRIPTION

Clear, colourless, oily liquid with a disagreeable aromatic odour.

SOLUBILITY

Slightly soluble in water. Soluble in ethanol, diethyl ether, acetone and aromatic and aliphatic hydrocarbons.

Solubility in water 1.12 g/L (25°C)

PHYSICAL DATA

Molar mass 130.23
Melting point -32°C
Boiling point 180°C
Specific gravity 0.82 (20°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®, neoprene; nitrile for splash protection). Exposure may cause irritation to the eyes and respiratory tract and mild skin irritation. Symptoms of exposure include cough,

headache, dizziness and drowsiness. Prolonged or repeated skin contact can lead to dryness and cracking. Eye exposure to the liquid may cause severe irritation and burns.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air if heated strongly. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. Test for peroxides before use, particularly if intending to heat or distill the alcohol.

STORAGE

With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides, which may become explosive if they are concentrated. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, bases and acid halides.

Store with flammable and combustible liquids in an AS compliant cabinet.

Mark the bottle with the date received and date opened.

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Octan-2-ol is harmful to aquatic life. Avoid release to the environment. Store waste or surplus octan-2-ol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. As the alcohol is a peroxide former, waste or surplus octan-2-ol should not be stored with any other waste.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. Wash contaminated clothing before reuse. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

Formula C₈H₁₈
CAS No. 111-65-9
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, volatile liquid with a petrol-like odour. Less dense than water.	Molar mass 114.23	ADG Class 3
SOLUBILITY Practically insoluble in water. Miscible with ethanol and acetone and petroleum ether.	Melting point -57°C	Packing Group II
Solubility in water 0.7 mg/L (20°C)	Boiling point 126°C	UN Number 1262
	Specific gravity 0.70 (20°C)	Poisons Schedule S5
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H315 Causes skin irritation
H336 May cause drowsiness or dizziness
H304 May be fatal if swallowed and enters airways
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Symptoms of exposure include CNS effects. Repeated skin contact may have a degreasing effect. There is a risk of aspiration into the lungs if ingested. Handle only in an operating fume cupboard or well-ventilated area. Avoid inhaling vapour or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

There is potential for the vapour to collect in low-lying, confined areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light; protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and all sources of ignition. Store away from oxidising agents. Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: comparing the properties of saturated and unsaturated hydrocarbons; a component of synthetic 'crude oil'.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Absorb with paper towel. Treat as for Waste Disposal of small quantity.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite and/or sand and collect with a non-sparking tool. Place material into a suitable labelled container and store for collection.

Ventilate the spill area and allow any residual solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with paper towel or place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.

Larger quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

Glassware contaminated with octane can be rinsed with a minimal amount of ethanol/methylated spirits into the waste bottle.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose empty bottles to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula $C_{16}H_{12}N_2O_7S_2 \cdot 2Na$

CAS No. 1936-15-8

User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Yellow to orange, odourless crystals or powder.	Molar mass 452.36	ADG Class -
Dye family azo	Melting point > 280°C decomposes	Packing Group -
Solubility water ¹ 80 mg/mL ethanol ¹ 3 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ_{max}) 475 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- tracking dye in gel electrophoresis
- histology: stains keratin

PREPARATION

Dissolve 1g in 75 mL distilled water. Make up to 100mL.³

References:

- Aldrich Handbook
- Sabnis
- Flinn

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₁₈H₁₄N₃O₃S.Na

CAS No. 554-73-4

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Yellow-brown to orange scales or powder.	Molar mass 375.38	ADG Class -
Dye family azo	Melting point 375°C decomposes	Packing Group -
Solubility water soluble	Flammability Combustible	UN Number None
		Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids, alkalis and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 1.4
red

pH 2.6
yellow

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If effects persist, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

Dissolve 0.1g in 75 mL distilled water. Make up to 100mL.¹

Reference: 1. Flinn

Formula $C_{28}H_{24}N_2O_7$

CAS No. 1400-62-0

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark brown powder or crystals. Originally derived from lichens, synthetic orcein is a mixture of 14 dyes. Dye family phenoxazine Solubility water ¹ 10 mg/mL ethanol ¹ 1 mg/mL Soluble in acetone, acetic acid and dilute alkali solution.	Molar mass Melting point Flammability Combustible Absorption ² (λ_{max}) 575 nm	ADG Class - Packing Group - UN Number None Poisons Schedule - Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile).

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

APPLICATIONS

- histology: stains elastic fibres, chromosomes

PREPARATION

(i) Stain for elastic fibres: Mix 1 g with 1 mL of concentrated HCl. Add this to 100 mL of ethanol. Allow to stand overnight, then filter.³ (ii) Aceto-orcein stock solution: Equip a flask with a condenser. Add 2 g of orcein to 45 mL of glacial acetic acid in the flask. Boil gently until dissolved. Cool and filter.⁴

References:

1. Aldrich Handbook 2. Sabnis 3. Flinn 4. Dungey

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation develops, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.



Formula C₂H₂O₄·2H₂O

CAS No. 6153-56-6

User Group 11-12



DESCRIPTION

Colourless, crystalline solid. Occurs naturally in many plants (rhubarb leaves, spinach, parsley).

SOLUBILITY

Soluble in water, alcohol, diethyl ether and glycerol.

Solubility in water 102 g/L (20°C)

PHYSICAL DATA

Molar mass 126.07

Melting point 101.5°C

Boiling point 149-160°C

Specific gravity 1.653 (18.5°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class 8

Packing Group III

UN Number 3261

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H312 Harmful in contact with skin

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Oxalic acid is a strong acid. Exposure may cause irritation to the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes, and clothing. Avoid prolonged or repeated exposure.

Oxalic acid in solution is corrosive to metals.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Protect from moisture.

Store away from heat and any sources of ignition. Store away from metals, alkali metals, bases, ammonia, mercury, oxidising agents, silver and silver compounds. Store with corrosive solids.

APPLICATIONS

Senior chemistry: a reducing agent.

Technical: preparation of buffer solutions; removing iron or manganese residues from glassware.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Neutralise as for solid spill. Decant neutral solution down the sink with further dilution. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water and mild soap. Call a POISONS CENTRE or doctor if you feel unwell.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

POISONS CENTRE: 13 11 26

oxygen, generated from a reaction

oxygen gas

DANGER



Formula O₂
CAS No. 7782-44-7
User Group 7-12

DESCRIPTION

Colourless, odourless, tasteless gas, slightly heavier than air and slightly soluble in water.

PHYSICAL DATA

Molar mass	32	Vapour density (air = 1)	1.1
Melting point	-219°C	Liquid density (water = 1)	-
Boiling point	-183°C	Flammability	Non-combustible oxidising gas
Solubility in water	4.28 mg/L (20°C, O ₂ atmosphere)	Flammability Range (% by volume of air)	-

HAZARD STATEMENTS

H270 May cause or intensify fire; oxidizer

WASTE DISPOSAL

Residual oxygen may be safely vented to the atmosphere in a well-ventilated area.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Oxygen is an oxidising agent and supports combustion. Oxygen is not toxic, but can be harmful if inhaled at high concentrations (> 60%).

Generation of oxygen should be conducted in a well-ventilated area away from sources of heat and ignition.

In an oxygen-enriched atmosphere, materials which burn in air will burn more vigorously and combustible materials such as oils or grease may ignite spontaneously. Ensure that glassware and apparatus is free from oil and grease. Oxygen can react dangerously with reducing agents, powdered metals, organic materials and phosphorus.

PREPARATION NOTES

Oxygen can be prepared from the decomposition of hydrogen peroxide, catalysed by manganese oxide or potassium iodide. The reaction rate depends on the surface area of the catalyst; only a small amount of finely divided catalyst is required (~0.1 g of MnO₂ powder or ~0.5g KI per 25 mL 6% H₂O₂).

The gas is collected over water.

The hydrogen peroxide is the limiting reagent.

The reaction can be quenched by diluting the reaction mixture with water.

APPLICATIONS

General science: the preparation of oxygen gas and investigation of its properties.

FIRST AID

IF IN EYES: Adverse effects to the eyes are not expected.

IF SWALLOWED: Ingestion is considered unlikely.

IF ON SKIN: Adverse effects to the skin are not expected.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. For advice, call the Poisons Information Centre or a doctor.

POISONS CENTRE: 13 11 26



Formula n/a
CAS No. 8012-95-1; 8042-47-5
User Group 7-12

DESCRIPTION

Colourless, odourless viscous liquid. A mixture of saturated hydrocarbons with carbon number predominantly in the range C15-C50. Less dense than water.

SOLUBILITY

Practically insoluble in water. Soluble in petroleum ether, oils and diethyl ether. Insoluble in ethanol.

Solubility in water ca. 1mg/L

PHYSICAL DATA

Molar mass -
Melting point ca. -20°C
Boiling point -
Specific gravity 0.83-0.90
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H304 May be fatal if swallowed and enters airways

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to mist or fumes may cause eye or respiratory irritation. Prolonged or repeated skin contact may cause irritation and dermatitis. May cause gastric irritation if a large amount is ingested. There is a risk of aspiration into the lungs if ingested.

Avoid generation and inhalation of mist, aerosol or fumes. Avoid contact with skin and eyes. Handle away from sources of ignition.

Pharmaceutical grade or food grade white mineral oil is not a Schedule 5 poison.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from sources of heat or ignition.

Store away from oxidising agents, strong acids and strong bases.

Store with general organic liquids.

APPLICATIONS

General science: comparison of physical properties of liquids (density, viscosity, thermal or electrical conductivity, refractive index).

Senior chemistry: to demonstrate the cracking of hydrocarbons.

Technical: storage medium for alkali metals; heating bath medium.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sand, or other inert material such as vermiculite or bentonite. Scoop up with a non-sparking tool.

Small quantity: Seal material in a plastic bag and dispose of as general waste.

Large quantity: Place material in a suitable labelled container and arrange for collection.

Residual oil can be removed from spill area by wiping down with paper towel wetted with petroleum solvent. The area should then be ventilated the area to allow any residual solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Paraffin oil floats on water and is slow to biodegrade. Do not release to waterways or waste water.

Small quantity: Absorb with non-combustible material. Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation occurs, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

Formula n/a
CAS No. 8002-74-2
User Group F-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Colourless, translucent or white, waxy solid with a faint odour. A mixture of predominantly straight chain hydrocarbons with carbon number >C20.</p> <p>SOLUBILITY Soluble in petroleum ether, warm alcohol, diethyl ether, oils and some esters.</p> <p>Solubility in water Insoluble</p>	<p>Molar mass -</p> <p>Melting point 45 - 95°C</p> <p>Boiling point >300°C</p> <p>Specific gravity ca. 0.90 (20°C)</p> <p>Flammability Combustible</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to dust (room temperature) or fumes (molten wax) may cause irritation to the eyes, skin, nose, throat and respiratory tract. Repeated or prolonged skin contact may cause irritation and dermatitis. May cause gastric irritation if a large amount is ingested. Skin or eye contact with molten wax may cause burns.

Avoid contact with skin and eyes. Avoid generating and inhaling dust.

When using hot molten wax, work in an operating fume cupboard or well-ventilated area away from any sources of ignition. Avoid inhalation of fumes from molten material.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from sources of heat or ignition.

Store away from oxidising agents, strong acids and strong bases.

Store with general organic solids.

APPLICATIONS

General science: candle making; melting point investigations.

SPILLS

As for Waste Disposal.

WASTE DISPOSAL

Take up with absorbent material. Seal in a plastic bag and dispose of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation occurs, seek medical advice/attention.

Eye contact with hot, molten wax: treat as for skin contact.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

Skin contact with hot, molten wax: Irrigate with plenty of cool running water. Cover or wrap area with a clean dressing. Do not attempt to remove adhered wax from skin. Seek urgent medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

WARNING

Formula C₅H₁₂O

CAS No. 71-41-0

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless liquid with a mild, sweet, fusel-like odour.	Molar mass 88.15	ADG Class 3
SOLUBILITY Sparingly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone.	Melting point -78°C	Packing Group III
Solubility in water 22 g/L (20°C)	Boiling point 138°C	UN Number 1105
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H332 Harmful if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; nitrile for splash protection) Exposure may cause irritation to the eyes, nose, throat and respiratory tract and on ingestion. Symptoms of exposure include nausea, headache, dizziness and CNS effects. Prolonged or repeated skin contact may cause irritation and dermatitis. Eye exposure to the liquid may cause severe irritation and burns.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, acid chlorides, bases, halogens, alkali metals and alkaline earth metals. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.

Small spill: Treat as for Waste Disposal.

Large spill: Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

WARNING

Formula C₅H₁₂O
CAS No. 6032-29-7
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, flammable, moderately volatile liquid with a strong, disagreeable odour.	Molar mass 88.15	ADG Class 3
SOLUBILITY Soluble in water, ethanol and diethyl ether.	Melting point -50°C	Packing Group III
Solubility in water 166 g/L (20°C)	Boiling point 119°C	UN Number 1105
	Specific gravity 0.81 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H332 Harmful if inhaled
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; nitrile for splash protection). Exposure may cause irritation to the eyes, nose, throat and respiratory tract and on ingestion. Symptoms of exposure include nausea, headache, dizziness and narcotic effects. Prolonged or repeated skin contact can lead to drying, cracking and dermatitis. Eye exposure to the liquid may cause redness, pain and possible eye damage.

Handle in an operating fume cupboard. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

Test for peroxides before use, particularly if intending to heat or distill the alcohol.

STORAGE

With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides, which may become explosive if they are concentrated. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, halogens, alkali metals and alkaline earth metals.

Store with flammable liquids in an AS compliant cabinet. Mark the bottle with the date received and date opened.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool. Place material into a suitable labelled container and store for collection. Wash the spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus 2-pentanol in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. As the alcohol is a peroxide former, it should not be stored with any other waste.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol.



Formula n/a
CAS No. 8009-03-8
User Group F-12

DESCRIPTION

Colourless, odourless semi-solid. A mixture of mainly saturated crystalline and liquid hydrocarbons with carbon number >C25. Less dense than water.

SOLUBILITY

Soluble in petroleum ether, oils and diethyl ether. Practically insoluble in glycerol and alcohol.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass -
Melting point ca. 38-60°C
Boiling point -
Specific gravity ca. 0.815-0.865 (25°C)
Flammability Combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SPILLS

As for Waste Disposal.

WASTE DISPOSAL

Take up with absorbent material. Seal in a plastic bag and dispose of as general waste.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Eye contact may cause mild irritation. Inhalation of mist may cause respiratory irritation. May cause gastric irritation if a large amount is ingested. May cause skin irritation or dermatitis in sensitive individuals.

Avoid inhalation of mist. Avoid contact with skin and eyes. Handle away from sources of ignition.

Purchase of pharmaceutical grade petrolatum is recommended to avoid toxic contaminants which may be present in less refined products.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from heat and light. Store away from sources of heat or ignition.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

General science: activities exploring its fluorescent properties; a release agent for moulds and casts.

Technical: to seal wet mount slides; lubricant for microscope mechanism.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation occurs, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin with plenty of soap and water. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.

Formula C₁₉H₁₄O₅S
CAS No. 143-74-8
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Odourless, bright to dark red crystals or powder.</p> <p>Dye family sulfonephthalein</p> <p>Solubility water¹ 3 mg/mL ethanol¹ 4 mg/mL Slightly soluble in acetone. Soluble in aqueous alkali.</p>	<p>Molar mass 354.38</p> <p>Melting point > 280°C decomposes</p> <p>Flammability Combustible</p> <p>Absorption¹ (λ_{max}) 557 nm</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids, alkalis, oxidising agents and reducing agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 6.8 yellow	pH 8.2 red	pH >8.2 pink/fuschia
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PREPARATION

Dissolve 0.1 g in 100 mL of ethanol. Make up to 500 mL with distilled water.²

References: 1. Aldrich Handbook 2. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation develops, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical advice/attention.

Formula C₂₀H₁₄O₄

CAS No. 77-09-8

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White or yellowish-white, odourless crystals or powder.	Molar mass 318.32	ADG Class -
Dye family phthalein	Melting point 262-263°C > 450°C	Packing Group -
Solubility water 1-6 mg/L (pH dependent) ethanol ¹ 30 mg/mL Soluble in acetone.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 552 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H341 Suspected of causing genetic defects
H350 May cause cancer
H361 Suspected of damaging fertility or the unborn child

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids, alkalis, oxidising agents and reducing agents.
Store with dyes and indicators or with toxic organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the respiratory and gastrointestinal tracts and mild irritation to the eyes. Phenolphthalein has been evaluated by the IARC as *possibly carcinogenic to humans*.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with 60% ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with 60% ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 8.2 colourless	pH 10 purple
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FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

Dissolve 0.5 g in 300mL ethanol and make up to 500 mL with distilled water.²

References: 1. Aldrich Handbook 2. Gabb & Latchem



Formula H₃PO₄
CAS No. 7664-38-2
User Group Staff

DESCRIPTION

Colourless, odourless, viscous, clear liquid. Commercially available as an 85% w/w aqueous solution.

SOLUBILITY

Soluble in water and ethanol.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 98
Melting point 21°C (85%)
Boiling point 158°C (85%)
Specific gravity 1.685 (25°C, 85%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group III
UN Number 1805
Poisons Schedule S6
Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile, neoprene). The concentrated acid is corrosive and should be handled with care.

Exposure can cause irritation and severe burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury. Repeated or prolonged skin contact can cause dermatitis. Handle only in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

When diluting, add the concentrated acid slowly to water. Never add water to the concentrated acid.

STORAGE

The acid is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Protect from freezing.

Store away from heat and source of ignition.

Store away from alkalis, metals, powdered metals, organic substances.

Store with corrosive liquids (acids).

APPLICATIONS

General science: to simulate the corrosive properties of phosphoric acid-containing softdrinks.

Senior chemistry: an example of a polyprotic, inorganic acid in titrations.

Technical: preparation of phosphate buffer solutions; removal of rust from glassware.

SPILLS

Wear PPE. Ensure good ventilation. Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water. Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.

Large spill: Place material in a suitable labelled container. Arrange for collection by a licenced contractor.

Wash spill area thoroughly with water.

Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift.

Small quantity: Wear PPE and work in a fume cupboard.

Add the waste acid slowly to a large volume of water.

Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.

Large quantity: Store in a suitable labelled container.

Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. Seek medical advice/attention if concerned.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

Formula Pt
CAS No. 7440-06-4
User Group 11-12

DESCRIPTION

Odourless, lustrous, silver-grey metal. Does not tarnish on exposure to air.

SOLUBILITY

Insoluble in water, mineral acids and organic acids. Reacts with aqua regia.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 195.08
Melting point 1772°C
Boiling point 3827°C
Specific gravity 21.45 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security IDM Cat 2

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to platinum dust may cause mild mechanical irritation of the skin, eyes or respiratory tract. Chronic exposure may lead to skin sensitisation or allergic asthma in susceptible individuals. Avoid generating or inhaling dust or fumes. Avoid contact with skin and eyes. Platinum absorbs oxygen from the air and releases the gas on heating. Handle away from heat and sources of ignition. In case of fire, use dry sand or dry chemical as the extinguishing agent.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste platinum metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

STORAGE

Store in a tightly closed container in a cool, dry place. Store away from acids, alkalis, halogens and oxidising agents. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: inert electrodes for electrolysis

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush particles off skin. Wash skin thoroughly with plenty of water and soap. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical attention.

Formula CH₃COOK

CAS No. 127-08-2

User Group 7-12

DESCRIPTION

Colourless crystals or powder with a weak odour of acetic acid.

SOLUBILITY

Soluble in water.

Solubility in water 2530 g/L (20°C)

PHYSICAL DATA

Molar mass 98.15

Melting point 292°C

Boiling point -

Specific gravity 1.57 (25°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract and on ingestion.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Mixing with strong acid generates fumes of acetic acid.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and oxidising agents. Store with general organic solids.

APPLICATIONS

Senior chemistry: qualitative analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.



Formula KBr
CAS No. 7758-02-3
User Group 7-12

DESCRIPTION

Colourless, odourless crystals, granules or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water and glycerol. Slightly soluble in alcohol and diethyl ether.

Solubility in water 650 g/L (20°C)

PHYSICAL DATA

Molar mass 119.01
Melting point 730-734°C
Boiling point 1435°C
Specific gravity 2.75 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

H315 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Chronic exposure to small quantities may lead to CNS effects and skin rash. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is slightly hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from oxidising agents and strong acids. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; redox reactions of the halogens.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and transfer to a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus potassium bromide in the original container or other suitable labelled container such as for inorganic solid waste. Arrange for collection by a licenced waste disposal contractor.

Waste solutions: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Larger quantity: Store in a container for waste inorganic solutions or alternatively, allow the water to evaporate in an operating fume cupboard and treat the residue as for solid waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice.



Formula K_2CO_3
CAS No. 6381-79-9
User Group 7-12

DESCRIPTION

Colourless, odourless, hygroscopic, granular powder.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 112 g/L (20°C)

PHYSICAL DATA

Molar mass 138.21
Melting point 891°C
Boiling point decomposes
Specific gravity 2.43 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions are strongly basic. Exposure may cause irritation to the skin, eyes and respiratory tract. May be corrosive, causing burns, at high concentrations or with prolonged or repeated exposure. Eye contact may result in severe eye damage and permanent injury. Prolonged or repeated skin contact may cause dermatitis and skin sensitization. Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from acids and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: example of a weak base.
Technical: preparation of buffers.

SPILLS

Wear PPE. Ensure good ventilation. Scoop spill material into a plastic container.

Small spill: Treat as for Waste Disposal.

Large spill: Place into a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste potassium carbonate slowly to a large volume of cold water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing. Rinse skin thoroughly with water/shower. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



Formula KCl
CAS No. 7447-40-7
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder with a saline taste. Hygroscopic. Occurs naturally as sylvite.

SOLUBILITY

Soluble in water. Soluble in glycerol. Slightly soluble in alcohol. Insoluble in ether and acetone.

Solubility in water 347 g/L (20°C)

PHYSICAL DATA

Molar mass 74.55
Melting point 773°C
Boiling point 1413°C
Specific gravity 1.98 g/cm³ (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from strong acids and strong oxidising agents. Store with general inorganic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile). Potassium chloride may cause irritation to the skin and eyes, and respiratory irritation. Avoid generating and inhaling dust. Avoid contact with skin and eyes.

SPILLS

Wear PPE, sweep up and treat as for Waste Disposal.

WASTE DISPOSAL

Small quantity: Dispose of as general waste or dilute to 5% and dispose of down the sink.

Large quantity: Place in a labelled bottle for waste dry chemicals and store for collection by a licenced waste disposal contractor.

APPLICATIONS

General science: to demonstrate an endothermic process (dissolution in water); flame tests.

Senior chemistry: concentrated aqueous solution may be used to prepare salt bridges for electrochemistry.

PREPARATIONS

The concentrated (3M) or saturated KCl solution can be used for the preparation of salt bridges from either strips of filter paper or agar gel in a tube.

A concentration of 0.5-1.0M is suitable for conducting a flame test.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If recovery is not rapid, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If skin irritation occurs: Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.

Potassium chloride

Formula KCl

CAS No. 7447-40-7

MW 74.55

Solubility in water 347 g/L (20°C)

LABORATORY NOTES

TABLE 1: Quantity of potassium chloride required to prepare a solution of given volume and concentration

concentration	final volume of solution			
	1000 mL	500 mL	250 mL	100 mL
0.1 M ^a	7.46 g	3.73 g	1.86 g	0.74 g
0.5 M	37.28 g	18.64 g	9.32 g	3.73 g
1.0 M	74.55 g	37.28 g	18.64 g	7.46 g
3.0 M	223.65 g	111.83 g	55.91 g	22.37 g
Saturated (20°C)	347 g	174 g	87 g	34.7 g

a alternatively, prepare by a 1 part in 10 dilution of a 1.0 M solution.

Procedure

1. Weigh out the required mass of solid
2. Place distilled water to about one-half the final volume in a mixing vessel such as a beaker or conical flask.
3. Transfer the solid to the mixing vessel and stir until the solution is clear and all of the solid has dissolved.
4. Transfer the solution to a measuring cylinder or volumetric flask and make up to the final volume.
5. Transfer the solution to a labelled bottle.

DISCLAIMER While all care has been taken in compiling this information, Science ASSIST can not accept liability for the completeness or correctness of the information, nor for errors or omissions.

VERSION
12 Dec 2016



Potassium citrate, monohydrate

tripotassium citrate hydrate; citric acid, tripotassium salt monohydrate

Formula $K_3C_6H_8O_7 \cdot H_2O$

CAS No. 6100-05-6

User Group 7-12

DESCRIPTION

Colourless, odourless, hygroscopic crystals, granules or powder.

SOLUBILITY

Soluble in water.

Solubility in water 640 g/L (20°C)

PHYSICAL DATA

Molar mass 324.41

Melting point 180°C (-H₂O)

Boiling point 230°C (decomposes)

Specific gravity 1.98 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong oxidising agents.
Store with general inorganic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild respiratory irritation. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE, sweep up and treat as for waste. Wash spill area thoroughly with water.

WASTE DISPOSAL

Small quantity: Dispose of as general waste or dilute to 1% and dispose of down the sink.

Large quantity: Place in a labelled bottle for waste dry chemicals and store for collection by a licenced waste disposal contractor.

APPLICATIONS

Senior biology: preparation of buffer solutions.

PREPARATIONS

The salt can be used for the preparation of buffer solutions from pH 3 to pH 6.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If skin irritation occurs: Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.

Potassium citrate, monohydrate

Formula $K_3C_6H_8O_7 \cdot H_2O$

CAS No. 6100-05-6

MW 324.41

Solubility in water 640 g/L (20°C)

LABORATORY NOTES

TABLE 1: Quantity of tripotassium citrate monohydrate required to prepare a solution of given volume and concentration

concentration	final volume of solution			
	1000 mL	500 mL	250 mL	100 mL
0.1 M	32.44 g	16.22 g	8.11 g	3.24 g
0.5 M	162.20 g	81.10 g	40.55 g	16.22 g
1.0 M	324.41 g	162.20 g	81.10 g	32.44 g
Saturated (20°C)	640 g	320 g	160 g	64 g

a alternatively, prepare by a 1 part in 10 dilution of a 1.0 M solution.

Procedure

1. Weigh out the required mass of solid
2. Place distilled water to about one-half the final volume in a mixing vessel such as a beaker or conical flask.
3. Transfer the solid to the mixing vessel and stir until the solution is clear and all of the solid has dissolved.
4. Transfer the solution to a measuring cylinder or volumetric flask and make up to the final volume.
5. Transfer the solution to a labelled bottle.

TABLE 2: Preparation of citric acid-tripotassium citrate buffer solution pH 3 to pH 6

pH	Volume of component required for 100mL	
	0.1M citric acid /mL	0.1M potassium citrate /mL
3.0	82.0	18.0
4.0	59.0	41.0
5.0	35.0	65.0
6.0	11.5	88.5

Procedure

For 100mL of buffer solution at the required pH, mix the given volumes of 0.1M potassium citrate and 0.1M citric acid.



Formula $K_2Cr_2O_7$

CAS No. 7778-50-9

User Group 11-12S (Notes D,K)



DESCRIPTION

Bright orange-red odourless crystals. Not hygroscopic or deliquescent (unlike sodium dichromate).

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 120 g/L (20°C)

PHYSICAL DATA

Molar mass 294.18

Melting point 398°C

Boiling point 500°C decomposes

Specific gravity 2.68 (25°C)

Flammability Non-combustible
oxidising solid

REGULATORY INFORMATION

ADG Class 6.1 (5.1)

Packing Group II

UN Number 3086

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer; H301 Toxic if swallowed; H312 Harmful in contact with skin; H330 Fatal if inhaled; H314 Causes severe skin burns and eye damage; H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled; H317 May cause an allergic skin reaction; H340 May cause genetic defects; H350 May cause cancer; H360 May damage fertility or the unborn child; H372 Causes damage to organs through prolonged or repeated exposure; H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, neoprene). Dichromates are strong oxidising agents and are corrosive and highly toxic. Exposure may cause irritation and corrosive injury to the skin, eyes, respiratory tract and on ingestion. Repeated or prolonged exposure can lead to sensitisation and an allergic reaction of the skin or respiratory tract. Eye contact can result in burns and permanent damage. Chromium (VI) compounds have been evaluated by the IARC as *carcinogenic to humans*. Handle only in an operating fume cupboard. Avoid generating or inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources. The purchase of a dilute solution is recommended so as to mitigate the hazards associated with handling and storing the solid reagent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight. Store away from heat and sources of ignition. Store away from reducing agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: in dilute solution, to distinguish between primary, secondary and tertiary alcohols; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area.

Solid spill: Spills can be covered with damp sand to avoid dust formation. Collect spill material with a non-sparking tool and place in suitable labelled container. Store for collection.

Solution spill: Cover with non-combustible absorbent such as sand, vermiculite or bentonite. Treat as for solid spill.

Apply a dilute solution of a reducing agent (sodium bisulfite, sodium metabisulfite or sodium thiosulfite) to the spill area.

Cover the solution with absorbent material (see above).

Collect material and add to a large volume of water. The resulting solution should be green due to chromium (III) ion.

If it is orange or grey, add further reducing agent portionwise with stirring until a green colour is obtained. Dispose of the solution down the sink. Dispose of solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The substance must not be disposed of as general waste.

Store waste or surplus potassium dichromate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor.

The hazard of chromium (VI) in solution can be lessened by treatment with a reducing agent (see above) to give a green solution of chromium (III) ions.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISONS CENTRE or doctor.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26



potassium ferricyanide (III)

potassium hexacyanoferrate(III); red prussiate of potash

Formula $K_3[Fe(CN)_6]$

CAS No. 13746-66-2

User Group 11-12

DESCRIPTION

Dark red, odourless crystals or powder.

SOLUBILITY

Soluble in water and acetone. Slightly soluble in alcohol.

Solubility in water 464 g/L (20°C)

PHYSICAL DATA

Molar mass 329.26

Melting point > 300°C decomposes

Boiling point -

Specific gravity 1.85 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

AUH031 Contact with acids liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. On ingestion, highly toxic hydrogen cyanide may be produced in the stomach due to the reaction with gastric acid.

Handle in a well ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Highly toxic hydrogen cyanide gas is produced on contact with strong acids. Heating or fire may generate toxic fumes of cyanides.

STORAGE

The substance is light-sensitive.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat.

Protect from exposure to light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: test for ferrous ion; component of ferroxy indicator.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste of surplus potassium ferricyanide in the original container or in a suitable labelled container such as for dry inorganic waste solids or waste aqueous solution of inorganic salts, as appropriate, and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.



potassium ferrocyanide, trihydrate

tetrapotassium hexacyanoferrate (II); yellow prussiate of potash

Formula $K_4[Fe(CN)_6] \cdot 3H_2O$

CAS No. 14459-95-1

User Group 7-12

DESCRIPTION

Light yellow, odourless crystals or powder with a mild saline taste.

SOLUBILITY

Soluble in water and acetone. Slightly soluble in alcohol.

Solubility in water 289 g/L (20°C)

PHYSICAL DATA

Molar mass 422.39

Melting point ca 70°C (-3H₂O)

Boiling point -

Specific gravity 1.85 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H412 Harmful to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Highly toxic hydrogen cyanide gas is produced on contact with strong acids. Heating or fire may generate toxic fumes of cyanides.

STORAGE

The substance is light-sensitive.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat.

Protect from exposure to light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: test for ferric ion.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus potassium ferrocyanide in the original container or in a suitable labelled container such as for waste inorganic solids or waste inorganic salt solutions, as appropriate, and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

Formula $C_8H_5KO_4$

CAS No. 877-24-7

User Group 11-12

DESCRIPTION

Colourless, odourless crystals.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 80 g/L

PHYSICAL DATA

Molar mass 204.22

Melting point 295-300°C

Boiling point -

Specific gravity 1.636

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion, inhalation or skin absorption of the substance may be harmful. Inhalation exposure may lead to asthma-like symptoms.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance may react violently with strong oxidising agents or nitric acid.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents and concentrated nitric acid.

Store with general organic solids.

APPLICATIONS

Technical: primary standard for standardising alkali solutions; buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

DANGER

Formula KHSO₄
CAS No. 7646-93-7
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 136.17	ADG Class 8
SOLUBILITY Soluble in water. Insoluble in alcohol and acetone.	Melting point 195°C decomposes	Packing Group II
Solubility in water 490 g/L	Boiling point -	UN Number 2509
	Specific gravity 2.24 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic and corrosive. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Contact with metals in the presence of water generates flammable hydrogen gas. Heating to decomposition releases corrosive and/or toxic fumes.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from alkalis, oxidising agents and alcohols. Store with corrosive solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Adjust to within pH 6-8 and decant solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

Solution: Adjust to within pH 6-8 and store in a suitable container for waste inorganic salt solutions. Arrange for collection.

Small volume of dilute solution (concentration < 1%): Adjust to within pH 6-8 by addition of sodium hydroxide (5% solution) and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26



potassium hydrogen tartrate

potassium bitartrate; potassium tartrate monobasic; cream of tartar

Formula $C_4H_5KO_6$

CAS No. 868-14-4

User Group F-12

DESCRIPTION

Colourless, odourless crystals or powder with a pleasant, slightly acid taste.

SOLUBILITY

Slightly soluble in water. Insoluble in alcohol.

Solubility in water 5.7 g/L (20°C)

PHYSICAL DATA

Molar mass 188.18

Melting point 250°C decomposes

Boiling point -

Specific gravity 1.954 (25°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Food science: chemistry of cooking.

Technical: buffer preparation; pH standard.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Adjust to within pH 6-8 and decant solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste.

Small volume of dilute solution: Neutralise to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If rapid recovery does not occur, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice if symptoms develop.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

Formula KOH
CAS No. 1310-58-3
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, hygroscopic pellets or flakes.	Molar mass 56.11	ADG Class 8
SOLUBILITY Soluble in water, alcohol and glycerol.	Melting point 360°C	Packing Group II
Solubility in water 1130 g/L (20°C)	Boiling point 1327°C	UN Number 1813
	Specific gravity 2.04 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The solid and solutions are highly corrosive; aqueous solutions are strongly basic. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury.
Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Dissolution of the hydroxide in water generates much heat. Carry out solution preparation in an operating fume cupboard. Place the mixing vessel in an ice-bath and add the solid cautiously to water. Avoid inhaling mist or fumes from the hot solution.

STORAGE

The salt is hygroscopic and absorbs carbon dioxide from the air, forming potassium carbonate. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light; protect from air and moisture.
Avoid storing solutions of the hydroxide in glass bottles, especially those with glass stoppers, as the hydroxide will react with the glass and the stopper may become fused. Store away from acids, oxidising agents and metals. Store with corrosive solids.

APPLICATIONS

General science: an example of a strong base.

SPILLS

Wear PPE. Ensure good ventilation.
Small spill: Scoop into a plastic container. Treat as for Waste Disposal.
Large spill: Scoop up and place into a suitable labelled container and store for collection.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste potassium hydroxide slowly, with stirring, to a large volume of ice-water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.
Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor
IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor.
POISONS CENTRE: 13 11 26

Formula KIO₃
CAS No. 7758-05-6
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White, odourless crystals or powder.	Molar mass 214.00	ADG Class 5.1
SOLUBILITY Soluble in water and dilute sulfuric acid. Insoluble in alcohol and nitric acid.	Melting point 560°C (decomposes)	Packing Group II
Solubility in water 92 g/L (25°C)	Boiling point -	UN Number 1479
	Specific gravity 3.89	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Potassium iodate is a moderately strong oxidising agent. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory and digestive tracts. Eye contact may cause permanent damage. Iodates are toxic to retinal cells by ingestion; uptake of a large amount may lead to visual impairment.

Handle in a well-ventilated area. Avoid generating or inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition.

In case of fire, use flooding quantities of water; do not use dry chemical, CO₂ or foam extinguisher.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place. Over time, potassium iodate can decompose on exposure to light, heat or air and moisture. Protect from air, moisture and direct sunlight. Store away from heat and all sources of ignition. Store away from reducing agents, flammable substances, combustible materials, acids and alkalis. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: the iodine clock reaction; demonstration of the Briggs-Rauscher oscillating reaction; iodometric titrations.

Technical: a primary standard; preparation of standard iodine solution; standardisation of thiosulfate solution.

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation.

Solid spill: Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect with a non-sparking tool. Add material slowly to a large volume of water and reduce the iodate and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste.

Wash spill area thoroughly with water; ensure no iodate residue remains in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid sodium iodate must not be disposed of with general waste. Store surplus or waste sodium iodate in the original container or other suitable labelled container. Arrange for collection by licenced waste disposal contractor.

Small quantity of solution: Treat with a reducing agent: 18 mL of 10% w/v solution of either sodium bisulfite or sodium metabisulfite will reduce 10 mL of saturated (ca. 0.4M) sodium iodate solution or a solution containing 1g of the salt. Add the bisulfite or metabisulfite solution to the iodate solution until a persistent pale yellow colour is obtained. Neutralise the solution with sodium carbonate to within pH 6-8 and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26



Formula KI
CAS No. 7681-11-0
User Group 7-12

DESCRIPTION

Colourless, odourless, crystals, granules or powder with a bitter saline taste. Hygroscopic and sensitive to light.

SOLUBILITY

Soluble in water, acetone and glycerol. Slightly soluble in ethanol.

Solubility in water 1430 g/L (20°C)

PHYSICAL DATA

Molar mass 166.01
Melting point 681°C
Boiling point 1323°C
Specific gravity 3.13 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security IDM Cat 2

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
H317 May cause an allergic skin reaction.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, neoprene, latex). Exposure to potassium iodide may cause skin, eye or respiratory irritation. Exposure to small amounts may cause symptoms of iodism in sensitive individuals. Skin contact or inhalation may lead to allergic sensitisation in some individuals. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

General science: in the preparation of aqueous solutions of iodine; to catalyse the decomposition of hydrogen peroxide ('Elephant's Toothpaste'); in the reaction to precipitate lead iodide.

Senior chemistry: a source of iodide ion in qualitative analysis; in clock reactions (the Harcourt-Essen Reaction, the Persulfate-Iodide Clock Reaction).

PREPARATIONS

Solutions of potassium iodide may become yellow with the oxidation of iodide ion to give iodine. One or two crystals of sodium thiosulfate or a small quantity of glucose can be added to the solution to reduce any generated iodine. Alternatively, solutions can be stabilised with addition of a small quantity of sodium carbonate or sodium bicarbonate which buffer the solution and thus render the pH less favourable for the oxidation of iodide.

STORAGE

Store in a tightly closed container in a cool, dry place away from heat and light. Over time, potassium iodide, both as a solid and in solution, becomes yellow with the generation of molecular iodine. Exposure to air, light or moisture may accelerate the decomposition.

Store away from oxidising agents, reducing agents, acids and metals.

Store with general inorganic solids.

SPILLS

Wear PPE, sweep up and treat as for waste. Wash spill area thoroughly with water.

WASTE DISPOSAL

Small quantity: Dilute to 1% and dispose of down the sink.

Large quantity: Place in a labelled bottle and store for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If skin irritation occurs: Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.

Potassium iodide

Formula KI

CAS No. 7681-11-0

MW 166.01

Solubility in water 1430 g/L (20°C)

LABORATORY NOTES

TABLE 1: Quantity of potassium iodide required to prepare a solution of given volume and concentration

concentration	final volume of solution			
	1000 mL	500 mL	250 mL	100 mL
0.1 M ^a	16.60 g	8.30 g	4.15 g	1.66 g
0.5 M	83.00 g	41.50 g	20.75 g	8.30 g
1.0 M	166.01 g	83.00 g	41.50 g	16.60 g

^a alternatively, prepare by a 1 part in 10 dilution of a 1.0 M solution.

Procedure

1. Weigh out the required mass of solid
2. Transfer solid to a mixing vessel such as a beaker or conical flask.
3. Add water to about two-thirds of the final volume and stir until the solution is clear and all of the solid has dissolved.
4. Transfer the solution to a measuring cylinder or volumetric flask and make up to the final volume.
5. Transfer the solution to a labelled bottle.
6. Potassium iodide solutions may become yellow over time, through oxidation of the iodide to molecular iodine. A small amount of dextrose or sodium thiosulfate may be added to the solution to reduce any generated iodine.

DISCLAIMER While all care has been taken in compiling this information, Science ASSIST can not accept liability for the completeness or correctness of the information, nor for errors or omissions.

VERSION
12 Dec 2016

ANGER

Formula $K_2S_2O_5$
CAS No. 16731-55-8
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystals, granules or powder with a slight odour of sulfur dioxide.	Molar mass 222.33	ADG Class -
SOLUBILITY Soluble in water. Insoluble in alcohol.	Melting point 150°C decomposes	Packing Group -
Solubility in water 450 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 2.34	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H318 Causes serious eye damage
H335 May cause respiratory irritation
AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a reducing agent and forms acidic and corrosive aqueous solutions. Exposure may cause irritation to the skin and severe irritation to the eyes and respiratory tract. Eye contact can cause permanent eye damage. Repeated exposure can lead to sensitisation. Exposure via the skin, inhalation or ingestion can result in an allergic response in individuals who are sensitive to sulfites.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust, vapours or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

On contact with acid or on heating, the substance decomposes, liberating toxic sulfur dioxide gas.

STORAGE

The substance is air- and moisture-sensitive. Oxidation to the sulfate can occur over time on exposure to air, particularly in the presence of moisture.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents and acids.

Store with general inorganic solids.

APPLICATIONS

Food science: investigations of its properties as a food/wine preservative.

Senior chemistry: qualitative inorganic analysis; iodine clock reaction; redox titrations.

Technical: to reduce an oxidising substance.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Treat as for Waste Disposal. Dispose of residual solid material as general waste.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Metabisulfite ion can be oxidised to sulfate ion by its reaction with hypochlorite (bleach) as follows: mix equal quantities of the metabisulfite and sodium carbonate and add to a large volume of water. Slowly add household bleach (>5% NaOCl) in the ratio of 17 mL per gram of metabisulfite. Allow the solution to stand for 1-2 hours. Neutralise to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor. Do not mix with incompatible waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical attention if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention if effects persist.

POISONS CENTRE: 13 11 26



Formula KNO_3
CAS No. 7757-79-1
User Group 7-12

DESCRIPTION

Colourless, odourless transparent prisms or crystalline powder with a cooling, pungent saline taste. Slightly hygroscopic.

SOLUBILITY

Soluble in water and glycerol. Slightly soluble in ethanol.

Solubility in water 316 g/L (20°C)

PHYSICAL DATA

Molar mass 101.1
Melting point 334°C
Boiling point 400°C (decomposes)
Specific gravity 2.11 (20°C)
Flammability Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class 5.1
Packing Group III
UN Number 1486
Poisons Schedule -
Security CSC

HAZARD STATEMENTS

H272 May intensify fire; oxidizer

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex, neoprene). Potassium nitrate is a strong oxidising agent. Exposure may cause irritation to the skin and eyes, and irritation and burns to the respiratory tract. Repeated or prolonged skin exposure may cause dermatitis. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is a risk of vigorous reaction, fire or explosion if potassium nitrate is mixed with combustible material or reducing agents, especially finely divided materials. Handle away from heat or any ignition source. The preparation of explosive mixtures is not recommended.

APPLICATIONS

General science: to demonstrate an endothermic process (dissolution in water); an example of a potassium salt in flame test activities.

Botany: investigations of the nutrient requirements of plants.

Senior chemistry: inorganic analysis; concentrated aqueous solution can be used to prepare salt bridges for electrochemistry.

PREPARATIONS

A concentration of 0.5-1M is suitable for conducting a flame test. The concentrated (2.5M), or saturated, KNO_3 solution can be used for the preparation of salt bridges from strips of filter paper or agar gel in a tube.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. The salt is hygroscopic; protect from moisture. Store away from reducing agents, combustible materials, organic substances and metals. Do not store on shelves made of wood or other combustible material. Store with oxidising substances (DG Class 5.1).

SPILLS

Wear PPE. Sweep up with a non-sparking tool and transfer to a bucket of water. Dilute to 1% and disposed of down the sink. The spill area, contaminated clothing and any other contaminated combustible or organic materials should be washed thoroughly with water.

WASTE DISPOSAL

Small quantity: Dilute to 1% and dispose of down the sink. **Large quantity:** Place in a labelled container and store for collection by a licenced waste contractor. Alternatively, dilute and utilise as a fertilizer for lawn or ornamental plants. Concentrated solutions may be allowed to evaporate and the sludge stored in a labelled container for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If skin irritation occurs: Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE: 13 11 26.

Potassium nitrate

Formula KNO_3

CAS No. 7757-79-1

Molar mass 101.1

Solubility in water 316 g/L (20°C)

LABORATORY NOTES

TABLE 1: Quantity of potassium nitrate required to prepare a solution of given volume and concentration

Concentration	Final volume of solution			
	1000 mL	500 mL	250 mL	100 mL
0.1M ^a	10.11 g	5.05 g	2.53 g	1.01 g
0.5 M	50.55 g	25.27 g	12.64 g	5.05 g
1.0 M	101.10 g	50.55 g	25.27 g	10.11 g
2.5 M	252.75 g	126.4 g	63.19 g	25.28 g
Saturated (20°C)	316 g	158 g	79 g	32 g

^a alternatively, prepare by a 1 part in 10 dilution of a 1.0 M solution.

Procedure

1. Weigh out the required mass of solid
2. Place distilled water to about one-half the final volume in a mixing vessel such as a beaker or conical flask.
3. Transfer the solid to the mixing vessel and stir until the solution is clear and all of the solid has dissolved.
4. Transfer the solution to a measuring cylinder or volumetric flask and make up to the final volume.
5. Transfer the solution to a labelled bottle.

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VERSION
12 Dec 2016



potassium oxalate monohydrate

dipotassium ethanedioate monohydrate; oxalic acid, dipotassium salt

WARNING



Formula $K_2C_2O_4 \cdot H_2O$

CAS No. 6487-48-5

User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder.

SOLUBILITY

Soluble in water.

Solubility in water 360 g/L (20°C)

PHYSICAL DATA

Molar mass 184.24

Melting point > 160°C (-H₂O)
decomposes

Boiling point -

Specific gravity 2.13 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H312 Harmful in contact with skin

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance can act as a weak reducing agent. Aqueous solutions of the salt are moderately alkaline. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Ingestion can lead to kidney damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition may produce toxic fumes of carbon and potassium oxides.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; redox chemistry.

Technical: a reducing agent.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash the spill area thoroughly with detergent and water.

Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus potassium oxalate in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If available, give plenty of milk. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26

DANGER

Formula KMnO_4
CAS No. 7722-64-7
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark violet, odourless crystals.	Molar mass 158.03	ADG Class 5.1
SOLUBILITY Soluble in water. Decomposed by alcohol.	Melting point > 240°C (decomposes)	Packing Group II
Solubility in water 64 g/L (20°C)	Boiling point -	UN Number 1490
	Specific gravity 2.70 (20°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security IDM Cat 3

HAZARD STATEMENTS

H272 May intensify fire; oxidising
H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Potassium permanganate is a strong oxidising agent. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact may cause burns and permanent damage. Symptoms of ingestion include gastrointestinal burns, nausea and vomiting.

Handle in a well-ventilated area. Avoid generating and breathing dust and aerosols. Avoid contact with skin, eyes and clothing. Handle away from combustible material and sources of heat and ignition.

In case of fire, flooding quantities of water should be used as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from reducing agents, combustible materials, alcohols, peroxides, powdered metals, zinc, copper, strong acids, sulfuric acid and alkali metals.

Store with oxidising substances (DG Class 5.1).

Permanganate ion in aqueous solution decomposes to give solid manganese dioxide, MnO_2 , which further catalyses the decomposition. The reaction is catalysed by light or impurities. To slow the decomposition reaction, store solutions in clean dark/opaque bottles and protect from light.

APPLICATIONS

General science: reduction of Mn(VII) to observe the colours of the lower oxidation states.

Senior chemistry: redox titrations; oxidising agent in organic chemistry; demonstration of the exothermic reaction of KMnO_4 with glycerol.

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation. **Solid spill:** Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect with a non-sparking tool. Add material slowly to a large volume of water. Reduce the permanganate and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste. Wash spill area thoroughly with water; ensure no permanganate residues remain in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid potassium permanganate must not be disposed of with general waste. Store surplus or waste solid in the original container or other suitable labelled container. Arrange for collection by licenced waste disposal contractor.

Small quantity of solution: Treat with a reducing agent under acidic conditions to give a solution containing Mn(II) . To treat 500mL of 0.1M KMnO_4 solution: Acidify by adding 10mL of 2M H_2SO_4 . In a fume cupboard, slowly add 300mL of 10% w/v sodium bisulfite or sodium metabisulfite solution. The resulting solution should be colourless to faint pink. If permanganate still remains, add a further portion of bisulfite solution. Neutralise by addition of sodium carbonate to within pH 6-8. Wash the solution down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

Formula $K_2S_2O_8$
CAS No. 7727-21-1
User Group 11-12S (Note D)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White, odourless crystals or powder.	Molar mass 270.32	ADG Class 5.1
SOLUBILITY Soluble in water. Insoluble in alcohol.	Melting point ca. 100°C (decomposes)	Packing Group III
Solubility in water 50 g/L (20°C)	Boiling point -	UN Number 1492
	Specific gravity 2.48 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
H317 May cause an allergic skin reaction
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.
Wear PPE: safety glasses, closed shoes, lab coat, gloves (neoprene, nitrile). Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract. Chronic exposure may lead to allergic dermatitis or asthma. Handle in an operating fume cupboard. Avoid generating or inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources and combustible materials. Use only clean, dry plastic or stainless steel tools and utensils when transferring persulfate from the stock bottle. In case of fire or runaway decomposition, flooding quantities of water should be used as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place. Over time, potassium persulfate slowly decomposes, releasing oxygen and oxides of sulfur. Decomposition is accelerated by heat, moisture, sunlight or contamination. Protect from air, moisture and direct sunlight. Store away from heat and ignition sources. Store with secondary containment (e.g. in a clear, lidded polyethylene bottle). Bottles of aqueous solutions must have a vented lid to avoid overpressurisation. Store away from acids, alkalis, halogens, reducing agents, organic substances, combustible materials, hydrogen peroxide and metals. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: iodine clock reaction kinetics

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation. **Solid spill:** Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect with a non-sparking tool. Add material slowly to a large volume of water. Reduce the persulfate and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste.

Wash spill area thoroughly with water; ensure no persulfate residues remain in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid persulfates must not be disposed of with general waste. Store waste or surplus potassium persulfate in the original container or other suitable labelled container. Arrange for disposal via a licenced contractor. Persulfate which has been exposed to water or other contaminant should be disposed of.

Small quantity of solution: Solutions of concentration <1%: wash down the sink. Higher concentrations: Dilute to <10%, then add H_2SO_4 (1M) until the pH is < 3. Cautiously add a reducing agent. 350mL of 10% sodium thiosulfate solution will reduce 500mL of 10% persulfate solution. Neutralise the resulting solution to within pH 6-8 by addition of sodium carbonate and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Wash skin with soap and plenty of water. If skin irritation or rash occurs: Get medical advice/attention

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26

potassium phosphate, dibasic

*dipotassium hydrogen phosphate;
phosphoric acid, dipotassium salt*

Formula K_2HPO_4
CAS No. 7758-11-4
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 174.18	ADG Class -
SOLUBILITY Soluble in water. Slightly soluble in alcohol.	Melting point >180°C decomposes	Packing Group -
Solubility in water 1600 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 2.44 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately alkaline. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large quantity may cause gastric upset.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. The salt may react violently with strong acids.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and oxidising agents. Store with general inorganic solids.

APPLICATIONS

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Small quantities of solid may be disposed of as general waste.

Larger quantity: Store waste solid in a suitable labelled container such as for waste inorganic solids. Waste solutions can be evaporated in a fume cupboard and the residue treated as solid waste, or the pH adjusted to within 6-8 and the solution transferred to a suitable labelled container such as for waste aqueous solutions.

Arrange for collection by a licenced waste contractor.

Alternatively, the salt can be applied to soil as a fertilizer.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If symptoms develop, seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If symptoms develop, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other respiratory symptoms occur, seek medical attention.



potassium phosphate, monobasic

*potassium dihydrogen phosphate;
phosphoric acid, monopotassium salt*

Formula KH_2PO_4
CAS No. 7778-77-0
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder.

SOLUBILITY

Soluble in water.

Solubility in water 222 g/L (20°C)

PHYSICAL DATA

Molar mass 136.09
Melting point ca 253°C decomposes
Boiling point -
Specific gravity 2.34 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately acidic. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large quantity may cause gastric upset.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. The salt may react violently with strong bases.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids, strong bases and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: crystal growing.

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Small quantities of solid may be disposed of as general waste.

Larger quantity: Store waste solid in a suitable labelled container such as for waste inorganic solids. Waste solutions can be evaporated in a fume cupboard and the residue treated as solid waste, or the pH adjusted to within 6-8 and the solution transferred to a suitable labelled container such as for waste aqueous solutions.

Arrange for collection by a licenced waste contractor.

Alternatively, the salt can be applied to soil as a fertilizer.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If symptoms develop, seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If symptoms develop, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other respiratory symptoms occur, seek medical attention.



Potassium sodium tartrate, tetrahydrate

Rochelle salt; Seignette salt

WARNING

Formula $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$

CAS No. 6381-59-5

User Group 7-12

DESCRIPTION

Colourless, odourless, translucent crystals or white powder with a cooling, saline taste. Effloresces slightly in warm air.

SOLUBILITY

Soluble in water. Insoluble in ethanol.

Solubility in water 630 g/L (20°C)

PHYSICAL DATA

Molar mass	282.22
Melting point	70-80°C
Boiling point	100°C (-3H ₂ O) 130-140°C (-4H ₂ O) 220°C (decomposes)
Specific gravity	1.79
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from acids and strong oxidising agents. Store with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause skin, eye or respiratory irritation.

Handle in a well-ventilated area. Avoid generating and inhaling dust and contact with skin and eyes.

SPILLS

Wear PPE, sweep up and treat as for waste.

WASTE DISPOSAL

Small quantity: Dilute to 1% and dispose of down the sink.

Large quantity: Place in a labelled bottle for waste dry chemicals and store for collection by a licenced waste disposal contractor.

APPLICATIONS

General science: for crystal growing activities; preparation of the salt from sodium hydrogen carbonate and cream of tartar.

Senior biology: a component of Fehling's solution.

Senior physics: crystals of the salt are used to demonstrate piezoelectricity.

PREPARATIONS

Fehling's solution is used to test for aldehydes or to distinguish between a reducing sugar such as glucose, fructose, or galactose and a non-reducing sugar such as sucrose. A positive result is a brick red precipitate of Cu_2O .

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If recovery is not rapid, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If skin irritation occurs: Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur: Seek medical advice/attention.

Potassium sodium tartrate, tetrahydrate

Formula $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$

CAS No. 6381-59-5

MW 282.22

Solubility in water 630 g/L (20°C)

LABORATORY NOTES

TABLE 1: Quantity of potassium sodium tartrate tetrahydrate required to prepare a solution of given volume and concentration

concentration	final volume of solution			
	1000 mL	500 mL	250 mL	100 mL
0.1 M ^a	28.22 g	14.11 g	7.05 g	2.82 g
0.5 M	141.11 g	70.55 g	35.28 g	14.11 g
1.0 M	282.22 g	141.11 g	70.55 g	28.22 g
2.0 M	564.44 g	282.22 g	141.11 g	56.44 g
Saturated (20°C)	630 g	315 g	157 g	63 g

^a alternatively, prepare by a 1 part in 10 dilution of a 1.0 M solution.

Procedure

1. Weigh out the required mass of solid
2. Place distilled water to about one-half the final volume in a mixing vessel such as a beaker or conical flask.
3. Transfer the solid to the mixing vessel and stir until the solution is clear and all of the solid has dissolved.
4. Transfer the solution to a measuring cylinder or volumetric flask and make up to the final volume.
5. Transfer the solution to a labelled bottle.

Fehling's solution (test for aldehydes, reducing sugars)

Prepare Solution A and Solution B. Mix the two solutions together in a ratio of 1:1 just prior to use.

Fehling's solution A: Dissolve 34.66 g copper sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in approximately 300 mL of distilled water. Make up the solution to 500 mL.

Fehling's solution B: Mix 173 g potassium sodium tartrate tetrahydrate ($\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$) and 50 g sodium hydroxide (NaOH) with approximately 350 mL of distilled water and stir until dissolved. Make up the solution to 500 mL.



Formula K_2SO_4

CAS No. 7778-80-5

User Group F-12

DESCRIPTION

Colourless, odourless crystals, granules or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water. Insoluble in ethanol.

Solubility in water 111 g/L (20°C)

PHYSICAL DATA

Molar mass 174.26

Melting point 1067-1069°C

Boiling point 1689°C

Specific gravity 2.66 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Decant solution down the sink. Dispose of residual solid material as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste.

Small volumes of dilute solution (concentration < 1%) can be neutralised and washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste inorganic solids or aqueous solutions, as appropriate, and arrange for collection by a licenced waste disposal contractor.

Alternatively, apply to soil as a fertiliser.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; precipitation reactions.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.



Formula KSCN
CAS No. 333-20-0
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 97.18	ADG Class -
SOLUBILITY Soluble in water, alcohol and acetone.	Melting point 173-175°C	Packing Group -
Solubility in water 2170 g/L	Boiling point 500°C decomposes	UN Number None
	Specific gravity 1.89	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302,H312,H332 Harmful if swallowed, in contact with skin or if inhaled
H412 Harmful to aquatic life with long lasting effects
AUH032 Contact with acids liberates very toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Chronic exposure may lead to gastrointestinal and CNS effects. Ingestion of a large quantity can result in convulsions and loss of consciousness.
Handle in a well-ventilated area. Avoid generating dust and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Mixing with acid can generate highly toxic hydrogen cyanide gas. Heating to decomposition generates highly toxic gases (oxides of potassium, sulfur and nitrogen, and hydrogen cyanide). The reaction with oxidising agents may be violent or explosive.

STORAGE

The substance is hygroscopic and light-sensitive. Decomposition occurs over time, on exposure to light. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat. Protect from moisture and sunlight.
Store away from oxidising agents and acids.
Store with general inorganic solids.

APPLICATIONS

General science: preparation of artificial blood.
Senior chemistry: test for Fe(III) ion; qualitative analysis.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Collect spill material and treat as for Waste Disposal.
Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. For very minor spills, collect material and add to a large volume of water. Decant solution down the sink and dispose of residual solid material as general waste. For larger spills, collect material and treat as for Waste Disposal.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.
Solutions: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste inorganic salt solutions and stored for collection.
Do not mix with incompatible waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Call a POISONS CENTRE or doctor if you feel unwell.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE: 13 11 26

Formula C₃H₈O
CAS No. 71-23-8
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, highly volatile liquid with a sweet, pleasant odour.	Molar mass 60.1	ADG Class 3
SOLUBILITY Miscible with water, ethanol and other alcohols, diethyl ether and propylene glycol. Soluble in acetone.	Melting point -126°C	Packing Group II
Solubility in water Miscible	Boiling point 97°C	UN Number 1274
	Specific gravity 0.8 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H318 Causes serious eye damage
H336 May cause drowsiness or dizziness

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; neoprene, nitrile for splash protection). Exposure may cause irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of exposure include CNS depression, nausea, headache and dizziness. Prolonged or repeated skin contact can lead to dryness and cracking. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids, acid chlorides, halogens, alkali metals and aluminium. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: to observe the reactivity of a primary alcohol; preparation of esters; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste. Alternatively, treat as for Waste Disposal of small quantity.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel and allow alcohol to evaporate in an operating fume cupboard. Dispose of paper towel as general waste.

Large quantity: Store in the original container or other suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical advice.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If symptoms develop, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

DANGER

Formula C₃H₈O
CAS No. 67-63-0
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Clear, colourless, volatile liquid with a musty odour of rubbing alcohol.	Molar mass 60.1	ADG Class 3
SOLUBILITY Miscible with water. Soluble in ethanol, acetone and diethyl ether.	Melting point -89°C	Packing Group II
Solubility in water Miscible	Boiling point 82°C	UN Number 1219
	Specific gravity 0.78 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Butyl, Viton®; nitrile for splash protection). Exposure to the vapour may cause mild to moderate irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of exposure include nausea, headache, dizziness and CNS depression. Eye exposure to the liquid may cause severe irritation and possible eye damage. Prolonged or repeated skin contact can lead to dryness and cracking. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. Test for peroxides before use, particularly if intending to heat or distill the alcohol.

STORAGE

2-Propanol is hygroscopic. With prolonged storage, and on exposure to air and sunlight, the alcohol may form peroxides, which may become explosive if they are concentrated. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from sunlight. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids, halogens, alkali metals and aluminium. Store with flammable liquids in an AS compliant cabinet. Mark the bottle with the date received and date opened.

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol; heat of combustion investigations.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Cover spill with non-combustible absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water and allow to stand until the solids have settled. Decant the solution down the sink with further dilution. Dispose of the absorbent material as general waste.

Large spill: Place material into a suitable labelled container and store for collection.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Add to a large volume of water and flush down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. As the alcohol is a peroxide former, waste or surplus isopropanol should not be stored with any other waste.

The bottle may be hazardous when empty due to residual vapour or liquid. Do not expose the empty bottle to heat, open flames or other sources of ignition.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Wash contaminated clothing before reuse. If irritation develops or persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

Formula C₃H₆O₂

CAS No. 79-09-4

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, oily liquid with a slightly pungent, disagreeable odour.	Molar mass 74.08	ADG Class 8 (3)
SOLUBILITY Soluble in water, ethanol and diethyl ether.	Melting point -21°C	Packing Group II
Solubility in water Miscible	Boiling point 141°C	UN Number 3463
	Specific gravity 0.99 (20°C)	Poisons Schedule S6
	Flammability Flammable	Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour

H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, butyl-rubber; neoprene gloves provide splash protection). Exposure may cause severe irritation to the skin, eyes and respiratory tract. Eye contact may result in burns and permanent eye damage. Inhalation exposure may lead to an asthma-like bronchitis.

Handle only in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling vapour or mist. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Vapours may form explosive mixtures with air. Handle away from heat and ignition sources.

Contact with reactive metals such as aluminium, iron, tin and zinc may generate flammable hydrogen gas.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Ensure container is kept upright to prevent leakage. Store away from heat and any sources of ignition.

Store away from oxidising agents, bases and reactive metals.

Store separately from other chemicals, on a low shelf, with secondary containment.

APPLICATIONS

Senior chemistry: ester preparation.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources. Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Collect spilled material with a non-sparking tool. Add slowly to a large volume of water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Decant the neutral solution down the sink with further dilution. Dispose of the residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

DANGER

Formula C₅H₁₀O₂
CAS No. 109-60-4
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, highly volatile liquid with a pear-like odour.	Molar mass 102.13	ADG Class 3
SOLUBILITY Sparingly soluble in water. Miscible with ethanol and diethyl ether.	Melting point -93°C	Packing Group II
Solubility in water 21.2 g/L (20°C)	Boiling point 102°C	UN Number 1276
	Specific gravity 0.89 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation
H336 May cause drowsiness or dizziness
AUH066 Repeated exposure may cause skin dryness and cracking

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness.
Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.
Store away from oxidising agents, acids, bases and alkali metal hydroxides.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between acetic acid and *n*-propanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₇H₁₄O₂
CAS No. 105-66-8
User Group 11-12



DESCRIPTION

Clear, colourless liquid with a sweet odour.

SOLUBILITY

Slightly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water Slightly soluble

PHYSICAL DATA

Molar mass 130.19
Melting point -95°C
Boiling point 143°C
Specific gravity 0.87 (20°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 3272
Poisons Schedule -
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; butyl rubber for splash contact). Exposure may cause skin, eye or respiratory irritation. Inhalation or ingestion may cause headache, dizziness or drowsiness. Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition. The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.
Store away from oxidising agents, acids and bases.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between butyric acid and *n*-propanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if feeling unwell.
IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₆H₁₂O₂
CAS No. 106-36-5
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless liquid with a pear-like odour.	Molar mass 116.16	ADG Class 3
SOLUBILITY Slightly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone.	Melting point -76°C	Packing Group II
Solubility in water 5 g/L (20°C)	Boiling point 122°C	UN Number 3272
	Specific gravity 0.88 (20°C)	Poisons Schedule -
	Flammability Highly flammable	Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H332 Harmful if inhaled

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (PE/EVAL; butyl rubber, nitrile for splash contact). Exposure may cause irritation to the skin, eyes, nose and throat and respiratory tract. Inhalation or ingestion may cause headache, dizziness or drowsiness.
Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.
The ester may attack/dissolve some plastics.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and any sources of ignition. Ensure container is kept upright to prevent leakage.
Store away from oxidising agents, acids and bases.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

Senior chemistry: product of the esterification reaction between propionic acid and *n*-propanol.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Absorb spill with paper towel, or cover with inert absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand and scoop up with a non-sparking tool.
Small spill: Evaporate as for Waste Disposal.
Large spill: Place material into a suitable labelled container and store for collection.
Wash the spill area with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or other absorbent and allow the solvent to evaporate in an operating fume cupboard. Dispose of absorbent material as general waste.
Large quantity: Store in a suitable labelled container such as for non-halogenated organic liquid waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention if feeling unwell.
IF ON SKIN: Take off immediately all contaminated clothing. Wash skin thoroughly with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26.



Formula C₃H₈O₂

CAS No. 57-55-6

User Group 7-12

DESCRIPTION

Clear, colourless, almost odourless, viscous liquid with a slightly acrid taste.

SOLUBILITY

Miscible with water, ethanol and acetone. Soluble in diethyl ether. Sparingly soluble in petroleum ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	76.1
Melting point	-60°C
Boiling point	188°C
Specific gravity	1.04 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Eye contact may cause mild irritation. Inhalation of vapour or mist from the heated substance may cause respiratory irritation. Repeated or prolonged skin contact may lead to irritation and dermatitis. Ingestion of a large amount may cause gastric irritation and CNS effects. Avoid generating and inhaling vapour or mist. If mists or vapours are being generated, work in an operating fume cupboard or well-ventilated area. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Vapours may form explosive mixtures with air if heated strongly. Handle away from heat and sources of ignition. The glycol may attack/dissolve some plastics.

STORAGE

The glycol is hygroscopic and light sensitive. With prolonged storage, explosive peroxides may form. Store in a tightly closed container in a cool, dry well-ventilated place. Protect from light and moisture. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, reducing agents, acids, alkalis and acid chlorides. Store with flammable and combustible liquids in an AS compliant cabinet.

APPLICATIONS

General science/Senior physics: to observe its physical properties (density, viscosity, refractive index, 'antifreeze' properties).

SPILLS

Wear PPE. Eliminate all ignition sources. Cover spill with sand, or other inert material such as vermiculite or bentonite. Scoop up with a non-sparking tool.

Small quantity: Seal material in a plastic bag and dispose of as general waste.

Large quantity: Place in a suitable labelled container and arrange for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb with non-combustible material. Seal in a plastic bag and dispose of as general waste.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If symptoms develop or if large amount ingested, seek medical attention.

IF ON SKIN: Remove contaminated clothing. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms develop, seek medical attention.



Formula C₁₂H₆NO₄.Na
CAS No. 62758-13-8
User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green to black powder.	Molar mass 251.18	ADG Class -
Dye family phenoxazine	Melting point -	Packing Group -
Solubility water ¹ 20 mg/mL ethanol ¹ 6 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 598 nm, 380 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- redox indicator: for measuring cell respiration;
- Blue bottle demonstration;
- assay for bacterial content of milk.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 3.8	pH 6.5	OXIDISED	REDUCED
orange	purple	blue-purple	pink

PREPARATION

(i) pH indicator: Dissolve 1 g in 100mL of distilled water.³ (ii) test for milk: Dissolve 0.005 g in 100mL of sterile distilled water (or follow instructions if using tablets). Add 1mL of solution to 10mL of milk.⁴

References:

1. Aldrich Handbook 2. Sabnis 3. Flinn 4. Guelph

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation develops or persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₂₈H₃₁ClN₂O₃

CAS No. 81-88-9

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Odourless, green crystals or powder which forms blue-red aqueous solutions. Dilute solutions are fluorescent.</p> <p>Dye family rhodamine</p> <p>Solubility water¹ 30 mg/mL ethanol¹ 50 mg/mL</p> <p>Slightly soluble in hydrochloric acid or sodium hydroxide solution.</p>	<p>Molar mass 479.02</p> <p>Melting point 210-211°C decomposes</p> <p>Flammability Combustible</p> <p>Absorption¹ (λ_{\max}) 543 nm</p>	<p>ADG Class -</p> <p>Packing Group -</p> <p>UN Number None</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage
H412 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation and burns to the eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- demonstrations of chemiluminescence

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

Reference: 1. Aldrich Handbook

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula $C_{20}H_2Cl_4I_4O_5 \cdot 2Na$

CAS No. 632-69-9

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red-brown to violet powder.	Molar mass 1017.65	ADG Class -
Dye family xanthene	Melting point decomposes	Packing Group -
Solubility water ¹ 100mg/mL ethanol ¹ 30 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ_{max}) 548 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

APPLICATIONS

- histology: contrast and cytoplasm stain.

PREPARATION

1% aqueous: Dissolve 1g in 75 mL distilled water. Make up to 100mL.³

References:

1. Aldrich Handbook
2. Sabnis
3. Flinn

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₂₀H₁₉ClN₄
CAS No. 477-73-6
User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark red to dark green crystals or powder.	Molar mass 350.85	ADG Class -
Dye family phenazine	Melting point > 240°C decomposes	Packing Group -
Solubility water ¹ 50 mg/mL ethanol ¹ 20 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 530 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H318 Causes serious eye damage
H319 Causes skin irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation and burns to the skin, eyes and respiratory tracts. May be harmful by ingestion or inhalation. When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- histology: stains lignin and plant cell walls; counterstain in Gram stain.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

PREPARATION

(i) for Gram stain: Dissolve 1g in 75 mL distilled water. Make up to 100mL.³ (ii) Lignin stain: Dissolve 1 g in 50mL ethanol. Make up to 100mL with distilled water.⁴

References:

1.Aldrich Handbook 2.Sabnis 3.Gabb & Latchem 4.Dungey

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



DANGER

Formula C₁₀H₁₆Cl₂O₂

CAS No. 111-19-3

User Group 11-12



DESCRIPTION

Colourless, pale yellow liquid with a pungent odour.

SOLUBILITY

Soluble in hydrocarbons and diethyl ether.

Solubility in water Decomposes

PHYSICAL DATA

Molar mass 239.14

Melting point -5--3°C

Boiling point 161°C

Specific gravity 1.12 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class 8

Packing Group II

UN Number 3265

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (butyl rubber; nitrile for splash contact). Sebacoyl chloride is corrosive and a lachrymator. Exposure may cause irritation and burns to the skin, eyes, respiratory tract and on ingestion. Eye exposure to the liquid or vapour may cause permanent damage. Skin contact may lead to dermatitis. Handle only in an operating fume cupboard. Avoid breathing vapour and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

The reaction with water gives sebacic acid and hydrogen chloride.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Store away from heat and sources of ignition. Store away from alcohols, oxidising agents, bases, alkali hydroxides, amines, alkali metals and alkaline earth metals. Store with corrosive liquids (organic acids).

APPLICATIONS

Senior chemistry: a reagent in the preparation of nylon.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition. Cover spill with a mixture of sodium carbonate or sodium bicarbonate and non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter). Scoop up with a non-sparking tool into a bucket of water. Allow the mixture to stand overnight. Test the pH (pH paper) and neutralise the solution by addition of HCl (1-2M) or sodium carbonate as necessary. Flush the neutral solution down the sink. Dispose of residual absorbent material as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid chloride can be decomposed by its reaction with aqueous base to give a non-hazardous water-soluble salt. Note that sebacoyl chloride requires 4 equivalents of base for neutralisation.

Small quantity: Add the waste acid chloride to sodium hydroxide solution (2M) or sodium carbonate solution (2M) at the rate of 1mL of acid chloride to 20 mL of aqueous base. Carbon dioxide gas will evolve from the reaction with sodium carbonate. Allow the mixture to stand overnight. Neutralise the solution to pH ~7 by addition of HCl (1-2M) and flush down the sink.

Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Take off immediately all contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If effects persist, seek medical attention.

POISONS CENTRE: 13 11 26.

Formula Si
CAS No. 7440-21-3
User Group 11-12

DESCRIPTION

Brittle, odourless, steel grey pieces or black to grey, lustrous needle-like crystals or platelets.

SOLUBILITY

Soluble in molten alkali oxides. Insoluble in organic solvents and mineral acids.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 28.09
Melting point 1410°C
Boiling point 2355°C
Specific gravity 2.33 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The flammability of silicon and its reactivity toward water increase as particle size decreases. Silicon in bulk form is considered non-flammable. However, silicon pieces can ignite if heated to high temperatures. Silicon dust can form explosive mixtures with air.

At room temperature on exposure to air, silicon develops a protective oxide layer. When heated, silicon will react with water, generating flammable hydrogen gas.

In case of fire, use dry sand or dry powder suitable for metal fires; do not use water, foam or CO₂ extinguisher.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Collect large pieces with a dry clean tool. Scoop up remaining material with a non-sparking tool into a suitable labelled container and store for collection. If the spill material is moist or wet, do not store in a closed container.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus silicon in the original container or other suitable, labelled container and arrange for collection by a licenced waste disposal contractor. If the material is wet or damp, do not store in a closed container as hydrogen may be slowly generated. Small quantities of bulk silicon can be disposed of as general waste; the expected environmental fate of elemental silicon is its slow oxidation to form silica.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, alkali carbonates, active metals and calcium.

Store with general inorganic solids.

APPLICATIONS

General science: qualitative properties of a metalloid element.

Senior physics: investigations of the change in electrical conductivity of silicon with temperature.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.



Formula Si
CAS No. 7440-21-3
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
<p>Odeourless, dark brown powder.</p> <p>SOLUBILITY Soluble in molten alkali oxides. Insoluble in organic solvents and mineral acids.</p> <p>Solubility in water Insoluble</p>	<p>Molar mass 28.09</p> <p>Melting point 1410°C</p> <p>Boiling point 2355°C</p> <p>Specific gravity 2.33 (20°C)</p> <p>Flammability Flammable</p>	<p>ADG Class 4.1</p> <p>Packing Group III</p> <p>UN Number 1346</p> <p>Poisons Schedule -</p> <p>Security -</p>

HAZARD STATEMENTS

H228 Flammable solid

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mechanical irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

The flammability of silicon and its reactivity toward water increase as the particle size decreases. Silicon powder can form explosive mixtures with air. Silicon will react with water, generating flammable hydrogen gas; the reaction with silicon dust proceeding at room temperature but requiring heat for silicon of a larger particle size.

At room temperature on exposure to air, silicon develops a protective oxide layer.

In case of fire, use dry sand or dry powder suitable for metal fires; do not use water, foam or CO₂ extinguisher.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation. Scoop up with a non-sparking tool into a suitable labelled container and store for collection. If the spill material is wet or damp, do not store in a closed container.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus silicon powder in the original container or other suitable, labelled container and arrange for collection by a licenced waste disposal contractor. If the material is wet or damp, do not stored in a closed container as hydrogen may be slowly generated.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from sources of heat or ignition.

Store away from oxidising agents, acids, alkali carbonates, active metals and calcium.

Store with flammable solids (DG Class 4.1).

APPLICATIONS

Senior chemistry: demonstration of the redox reaction between sand and magnesium powder, giving elemental silicon.

Technical: preparation of silicon tetrachloride.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

Formula Ag
CAS No. 7440-22-4
User Group F-12



DESCRIPTION

Soft, ductile, lustrous, white metallic solid. The element has the highest electrical and thermal conductivity of all the metals.

SOLUBILITY

Insoluble in water. Reacts with nitric and hot sulfuric acids. Insoluble in alkalis.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 107.87
Melting point 961.9°C
Boiling point 2212°C
Specific gravity 10.49
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 9
Packing Group III
UN Number 3077
Poisons Schedule -
Security -

HAZARD STATEMENTS

H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Finely divided silver may cause mild irritation to the skin, eyes and respiratory tract. Inhalation of dust or fumes may lead to metal fume fever.

Handle in a well-ventilated area. Avoid generating and inhaling dust or fumes. Avoid contact with skin, eyes and clothing.

Silver can react explosively with acetylene. Compounds formed with ammonia can become explosive when dry. Silver can act dangerously with oxidising agents and halogens. Hydrogen peroxide may decompose violently in the presence of silver.

Finely divided silver is flammable; handle away from sources of ignition. Combustion produces toxic fumes of silver oxides.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste silver metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

STORAGE

Store in a tightly closed container in a cool, dry place away from heat and light.

Store away from ammonia, oxidising agents, hydrogen peroxide, acids, halogens and alkalis. Store with general inorganic solids.

APPLICATIONS

General science: Qualitative properties of the element.
Senior chemistry: Product of redox chemistry.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush particles off skin. Wash skin thoroughly with plenty of water and soap. If skin irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical attention.

POISONS INFORMATION CENTRE 13 11 26

Formula AgNO₃
CAS No. 7761-88-8
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals with a bitter taste.	Molar mass 169.87	ADG Class 5.1
SOLUBILITY Soluble in water, glycerol, hot alcohol and aqueous ammonia.	Melting point 212°C	Packing Group II
Solubility in water 1220 g/L (20°C)	Boiling point 433°C 400°C decomposes	UN Number 1493
	Specific gravity 4.35	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H314 Causes severe skin burns and eye damage
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The substance is a strong oxidising agent. Exposure may cause irritation and burns to the skin, eyes and respiratory tract. Eye exposure may lead to permanent eye damage.
Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Handle away from sources of ignition and flammable or combustible materials.
The substance can react dangerously with reducing agents, alkali metals and active metals.
In case of fire, use water as the extinguishing agent.

STORAGE

The salt decomposes on exposure to light, becoming grey-black. Traces of organic materials promote the reaction. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from air and light. Store away from heat and sources of ignition.
Store away from acids, alkalis, reducing agents, alkali metals, organic substances and combustible materials.
Do not store on shelves made from wood.
Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: Tollens' test; electrochemistry; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources and combustible material from the spill area.
Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.
Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as the original container or with waste silver metal and salts or their solutions. Arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.
Silver ions can be precipitated from solution as the chloride by addition of sodium chloride solution. The supernatant should then be neutralised before washing to waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical advice/attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush any visible particles off skin. Wash skin thoroughly with plenty of water and soap. If symptoms develop, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms appear, seek immediate medical advice/attention.

Formula Na
CAS No. 7440-23-5
User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Silvery-white, ductile, light, soft metal; rapidly tarnishes on exposure to air, becoming greyish-white.	Molar mass 22.99	ADG Class 4.3
SOLUBILITY Reacts violently with water, releasing flammable hydrogen gas. Soluble in liquid ammonia, giving a blue solution.	Melting point 97.8°C	Packing Group I
Solubility in water Reacts with water	Boiling point 881°C	UN Number 1428
	Specific gravity 0.968 (20°C)	Poisons Schedule -
	Flammability Flammable solid	Security IDM Cat 2

HAZARD STATEMENTS

H260 In contact with water releases flammable gases which may ignite spontaneously.
H314 Causes severe skin burns and eye damage.
AUH014 Reacts violently with water.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Sodium is corrosive and a strong reducing agent. Exposure can cause severe irritation and burns to the skin, eyes and respiratory tract. Fumes of burning sodium are highly irritating. The reaction with water generates flammable hydrogen gas and caustic sodium hydroxide.
Avoid contact with skin and eyes. Ensure that all tools used in handling are dry. Handle away from open flames and other ignition sources.
In case of fire, use dry chemical, dry sand, soda ash, or lime; do not use water, foam or CO₂ extinguisher.

APPLICATIONS

Senior chemistry: In the demonstration of the reaction of an alkali metal with water.

PREPARATIONS

For detailed safety notes and procedure, see Science ASSIST Standard Operating Procedure: Demonstrating the reaction of alkali metals with water.

STORAGE

Sodium is air and moisture sensitive. Store in a tightly closed container in a cool, dry place away from heat and light. Ensure that metal is protected from moisture by storing under paraffin oil. Sodium reacts violently with water; keep away from contact with water. Store away from heat and sources of ignition. Store away from acids, heavy metals, halogenated hydrocarbons, oxidising agents, halogens, alcohols and sulfur. Store with DG Class 4.3 Dangerous When Wet substances.

SPILLS

See Laboratory Notes

WASTE DISPOSAL

Small quantity: See Laboratory Notes

Large quantity of waste: Store under mineral oil in a suitable container and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Brush off loose particles from skin. Rinse skin with water/shower. If skin irritation or a rash occurs: Get medical advice/attention.

IF INHALED- metal oxide fumes (unlikely) or hydrogen gas: Move patient to fresh air and keep at rest in a position comfortable for breathing.

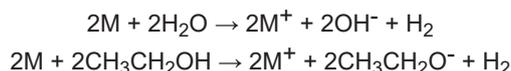
POISONS CENTRE: 13 11 26

alkali metals

LABORATORY NOTES

PROCEDURES FOR THE TREATMENT OF WASTE ALKALI METALS: LITHIUM AND SODIUM

Principle of destruction: Lithium and sodium are destroyed by their reaction with either water or an alcohol to yield hydrogen gas and the metal hydroxide or metal alkoxide, respectively. The reaction with an alcohol is slower than the reaction with water.



Wear PPE: laboratory coat or apron, closed shoes, safety glasses, gloves (nitrile). Carry out the destruction procedure in an operating fume cupboard. Ensure that there are no ignition sources present. Having a fire blanket close to hand, to smother the reaction if necessary, is also advisable.

DESTRUCTION OF WASTE LITHIUM (up to 1g)

To 1-2L of iced water in a beaker or bucket, cautiously add small pieces of lithium, one piece at a time at such a rate that hydrogen evolves in a controlled manner and the reaction does not become violent. Allow each piece to react completely before adding the next. Neutralise the solution with dilute citric acid or hydrochloric acid (1M) to within pH 6-8 and dispose of down the sink.

The method for destruction of sodium by its reaction with ethanol can also be used with lithium.¹ Lithium reacts more slowly with ethanol than does sodium, and the lithium-ethanol mixture should be allowed to stand overnight to ensure complete reaction of the metal.

DESTRUCTION OF WASTE SODIUM¹ (up to 1g)

To 100mL of cold ethanol or methylated spirits in a beaker, cautiously add small pieces of sodium, one piece at a time at such a rate that hydrogen evolves in a controlled manner and the reaction does not become violent. Stir the mixture until all of the sodium has completely reacted. Cautiously add a few mL of water with stirring, and allow the mixture to stand for 1 hour, to ensure that there is no residual unreacted sodium. Dilute the solution with an equal volume of water, and neutralise with dilute citric acid or hydrochloric acid (1M) to within pH 6-8. Dilute ten-fold with water and flush down the sink.

Sodium can also be destroyed by reacting it with isopropanol (propan-2-ol). The reaction of sodium with isopropanol is slower than the reaction with ethanol, and the sodium-isopropanol mixture should be allowed to stand overnight to ensure complete reaction of the metal. A small quantity of ethanol is then added with stirring, and the mixture is allowed to stand for 1 hour. Water is then added, and so on as in the procedure using ethanol.

TREATMENT OF SPILLS OF LITHIUM OR SODIUM²

Wear PPE. Isolate spill area. Eliminate all sources of ignition. Using a dry tool, collect larger pieces of the metal and return them to the storage container. If water is present, cover the residual spill with a 1:1:1 mixture by weight of sodium carbonate, cat litter (bentonite) and dry sand. If no water is present, cover the residual spill with dry sand. Collect material into a corrosion-resistant container with a non-sparking tool. To a large volume of cold ethanol/methylated spirits in a beaker or bucket, slowly add the collected material in small portions with stirring. Allow each portion to react completely before adding the next. Allow the mixture to stand overnight. Add a small volume of water with stirring and allow to stand for 1 hour. Dilute the mixture with an equal volume of water and neutralise to within pH 6-8. Dilute the neutral solution further with water and decant the solution down the sink. Dispose of the solid material in the general waste. Wet the spill area with ethanol/methylated spirits and then rinse with water to ensure destruction of any metal residues.

REFERENCES

1. Adapted from Lunn, G., Sansone, E. B., Destruction of Hazardous Chemicals in the Laboratory, John Wiley & Sons, 2012, p 37.
2. Armour, M.A., Hazardous Laboratory Chemicals Disposal Guide, CRC Press, 2003, p. 325 and p. 535.



Formula CH₃CO₂Na

CAS No. 127-09-3

User Group 7-12

DESCRIPTION

Colourless, odourless crystals with a weak odour of acetic acid.

SOLUBILITY

Soluble in water. Moderately soluble in alcohol.

Solubility in water 365 g/L (20°C)

PHYSICAL DATA

Molar mass 82.03

Melting point 324°C decomposes

Boiling point -

Specific gravity 1.52 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security IDM Cat 3

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately alkaline. Exposure may cause mild irritation to the eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Mixing with strong acid generates fumes of acetic acid.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: qualitative analysis.

Technical: preparation of sodium acetate trihydrate; buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste dry organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.



Formula CH₃CO₂Na.3H₂O

CAS No. 6131-90-4

User Group 7-12

DESCRIPTION

Colourless, odourless crystals with a weak odour of acetic acid.

SOLUBILITY

Soluble in water and diethyl ether. Slightly soluble in alcohol.

Solubility in water 613 g/L (20°C)

PHYSICAL DATA

Molar mass 136.08

Melting point 58°C

Boiling point 120°C (-3H₂O)

Specific gravity 1.42 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security IDM Cat 3

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the eyes and respiratory tract.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Mixing with strong acid generates fumes of acetic acid.

STORAGE

The substance is hygroscopic and is efflorescent in warm, dry air.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and oxidising agents. Store with general organic solids.

APPLICATIONS

General science: demonstration of the exothermic process of crystallisation from the supersaturated solution.

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of as general waste. Small volumes of dilute solution (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste dry organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

Formula NaBr

CAS No. 7647-15-6

User Group 7-12

DESCRIPTION

Colourless, odourless crystals, granules or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water. Moderately soluble in alcohol.

Solubility in water 905 g/L (20°C)

PHYSICAL DATA

Molar mass 102.89

Melting point 755°C

Boiling point 1393°C

Specific gravity 3.20 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract. Chronic exposure to small quantities may lead to CNS effects and skin rash.

Handle in a well ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is hygroscopic and light-sensitive.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat. Protect from sunlight and moisture.

Store away from strong acids, oxidising agents, halogens and alkali metals.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; redox reactions of the halogens.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and transfer to a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus sodium bromide in the original container or other suitable labelled container such as for dry inorganic solid waste. Arrange for collection by a licenced waste disposal contractor.

Waste solutions: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Larger quantity: Store in a container for waste inorganic solutions or alternatively, allow the water to evaporate in an operating fume cupboard and treat the residue as for solid waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice.



Formula Na_2CO_3
CAS No. 497-19-8
User Group 7-12

DESCRIPTION

Colourless, odourless, hygroscopic powder with a bitter taste.

SOLUBILITY

Soluble in water and glycerol. Slightly soluble in alcohol. Insoluble in acetone.

Solubility in water 217 g/L (20°C)

PHYSICAL DATA

Molar mass 105.99
Melting point 851°C
Boiling point decomposes
Specific gravity 2.53
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions are strongly basic. Exposure may cause irritation to the skin, eyes and respiratory tract. May be corrosive, causing burns, at high concentrations or with prolonged or repeated exposure. Eye contact may result in severe eye damage. Prolonged or repeated skin contact may cause dermatitis and skin sensitization.

Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

To prepare a standard solution, absorbed water can be removed by heating the salt at 260-270°C for 30 minutes, then allowing it to cool in a desiccator.

STORAGE

The salt is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from acids and oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: primary standard for acid-base titrations.
Technical: preparation of buffers; neutralising agent.

SPILLS

Wear PPE. Ensure good ventilation. Scoop spill material into a plastic container.

Small spill: Treat as for Waste Disposal.

Large spill: Place into a suitable labelled container and store for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste potassium carbonate slowly to a large volume of cold water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing. Rinse skin thoroughly with water/shower. If irritation occurs, seek medical advice

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula NaCl
CAS No. 7647-14-5
User Group F-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystals or powder with a characteristic saline taste and odour.	Molar mass 58.44	ADG Class -
SOLUBILITY Soluble in water, glycerol and ethylene glycol. Very slightly soluble in alcohol.	Melting point 801°C	Packing Group -
Solubility in water 358 g/L (20°C)	Boiling point 1461°C	UN Number None
	Specific gravity 2.17 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause slight irritation to the skin, eyes and respiratory tract. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Solutions of the salt are corrosive to base metals.

STORAGE

The salt is somewhat hygroscopic. Store in a tightly closed, corrosion-resistant container in a cool, dry, well-ventilated place. Store away from strong oxidising agents and alkali metals. Store with general inorganic solids.

APPLICATIONS

General science: qualitative observations of chemical substances; flame tests; observation of an endotherm (mixture with ice).
Senior biology: demonstration of osmosis; germination experiments.
Senior chemistry: corrosion experiments; displacement reactions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of as general waste (solid) or wash down the sink (solutions).

Solutions may be evaporated with heating in a fume cupboard.

Large quantity: Store in a suitable labelled container such as for waste inorganic solids or solutions, as appropriate, and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persists, seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If a large amount ingested, seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs seek medical advice.

IF INHALED: Move patient to fresh air.



Formula $\text{Na}_3\text{C}_6\text{H}_8\text{O}_7 \cdot 2\text{H}_2\text{O}$

CAS No. 6132-04-3

User Group 7-12

DESCRIPTION

Colourless, odourless crystals or granular powder with a pleasant acid taste.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 720 g/L (25°C)

PHYSICAL DATA

Molar mass	294.10
Melting point	150°C (-2H ₂ O) 309.6°C
Boiling point	decomposes
Specific gravity	1.76 (18°C) (anhydrous)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion can result in burns to the upper digestive and respiratory tracts.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste. Small volumes of dilute solutions (concentration < 15): Adjust to within pH 6-8 and wash down the sink.

Larger quantity: Store solid in a suitable labelled container such as for waste dry organic solids. Solutions: Adjust to within pH 6-8 and store in a suitable labelled container such as for waste aqueous solutions. Alternatively, allow the solution to evaporate and treat the residue as solid waste. Arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

General science: food science experiments.

Technical: buffer preparation.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms persists, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs seek medical advice.

IF INHALED: Move patient to fresh air.

sodium dichromate dihydrate

bichromate of soda; disodium dichromate dihydrate

DANGER

Formula $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$
CAS No. 7789-12-0
User Group 11-12S (Notes D,K)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Red-orange, odourless, deliquescent crystals.	Molar mass 298.00	ADG Class 6.1 (5.1)
SOLUBILITY Soluble in water. Insoluble in alcohol.	Melting point 140°C (-2H ₂ O) 357°C (anhydrous salt)	Packing Group II
Solubility in water 732 g/L (20°C)	Boiling point >400°C decomposes	UN Number 3086
	Specific gravity 2.35 (20°C)	Poisons Schedule S6
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer; H301 Toxic if swallowed; H312 Harmful in contact with skin; H330 Fatal if inhaled; H314 Causes severe skin burns and eye damage; H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled; H317 May cause an allergic skin reaction; H340 May cause genetic defects; H350 May cause cancer; H360 May damage fertility or the unborn child; H372 Causes damage to organs through prolonged or repeated exposure; H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, neoprene). Dichromates are strong oxidising agents and are corrosive and highly toxic. Exposure may cause irritation and corrosive injury to the skin, eyes, respiratory tract and on ingestion. Repeated or prolonged exposure can lead to sensitisation and an allergic reaction of the skin or respiratory tract. Eye contact can result in burns and permanent damage. Chromium (VI) compounds have been evaluated by the IARC as *carcinogenic to humans*. Handle only in an operating fume cupboard. Avoid generating or inhaling dust. Avoid ingestion and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources. The purchase of a dilute solution of the potassium salt is recommended so as to avoid handling and storing the solid reagent.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from moisture and sunlight. Store away from heat and sources of ignition. Store away from reducing agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: in dilute solution, to distinguish between primary, secondary and tertiary alcohols.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition and any combustible material from the spill area. **Solid spill:** Spills can be covered with damp sand to avoid dust formation. Collect spill material with a non-sparking tool and place in suitable labelled container. Store for collection. **Solution spill:** Cover with non-combustible absorbent such as sand, vermiculite or bentonite. Treat as for solid spill. Apply a dilute solution of a reducing agent (sodium bisulfite, sodium metabisulfite or sodium thiosulfite) to the spill area. Cover the solution with absorbent material (see above). Collect material and add to a large volume of water. The resulting solution should be green due to chromium (III) ion. If it is orange or grey, add further reducing agent portionwise with stirring until a green colour is obtained. Dispose of the solution down the sink. Dispose of solid material as general waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The substance must not be disposed of as general waste. Store waste or surplus sodium dichromate in the original container or other suitable labelled container and arrange for collection by a licenced waste disposal contractor. The hazard of chromium (VI) in solution can be lessened by treatment with a reducing agent (see above) to give a green solution of chromium (III) ions.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISONS CENTRE or doctor.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.
 POISONS CENTRE: 13 11 26

DANGER

Formula Na₂S₂O₄
CAS No. 7775-14-6
User Group 7-12S



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White or yellow-grey, crystalline solid with a slight odour of sulfur dioxide.	Molar mass 174.11	ADG Class 4.2
SOLUBILITY Soluble in water. Slightly soluble in alcohol.	Melting point ca 100°C decomposes	Packing Group II
Solubility in water 250 g/L (20°C)	Boiling point -	UN Number 1384
	Specific gravity 2.5 (20°C)	Poisons Schedule -
	Flammability Combustible. Can self-ignite in moist air.	Security -

HAZARD STATEMENTS

H251 Self-heating; may catch fire
H302 Harmful if swallowed
AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong reducing agent. Exposure may cause irritation to the skin, eyes and respiratory tract. Exposure via inhalation or ingestion can result in an allergic response in individuals who are sensitive to sulfur.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Keep work area clean and dry. Do not leave the container open. Toxic sulfur dioxide gas may be produced if the substance is heated or exposed to acid. In solution, the substance will decompose to hydrogen sulfate, thiosulfate and hydrogen sulfite; sulfur dioxide is generated under strongly acidic conditions. Cool, alkaline solutions (pH 9-11) of the substance are more stable.

STORAGE

The substance can heat and ignite spontaneously in air on contact with a small amount of water.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture.

Store away from acids, oxidising agents and combustible materials. Store with spontaneously combustible substances (DG Class 4.2).

APPLICATIONS

General science: in solution, as a reducing agent; experiments with dyes (indigo).

Technical: cleaning agent for reducing and sequestering metal ions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid or solution spill: Cover spill with a 1:1:1 mixture of sodium carbonate, sand and absorbent material such as vermiculite or bentonite. Collect material and add to a large volume of water. Treat with household bleach and neutralise as for Waste Disposal, and decant the solution down the sink. Dispose of residual solid material as general waste. Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Add to a large volume of water. Add to the solution an equal quantity of sodium carbonate. Slowly add household bleach in the ratio of 30 mL for each gram of sodium dithionite. Allow to stand for 1-2 hours. Test for the presence of sodium dithionite by addition of 1-2 drops of silver nitrate solution to 1-2 mL of the dithionite/bleach solution. A black precipitate indicates the presence of unreacted dithionite; the solution should be treated further with bleach. When the reaction is complete, neutralise to within pH 6-8 and wash down the sink.

Large quantity: Store in a separate labelled container and arrange for collection by a licenced waste disposal contractor. Do not mix with any other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation or other symptoms occur, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms appear, seek medical advice/attention.



sodium hydrogen carbonate

sodium bicarbonate; baking soda

Formula NaHCO₃

CAS No. 144-55-8

User Group F-12

DESCRIPTION

Colourless, odourless crystals, granules or powder

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 96 g/L (20°C)

PHYSICAL DATA

Molar mass 84.01

Melting point 270°C decomposes

Boiling point -

Specific gravity 2.22 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions are weakly basic.

Exposure may cause mild irritation to the skin, eyes and respiratory tract. Prolonged or repeated skin contact may cause drying and cracking.

Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

When heated above 50°C, the bicarbonate gradually decomposes to give sodium carbonate, water and carbon dioxide.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: acid-base chemistry.

Senior chemistry: example of a weak base.

Technical: preparation of buffers; neutralising agent.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up spill material into a plastic container. Treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: (i) Seal in a plastic bag and dispose of as general waste. Alternatively, (ii) Wearing PPE and working in a fume cupboard, add waste sodium bicarbonate slowly to a large volume of water. Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation occurs, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing. Rinse skin thoroughly with water. If symptoms occur, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.



sodium hydrogen sulfate

sodium bisulfate; sulfuric acid, monosodium salt

DANGER



Formula NaHSO₄
CAS No. 7681-38-1
User Group 11-12

DESCRIPTION

Colourless, odourless crystals or powder with a faint acidic odour.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 1080 g/L (20°C)

PHYSICAL DATA

Molar mass 120.06
Melting point 315°C decomposes
Boiling point -
Specific gravity 2.103 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group II
UN Number 3260
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic and corrosive. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust, vapours or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Contact with most metals in the presence of water generates flammable hydrogen gas. Heating to decomposition may generate toxic and corrosive fumes of sulfur oxides and sulfuric acid.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from alkalis, oxidising agents and alcohols. Store with corrosive solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; generation of copper sulfate by its reaction with copper oxide.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Adjust to within pH 6-8 and decant solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solutions: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink after neutralising to within pH 6-8. Larger quantities: neutralise to within pH 6-8 and store in a suitable labelled container such as for waste inorganic solutions and arrange for collection.

Solid: Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If effects persist, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms appear, seek medical advice/attention.

POISONS CENTRE: 13 11 26



Formula NaOH
CAS No. 1310-73-2
User Group 11-12

DESCRIPTION

Colourless, odourless, hygroscopic pellets or flakes.

SOLUBILITY

Soluble in water, alcohol and glycerol. Insoluble in acetone and diethyl ether.

Solubility in water 1090 g/L (20°C)

PHYSICAL DATA

Molar mass 40.00
Melting point 318-323°C
Boiling point 1390°C
Specific gravity 2.13 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group II
UN Number 1823
Poisons Schedule S6
Security IDM Cat 3

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The solid and solutions are highly corrosive; aqueous solutions are strongly basic. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury. Skin contact may cause irritant dermatitis.

Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Dissolution of the hydroxide in water generates much heat. Carry out solution preparation in an operating fume cupboard. Place the mixing vessel in an ice-bath and add the solid cautiously to water. Avoid inhaling mist or fumes from the hot solution.

STORAGE

The hydroxide is hygroscopic and reacts with carbon dioxide from the air to form sodium carbonate. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air and moisture. Avoid storing solutions of the hydroxide in glass bottles, especially those with glass stoppers, as the hydroxide will react with the glass and the stopper may become fused. Store away from acids, oxidising agents, metals, ammonium salts and organic materials. Store with corrosive solids.

APPLICATIONS

General science: an example of a strong base; to demonstrate an exothermic dissolution process.
Senior chemistry: diluted, in acid-base titrations.

SPILLS

Wear PPE. Ensure good ventilation.

Small spill: Scoop into a plastic container. Treat as for Waste Disposal.

Large spill: Scoop up and place into a suitable labelled container and store for collection.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wear PPE and work in a fume cupboard. Add waste sodium hydroxide slowly, with stirring, to a large volume of ice-water. Neutralise the solution to within pH 6 - 8 by slow addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Large quantity: Place in a suitable labelled container. Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26



sodium hypochlorite, 5-9% solution

bleach; hypochlorous acid, sodium salt

WARNING



Formula NaOCl
CAS No. 7681-52-9
User Group 7-12S

DESCRIPTION

Pale yellow liquid with a pungent chlorine-like odour.

SOLUBILITY

Miscible with water. Reacts with organic solvents.

Solubility in water Miscible

PHYSICAL DATA

Molar mass 77.44
Melting point -6°C (5%)
Boiling point decomposes
Specific gravity 1.1 (6%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The solution is a moderately strong oxidising agent and is strongly alkaline. Exposure may cause severe irritation to the skin, eyes and respiratory tract and on ingestion. Asthma, dermatitis or conjunctivitis can result from repeated or prolonged inhalation, skin or eye exposure (respectively).

Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist and contact with skin, eyes and clothing. Handle away from heat and sources of ignition. Take care when opening the bottle in case of overpressurisation.

Mixing bleach with acid, particularly hydrochloric acid, generates toxic chlorine gas.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Commercial bleach solutions are expected to be relatively stable but will decompose slowly over time, releasing low concentrations of oxygen and chlorine gases. Decomposition is accelerated with exposure to heat, sunlight, metal oxides or other impurities.

Store away from reducing agents, strong acids, organic substances, combustible materials, powdered metals, amines, ammonium salts.

Store with corrosive substances (non-acids).

APPLICATIONS

General science: example of a household substance.

Senior biology: an antimicrobial agent.

Senior chemistry: determination of chlorine in bleach.

Technical: preparation of chlorine or bromine water; disinfectant.

SPILLS

Wear PPE. Ensure good ventilation. Dilute spill with water and wash down the sink with further dilution.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Dilute to a concentration of $\leq 0.5\%$ and wash down the sink. Alternatively, sodium hypochlorite solution can be treated with a reducing agent. 100mL of 10% sodium bisulfite or sodium metabisulfite will reduce 100 mL of 5% sodium hypochlorite solution. Work in a fume cupboard. Dilute the hypochlorite solution to a concentration $\leq 5\%$. Add the reducing agent slowly to the hypochlorite solution, with stirring. Neutralise the resulting solution to within pH 6-8 by cautious addition of hydrochloric acid (1M). Wash the neutral solution down the sink with further dilution.

Large quantity of surplus sodium hypochlorite: Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

sodium hypochlorite, 10-12.5% solution

bleach; hypochlorous acid, sodium salt

ANGER

Formula NaOCl
CAS No. 7681-52-9
User Group 7-12S



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Pale yellow liquid with a pungent chlorine-like odour. Commercial products of this concentration are available as swimming pool 'chlorine' or industrial bleach.	Molar mass 77.44	ADG Class 8
SOLUBILITY Miscible with water. Reacts with organic solvents.	Melting point -25°C (8-12.5%)	Packing Group III
Solubility in water Miscible	Boiling point decomposes	UN Number 1791
	Specific gravity 1.2 (14%)	Poisons Schedule S5
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H314 Causes severe skin burns and eye damage
H400 Very toxic to aquatic life
AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The solution is a moderately strong oxidising agent and is strongly alkaline. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact may cause burns and permanent damage. Asthma, dermatitis or conjunctivitis can result from repeated or prolonged inhalation, skin or eye exposure (respectively). Handle in an operating fume cupboard or well-ventilated area. Avoid breathing vapour or mist and contact with skin, eyes and clothing. Handle away from heat and sources of ignition. Take care when opening the bottle in case of overpressurisation.

Mixing bleach with acid, particularly hydrochloric acid, generates toxic chlorine gas.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Commercial bleach solutions are expected to be relatively stable but will decompose slowly over time, releasing low concentrations of oxygen and chlorine gases. Decomposition is accelerated with exposure to heat, sunlight, metal oxides or other impurities.

Store away from reducing agents, strong acids, organic substances, combustible materials, powdered metals, amines, ammonium salts.

Store with corrosive substances (non-acids).

APPLICATIONS

General science: (diluted) example of a household substance.

Senior biology: an antimicrobial agent.

Senior chemistry: determination of chlorine in bleach; pool chemistry investigations.

Technical: preparation of chlorine or bromine water; disinfectant.

SPILLS

Wear PPE. Ensure good ventilation. Dilute spill with water and wash down the sink with further dilution.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Dilute to a concentration of $\leq 0.5\%$ and wash down the sink. Alternatively, sodium hypochlorite solution can be treated with a reducing agent. 100mL of 10% sodium bisulfite or sodium metabisulfite will reduce 100 mL of 5% sodium hypochlorite solution. Work in a fume cupboard. Dilute the hypochlorite solution to a concentration $\leq 5\%$. Add the reducing agent slowly to the hypochlorite solution, with stirring. Neutralise the resulting solution to within pH 6-8 by cautious addition of hydrochloric acid (1M). Wash the neutral solution down the sink with further dilution.

Large quantity of surplus sodium hypochlorite: Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.

IF ON SKIN: Remove immediately all contaminated clothing and wash before reuse. Rinse skin thoroughly with water/shower. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

POISONS CENTRE: 13 11 26

Formula NaI
CAS No. 7681-82-5
User Group 7-12



DESCRIPTION

Colourless, odourless crystals or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water, alcohol, acetone and glycerol.

Solubility in water 1793 g/L (20°C)

PHYSICAL DATA

Molar mass 149.89
Melting point 651-661°C
Boiling point 1304°C
Specific gravity 3.67 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule
Security IDM Cat 2

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. The substance is moderately toxic by ingestion or inhalation. Prolonged exposure to iodides can lead to iodism in sensitive individuals. Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The substance can react violently with strong oxidising agents, with generation of iodine fumes.

STORAGE

The salt is deliquescent and on exposure to air and light, gradually turns brown, with liberation of iodine. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from air, light and moisture. Store away from acids, alkali metals and oxidising agents. Store with general inorganic solids.

APPLICATIONS

General science: precipitation reactions.
Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantities of dilute solutions (concentration < 1%) may be washed down the sink.

Large quantity: Store waste solid in a suitable labelled container such as for waste inorganic solids. Solutions should be adjusted to within pH 6-8 and stored as aqueous waste. Solutions may be allowed to evaporate in a fume cupboard and the solid residue stored accordingly. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water and soap. If irritation occurs, get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other respiratory symptoms occur, seek medical attention.

Formula NaIO₃
CAS No. 7681-55-2
User Group 11-12S (Note B)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White, odourless crystals or powder.	Molar mass 197.89	ADG Class 5.1
SOLUBILITY Soluble in water, acetone and acetic acid. Insoluble in methanol.	Melting point ca.560°C(decomposes)	Packing Group II
Solubility in water 81 g/L (20°C)	Boiling point -	UN Number 1479
	Specific gravity 4.28 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H317 May cause an allergic skin reaction
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Sodium iodate is a moderately strong oxidising agent. Exposure may cause severe irritation and corrosive injury to the skin, eyes and respiratory and digestive tracts. Eye contact may cause permanent damage. Symptoms of allergic reaction may include rash, itching or breathing difficulty. Iodates are toxic to retinal cells by ingestion; ingestion of a large amount may lead to visual impairment. Handle in a well-ventilated area. Avoid generating or inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and other sources of ignition. In case of fire, use flooding quantities of water; do not use dry chemical, CO₂ or foam extinguisher.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place. Over time, sodium iodate can decompose on exposure to light, heat or air and moisture. Protect from air, moisture and direct sunlight. Store away from heat and all sources of ignition. Store away from reducing agents, flammable substances, combustible materials, acids and alkalis. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: the iodine clock reaction; demonstration of the Briggs-Rauscher oscillating reaction.
Technical: preparation of haematoxylin microscopy stain.

SPILLS

Wear PPE. Remove all sources of ignition and any combustible materials from the spill area. Ensure good ventilation.

Solid spill: Collect material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Absorb with non-combustible material such as sand, vermiculite or bentonite (clay cat litter). Collect with a non-sparking tool. Add material slowly to a large volume of water and reduce the iodate and neutralise the solution as for Waste Disposal. Decant the supernatant down the sink and dispose of solid residue as general waste.

Wash spill area thoroughly with water; ensure no iodate residue remains in contact with combustible material. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid sodium iodate must not be disposed of with general waste. Store surplus or waste sodium iodate in the original container or other suitable labelled container. Arrange for collection by licenced waste disposal contractor.

Small quantity of waste solution: Treat with a reducing agent: 18 mL of 10% w/v solution of either sodium bisulfite or sodium metabisulfite will reduce 10 mL of saturated (ca. 0.4M) sodium iodate solution or a solution containing 1g of the salt. Add the bisulfite or metabisulfite solution to the iodate solution until a persistent pale yellow colour is obtained. Neutralise the solution with sodium carbonate to within pH 6-8 and flush down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with soap and plenty of water. If skin irritation or rash occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or doctor.

POISONS CENTRE: 13 11 26

ANGER

Formula $\text{Na}_2\text{S}_2\text{O}_5$
CAS No. 7681-57-4
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to yellowish crystals, granules or powder with a slight odour of sulfur dioxide.	Molar mass 190.11	ADG Class -
SOLUBILITY Soluble in water and glycerol. Slightly soluble in alcohol.	Melting point > 150°C decomposes	Packing Group -
Solubility in water 650 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 1.4 (25°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage
AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong reducing agent and forms acidic and corrosive aqueous solutions. Exposure may cause irritation to the skin and severe irritation to the eyes and respiratory tract. Eye contact can cause permanent eye damage. Repeated exposure can lead to sensitisation. Exposure via the skin, inhalation or ingestion can result in an allergic response in individuals who are sensitive to sulfites.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust, vapours or mist. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

On contact with acid or on heating, the substance decomposes, liberating toxic sulfur dioxide gas.

STORAGE

The substance is air- and moisture-sensitive. Oxidation to the sulfate occurs over time on exposure to air, particularly in the presence of moisture.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents and acids.

Store with general inorganic solids.

APPLICATIONS

Food science: investigations of its properties as a food/wine preservative.

Senior chemistry: qualitative inorganic analysis; iodine clock reaction; redox titrations.

Technical: for reducing an oxidising substance.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Treat as for Waste Disposal. Dispose of residual solid material as general waste.

Wash the spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Metabisulfite ion can be oxidised to sulfate ion by its reaction with hypochlorite (bleach) as follows: mix equal quantities of sodium metabisulfite and sodium carbonate and add to a large volume of water. Slowly, with stirring, add household bleach (5% NaOCl) in the ratio of 19 mL per gram of metabisulfite. Allow the solution to stand for several hours. Neutralise to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container such as for waste toxic inorganic substances and arrange for collection by a licenced waste disposal contractor. Do not mix with incompatible waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical attention if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention if effects persist.

POISONS CENTRE: 13 11 26

sodium metasilicate, pentahydrate

disodium metasilicate pentahydrate; water glass

DANGER

Formula $\text{Na}_2\text{SiO}_3 \cdot 5\text{H}_2\text{O}$

CAS No. 10213-79-3

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless granules.	Molar mass 212.14	ADG Class 8
SOLUBILITY Soluble in water. Insoluble in alcohol.	Melting point 72°C (-5H ₂ O) 1090°C (anhydrous)	Packing Group III
Solubility in water 840 g/L (20°C)	Boiling point -	UN Number 3253
	Specific gravity 1.75	Poisons Schedule S5
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the substance are strongly alkaline. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion. Handle in a well-ventilated area. Avoid generating dust and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The substance reacts with acidic solutions exothermically, forming a gel.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents and acids.
Store with general inorganic solids.

APPLICATIONS

General science: preparation of crystals and crystal gardens; preparation of a silicone polymer.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Collect spill material and treat as for Waste Disposal.
Solution spill: Neutralise spill and cover with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.
Wash the spill area thoroughly with warm water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Transfer to a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.
Solution: Adjust to within pH 6-8. Small amount: wash down the sink or take up with absorbent material and dispose of as general waste. Larger amount: Transfer to a suitable labelled container such as for waste aqueous solutions and store for collection.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Immediately call a POISONS CENTRE or doctor.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water and soap. If irritation occurs, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention if cough or other symptoms occur.
POISONS CENTRE: 13 11 26

sodium molybdate dihydrate

disodium molybdate dihydrate; molybdic acid, disodium salt

Formula $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$

CAS No. 10102-40-6

User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals.	Molar mass 241.95	ADG Class -
SOLUBILITY Soluble in water.	Melting point 130°C (-2H ₂ O) 687°C (anhydrous)	Packing Group -
Solubility in water 840 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 3.78 (anhydrous)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. The substance may be harmful if absorbed by inhalation or through the skin and is moderately toxic by ingestion, particularly in high doses. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents and halogens.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: demonstrations of the oxidation states of molybdenum and of its complexes.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Transfer to a suitable labelled container such as for waste inorganic solids or aqueous solutions, as appropriate.

Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if symptoms occur.

WARNING

Formula NaNO₃
CAS No. 7631-99-4
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals, granules or powder with a bitter, saline taste.	Molar mass 84.99	ADG Class 5.1
SOLUBILITY Soluble in water and glycerol. Slightly soluble in alcohol and acetone.	Melting point 308°C	Packing Group III
Solubility in water 874 g/L (20°C)	Boiling point 380°C	UN Number 1498
	Specific gravity 2.26 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security CSC

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong oxidising agent. Exposure may cause irritation to the skin, eyes and respiratory tract. The substance is moderately toxic by ingestion or inhalation. Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and ignition sources. Mixing of the substance with reducing agents and/or combustible material may result in fire or explosion, liberating toxic oxides of nitrogen. In case of fire, use water as the extinguishing agent. The preparation of explosive mixtures is not recommended.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Store away from heat and sources of ignition. Store away from acids, alkali metals, powdered metals, organic substances, reducing agents and combustible materials. Do not store on wooden surfaces. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

General science: flame tests.
Senior chemistry: qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation. Remove combustible material and ignition sources from the spill area.
Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.
Solution spill: Cover spill with absorbent, non-combustible material such as sand, vermiculite or bentonite. Collect with a non-sparking tool and transfer to a suitable labelled container and store for collection. Do not mix with other waste. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solution waste: Small volumes of dilute solutions (concentration < 1%) may be washed down the sink.
Large quantity: Place in a suitable labelled container and store for collection by a licenced waste disposal contractor. Concentrated solutions may be allowed to evaporate and the sludge stored in a labelled container for collection. Solutions of nitrates should not be heated to evaporate and should not be evaporated to dryness. Do not mix with other waste. Alternatively, the salt can be applied as a fertilizer for lawn or ornamental plants.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs, get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other respiratory symptoms occur, seek medical attention.
POISONS CENTRE: 13 11 26



Formula $\text{Na}_2\text{C}_2\text{O}_4$

CAS No. 62-76-0

User Group 7-12

DESCRIPTION

Colourless, odourless powder.

SOLUBILITY

Soluble in water. Insoluble in alcohol or ether.

Solubility in water 37 g/L (20°C)

PHYSICAL DATA

Molar mass 134

Melting point 250-270°C
decomposes

Boiling point -

Specific gravity 2.27 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule S6

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H312 Harmful in contact with skin

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance can act as a weak reducing agent. Aqueous solutions of the salt are moderately alkaline. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage. Ingestion can lead to kidney damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition may produce toxic fumes of carbon and sodium oxides.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; redox chemistry.

Technical: a reducing agent; primary standard for standardising potassium permanganate solution.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Adjust to within pH 6-8 and decant solution down the sink. Dispose of residual solid material as general waste.

Wash the spill area thoroughly with detergent and water.

Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store waste or surplus sodium oxalate in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If available, give plenty of milk. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26



sodium phosphate, dibasic

disodium hydrogen orthophosphate; phosphoric acid, disodium salt

Formula Na_2HPO_4

CAS No. 7558-79-4

User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder with a saline taste.

SOLUBILITY

Soluble in water. Very slightly soluble in alcohol.

Solubility in water 77 g/L (20°C)

PHYSICAL DATA

Molar mass 141.96

Melting point ca 250°C decomposes

Boiling point -

Specific gravity ca 1.7 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately alkaline. Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of a large quantity may cause gastric upset.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. The salt may react violently with strong acids.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: food science experiments.

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Small quantities of solid may be disposed of as general waste.

Larger quantity: Store waste solid in a suitable labelled container such as for waste inorganic solids. Waste solutions can be evaporated in a fume cupboard and the residue treated as solid waste, or the pH adjusted to within 6-8 and the solution transferred to a suitable labelled container such as for waste aqueous solutions.

Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If symptoms persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical advice/attention.

sodium phosphate, monobasic, dihydrate

*monosodium dihydrogen orthophosphate dihydrate;
phosphoric acid, monosodium salt*

Formula $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$

CAS No. 13472-35-0

User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 156.02	ADG Class -
SOLUBILITY Soluble in water. Practically insoluble in alcohol.	Melting point >170°C decomposes	Packing Group -
Solubility in water 850 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 1.915 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are moderately acidic. Exposure may cause mild irritation to the skin, eyes and respiratory tract. Ingestion of a large quantity may cause gastric upset.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from strong acids and strong bases.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis.

Technical: buffer preparation.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Small volumes of dilute solutions (concentration < 1%) can be washed down the sink. Small quantities of solid may be disposed of as general waste.

Larger quantity: Store waste solid in a suitable labelled container such as for waste inorganic solids. Waste solutions can be evaporated in a fume cupboard and the residue treated as solid waste, or the pH adjusted to within 6-8 and the solution transferred to a suitable labelled container such as for waste aqueous solutions.

Arrange for collection by a licenced waste contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical advice.

sodium phosphate, tribasic, dodecahydrate

trisodium orthophosphate dodecahydrate

WARNING



Formula $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$

CAS No. 10101-89-0

User Group 7-12

DESCRIPTION

Colourless, odourless crystalline solid or powder.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 285 g/L (20°C)

PHYSICAL DATA

Molar mass 380.12

Melting point ca. 75°C

Boiling point 100°C (-11H₂O)

Specific gravity 1.62 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number -

Poisons Schedule S5

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are strongly alkaline. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent eye damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance corrodes some metals such as aluminium, zinc, tin and magnesium, the reaction producing flammable hydrogen gas.

The reaction of the salt with acids can be violent and exothermic.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and metals.

Store with general inorganic solids.

APPLICATIONS

General science: investigations of the chemistry of detergents.

Senior chemistry: precipitation reactions; qualitative inorganic analysis.

SPILLS

Wear PPE. Ensure good ventilation. Remove combustible material and ignition sources from the spill area.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and add to a large volume of water. Neutralise as for Waste Disposal and decant the solution down the sink. Dispose of solid residue as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

As appropriate, place in a suitable labelled container such as for waste inorganic solids or adjust the pH to within 6-8 and store with waste aqueous solutions. Arrange for collection by a licenced waste contractor.

Small volume of dilute solution (concentration < 1%): Adjust to within pH 6-8 and wash down the sink.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation occurs, get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If cough or other respiratory symptoms occur, seek medical attention.

POISONS CENTRE: 13 11 26



Formula $\text{Na}_2\text{O} \cdot (\text{SiO}_2)_x(\text{aq})$

CAS No. 1344-09-8

User Group 7-12

DESCRIPTION

Colourless, odourless, viscous liquid. The given classification is for a product with composition 1:1 in Na_2O and SiO_2 and a concentration of 30-60%.

SOLUBILITY

Soluble in water.

Solubility in water miscible

PHYSICAL DATA

Molar mass	-
Melting point	< 0°C
Boiling point	> 100°C
Specific gravity	1.2-1.7
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	S5
Security	-

HAZARD STATEMENTS

H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is highly alkaline. Exposure may cause irritation and burns to the skin, eyes and respiratory tract and on ingestion.

Handle in a well-ventilated area. Avoid inhaling mist or vapour. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance reacts with acid exothermically, forming a gel.

STORAGE

The solution absorbs CO_2 from the air, leading to precipitation of insoluble silica. Freezing and re-melting of the substance may cause the solution to separate, giving an inhomogeneous mixture. Gradual decomposition of the substance may occur with prolonged exposure to temperatures above 32°C.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from air. Do not store in aluminium, tin or zinc containers; flammable hydrogen gas may be generated on prolonged contact with these metals.

Store away from oxidising agents and acids.

Store with general inorganic solutions.

APPLICATIONS

General science: preparation of crystals and crystal gardens; preparation of a silicone polymer.

SPILLS

Wear PPE. Ensure good ventilation. Neutralise spill and cover with absorbent material such as sand, vermiculite or bentonite. Treat as for Waste Disposal.

Wash the spill area thoroughly with warm water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Neutralise to within pH 6-8 and wash down the sink or take up with absorbent material and dispose of as general waste.

Large quantity: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste aqueous solutions. Alternatively, take up with absorbent material and transfer to a container for waste inorganic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water and soap. If irritation occurs, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention if symptoms occur.

Formula Na_2SO_4
CAS No. 7757-82-6
User Group 7-12

DESCRIPTION

Colourless, odourless crystals, granules or powder with a bitter, saline taste.

SOLUBILITY

Soluble in water and glycerol. Insoluble in alcohol.

Solubility in water 170 g/L (20°C)

PHYSICAL DATA

Molar mass 142.04
Melting point 888°C
Boiling point > 890°C decomposes
Specific gravity 2.67 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract and on ingestion. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Adjust to within pH 6-8 and decant solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste.

Small volumes of dilute solutions (concentration < 1%) can be neutralised and washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste inorganic solids or aqueous solutions, as appropriate, and arrange for collection by a licenced waste disposal contractor.

STORAGE

The substance is hygroscopic.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; precipitation reactions; a drying agent.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

Formula $\text{Na}_2\text{S}\cdot x\text{H}_2\text{O}$

CAS No. 27610-45-3

User Group Staff



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless to yellow to brick-red flakes or crystalline solid with an odour of hydrogen sulfide.	Molar mass 78.04 (anhydrous) 240.18 (nonahydrate)	ADG Class 8
SOLUBILITY Soluble in water. Slightly soluble in alcohol. Insoluble in ether and <i>n</i> -octanol.	Melting point 50°C (nonahydrate) 1176°C (anhydrous)	Packing Group II
Solubility in water 450 g/L (20°C)	Boiling point -	UN Number 1849
	Specific gravity 1.43 (nonahydrate)	Poisons Schedule S5
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H290 May be corrosive to metals
H302 Harmful if swallowed
H311 Toxic in contact with skin
H314 Causes severe skin burns and eye damage
H400 Very toxic to aquatic life

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong reducing agent. Aqueous solutions of the substance are strongly alkaline. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Eye contact can cause permanent injury. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or vapours. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Use non-sparking tools. Do not handle the substance with bare hands. The substance reacts violently with acid, generating toxic hydrogen sulfide gas. Heating to decomposition will generate toxic fumes of oxides of sulfur. Anhydrous sodium sulfide is combustible and can self-ignite when heated.

STORAGE

The substance is hygroscopic and discolours on exposure to air and light, becoming brown-black. Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from air, light and moisture. Store away from heat and sources of ignition. Store away from acids, metals and oxidising agents. Store with corrosive solids, with secondary containment. Some manufacturers recommend storing in the refrigerator.

APPLICATIONS

Senior chemistry: in dilute solution, demonstration of precipitation reactions.
Technical: precipitation of metal ions from waste solutions.

SPILLS

Wear PPE. Ensure good ventilation. Remove combustible material and ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with a 1:1:1 mixture of sodium carbonate or calcium carbonate, and sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Sodium sulfide can be oxidised with bleach (sodium hypochlorite) to give sodium sulfate as follows: Work in an operating fume cupboard. To 90mL of household bleach (5% NaOCl), add, with stirring, 50mL of 1% NaOH solution. To the solution add 1g of sodium sulfide in portions over 1 hour. Stir the mixture for a further 1 hour. Check that the oxidant is still in excess: To 2-3 drops of the solution, add 2-3 drops of 10% KI solution. Acidify with 1 drop of 1M HCl. Add 1 drop of starch indicator (1%). A deep blue colour indicates that oxidant is still present, in which case, adjust to within pH 6-8 and wash down the sink. If the oxidant has been consumed, add a further portion of bleach and proceed as before.

Large quantity: Place in a suitable labelled container and store for collection by a licenced waste disposal contractor. Do not mix with other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26

Formula Na_2SO_3
CAS No. 7757-83-7
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder with a saline, sulfurous taste.	Molar mass 126.04	ADG Class -
SOLUBILITY Soluble in water and glycerol. Practically insoluble in alcohol.	Melting point > 500°C decomposes	Packing Group -
Solubility in water 220 g/L (20°C)	Boiling point -	UN Number None
	Specific gravity 2.63 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a strong reducing agent and is moderately toxic by ingestion of gram doses or larger amounts. Aqueous solutions of the salt are alkaline. Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Exposure via the skin, inhalation or ingestion can result in an allergic response in individuals who are sensitive to sulfites. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The substance may react violently with oxidising agents. The reaction with acids may produce toxic sulfur dioxide gas. Heating to decomposition generates toxic fumes of oxides of sodium and of sulfur.

STORAGE

The substance is air- and moisture-sensitive. Oxidation to the sulfate occurs over time, on exposure to air. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from oxidising agents and acids. Store with general inorganic solids.

APPLICATIONS

General science: redox reactions.
Technical: reducing agent; preparation of sulfur dioxide.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Collect spill material and treat as for Waste Disposal.
Solution spill: Cover spill with a 1:1:1 mixture of sodium carbonate, vermiculite or bentonite, and sand. Collect material and add to a large volume of water. Treat with household bleach and neutralise as for Waste Disposal. Decant the solution down the sink and dispose of residual solid material as general waste. Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: The sulfite ion can be oxidised to sulfate ion by its reaction with hypochlorite (household bleach) as follows: mix equal quantities of the sulfite and sodium carbonate and add to a large volume of water. Slowly, with stirring, add household bleach (5% NaOCl) in the ratio of 14 mL per gram of sulfite. Allow the solution to stand for several hours. Neutralise to within pH 6-8 and wash down the sink.
Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if effects persist.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice.



Formula $C_4H_4Na_2O_6 \cdot 2H_2O$

CAS No. 6106-24-7

User Group 7-12

DESCRIPTION

Translucent to white crystals, granules or powder. Odourless to slight tartaric odour.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 290 g/L (20°C)

PHYSICAL DATA

Molar mass 230.08

Melting point 57°C

Boiling point 120°C (-2H₂O)

Specific gravity 1.82

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water. Decant the supernatant solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dispose of solid as general waste. Small volumes of dilute solutions (concentration < 1%) can be washed down the sink.

Large quantity: Store in a suitable labelled container such as for waste organic solids and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with general organic solids.

APPLICATIONS

Food science: an emulsifier.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If rapid recovery does not occur, seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice if effects persist.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.

sodium tetraborate, decahydrate

borax decahydrate; sodium borate; disodium tetraborate decahydrate

DANGER



Formula $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$

CAS No. 1303-96-4

User Group 7-12

DESCRIPTION

Colourless, odourless crystals, granules or powder.

SOLUBILITY

Soluble in water and glycerol. Slightly soluble in acetone. Insoluble in alcohol.

Solubility in water 49.74 g/L (20°C)

PHYSICAL DATA

Molar mass	381.37
Melting point	62°C (-5H ₂ O) 320°C (-5H ₂ O) 743°C (anhydrous)
Boiling point	1575°C decomposes
Specific gravity	1.72 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	S5
Security	-

HAZARD STATEMENTS

H360 May damage fertility or the unborn child

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are alkaline. Exposure may cause mild irritation to the skin, eyes and respiratory tract. Ingestion may cause gastric upset and CNS effects. Absorption via the skin can occur if the skin is damaged or irritated. Reproductive toxicity effects have been shown in animals which were subject to high exposure levels.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The reaction with strong reducing agents, such as alkali metals, will produce flammable hydrogen gas.

The substance is non-flammable and has flame retardant properties.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Small spill: Collect material and add to a large volume of water. Adjust to within pH 6-8. Decant the supernatant solution down the sink. Larger spill: Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small volumes of dilute solution (concentration <1%) can be washed down the sink. Larger quantities of solution can be allowed to evaporate and the solid stored for collection.

Larger quantities of solid or solution waste: Store in a suitable labelled container such as for waste inorganic solids or aqueous solutions, as applicable, and arrange for collection by a licenced waste disposal contractor.

STORAGE

The substance is efflorescent in dry air, with crystals developing a powdery coating over time.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents, reducing agents and acids.

Store with general inorganic solids.

APPLICATIONS

General science: preparation of slime; crystal growing; flame test.

Technical: buffer preparation.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. Seek medical advice if effects persist.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice if effects persist.



Formula NaSCN
CAS No. 540-72-7
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 81.07	ADG Class -
SOLUBILITY Soluble in water and alcohol.	Melting point 310°C	Packing Group -
Solubility in water 1250 g/L (20°C)	Boiling point > 368°C decomposes	UN Number None
	Specific gravity 1.74 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302,H312,H332 Harmful if swallowed, in contact with skin or if inhaled
H412 Harmful to aquatic life with long lasting effects
AUH032 Contact with acids liberates very toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract and on ingestion. Chronic exposure may lead to gastrointestinal and CNS effects. Ingestion of a large quantity can result in convulsions and loss of consciousness.
Handle in a well-ventilated area. Avoid generating dust and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Mixing with acid can generate highly toxic hydrogen cyanide gas. Heating to decomposition generates highly toxic gases (oxides of sodium, sulfur and nitrogen, and hydrogen cyanide). The reaction with oxidising agents may be violent or explosive.

STORAGE

The substance is hygroscopic and light-sensitive. Decomposition occurs over time, on exposure to light. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat. Protect from moisture and sunlight.
Store away from oxidising agents and acids.
Store with general inorganic solids.

APPLICATIONS

General science: preparation of artificial blood.
Senior chemistry: test for Fe(III) ion; qualitative analysis.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Collect spill material and treat as for Waste Disposal.
Solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. For very minor spills, collect material and add to a large volume of water. Decant solution down the sink and dispose of residual solid material as general waste. For larger spills, collect material and treat as for Waste Disposal.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for waste inorganic solids and arrange for collection by a licenced waste disposal contractor.
Solutions: Neutralise to within pH 6-8 and transfer to a suitable labelled container such as for waste inorganic salt solutions and stored for collection.
Do not mix with incompatible waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Call a POISONS CENTRE or doctor if you feel unwell.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Rinse skin thoroughly with plenty of water. If irritation persists, seek medical advice.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.
POISONS CENTRE: 13 11 26

sodium thiosulfate, pentahydrate

sodium hyposulfite pentahydrate; 'hypo'

Formula $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

CAS No. 10102-17-7

User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White, translucent, odourless crystals or powder.	Molar mass 248.18	ADG Class -
SOLUBILITY Soluble in water. Insoluble in alcohol.	Melting point 48°C	Packing Group -
Solubility in water 701 g/L (20°C)	Boiling point 100°C (-5H ₂ O)	UN Number None
	Specific gravity 1.67	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The substance is a mild reducing agent. Exposure may cause slight irritation to the skin, eyes and respiratory tract. Prolonged or repeated skin contact may result in dermatitis.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition produces toxic fumes of sodium oxide and sulfur oxides. The reaction with acids generates toxic sulfur dioxide gas. The reaction with oxidising agents may be violent.

STORAGE

The substance is hygroscopic in moist air and efflorescent above 33°C in dry air. Thiosulfate in aqueous solution slowly decomposes at room temperature, and more rapidly when heated.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: investigations of the rate of its reaction with hydrochloric acid.

Senior chemistry: titrimetric determination of iodine.

Technical: a reducing agent.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Small solution spill: Cover spill with absorbent material such as paper towel, sand, vermiculite or bentonite. Collect material and add to a large volume of water and decant the solution down the sink. Dispose of residual solid material as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity of solution: Small volumes of dilute solutions (concentration <1%) can be washed down the sink. Larger volumes of solutions can be treated with household bleach (5% sodium hypochlorite) to oxidise the thiosulfate to sulfate ion as follows: Add an equal quantity of sodium carbonate to the thiosulfate solution. Slowly, with stirring add bleach, in portions, in the ratio of 23 mL of bleach per gram of sodium thiosulfate pentahydrate. Allow the mixture to stand for 1-2 hours, then neutralise it to within pH 6-8 and wash down the sink.

Large quantity: Store in a suitable labelled container such as for waste inorganic solids or aqueous solutions, as appropriate, and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice if effects persist.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice if feeling unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.



Formula $C_{18}H_{36}O_2$

CAS No. 57-11-4

User Group F-12

DESCRIPTION

White to pale yellow waxy solid (flake, crystal or powder) with a light tallow-like odour.

SOLUBILITY

Practically insoluble in water. Soluble in alcohol, acetone, toluene and diethyl ether.

Solubility in water 0.597 mg/L (25°C)

PHYSICAL DATA

Molar mass 284.48

Melting point 69-70°C

Boiling point 350°C (decomposes)

Specific gravity 0.941 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Ingestion of large amounts may cause gastric irritation.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes, and clothing.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents, reducing agents and bases.

Store with general organic solids.

APPLICATIONS

General science: to observe the melting and freezing points of stearic acid; to observe its emulsifying properties; preparation of hand cream.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Scoop up with a non-sparking tool. Treat as for waste acid.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Scoop up and add to a large volume of water. Neutralise the solution as for Waste Disposal. Decant neutral solution down the sink. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Wrap well in paper and dispose of as general waste.

Alternatively, dissolve waste by adding to 5% sodium carbonate solution. Test the pH with pH paper and neutralise the solution to within pH 6-8 by addition of sodium carbonate or dilute hydrochloric acid (0.5M) in portions as necessary. Flush the neutral solution down the sink.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If symptoms occur, seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of water and mild soap. If symptoms occur, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.



strontium chloride hexahydrate

strontium chloride hexahydrate

DANGER



Formula SrCl₂·6H₂O

CAS No. 10025-70-4

User Group 7-12

DESCRIPTION

Odourless, white, crystalline needles with sharp, bitter taste.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol and acetone.

Solubility in water 1062 g/L (0°C)

PHYSICAL DATA

Molar mass 266.61

Melting point 61°C 150°C (-6H₂O)
874°C (anhydrous)

Boiling point 1250°C anhydrous

Specific gravity 1.93

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation and burns to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from heat, light and moisture. Store away from oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: flame tests.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources from the spill area.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as the original container or with waste inorganic salts or their solutions. Arrange for collection by a licenced waste disposal contractor.

Strontium ions can be precipitated from solution as the sulfate by addition of sodium sulfate solution.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Brush any visible particles off skin. Wash skin thoroughly with plenty of water and soap. If irritation occurs, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms appear, seek medical advice/attention.

Formula Sr(NO₃)₂
CAS No. 10042-76-9
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals, powder or granules with a bitter taste.	Molar mass 211.63	ADG Class 5.1
SOLUBILITY Soluble in water. Slightly soluble in alcohol and acetone.	Melting point 570°C	Packing Group III
Solubility in water 660 g/L (20°C)	Boiling point 645°C decomposes	UN Number 1507
	Specific gravity 2.986	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H318 Causes serious eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). The substance is a strong oxidising agent. Exposure may cause irritation and burns to the skin, eyes and respiratory tract. Eye exposure may lead to permanent eye damage.
Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
Handle away from sources of ignition and flammable or combustible materials.
The substance can react dangerously with reducing agents, alkali metals and active metals. There is a risk of explosion if the substance is subject to shock or friction.
In case of fire, use water as the extinguishing agent.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place. Protect from air and light.
Store away from heat and sources of ignition.
Store away from acids, alkalis, reducing agents, alkali metals, organic substances and combustible materials.
Do not store on shelves made from wood.
Store with oxidising substances (DG Class 5.1).

APPLICATIONS

General science: flame tests.
Senior chemistry: redox reactions; displacement reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources and combustible material from the spill area.
Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.
Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.
Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor. Do not mix with other waste.
Strontium ions can be precipitated from solution as the sulfate by addition of sodium sulfate solution.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If symptoms occur, seek medical attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing.



Formula H₃NSO₃
CAS No. 5329-14-6
User Group 11-12S

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless crystals or powder.	Molar mass 97.09	ADG Class 8
SOLUBILITY Soluble in water. Slightly soluble in acetone. Sparingly soluble in ethanol, methanol. Insoluble in diethyl ether.	Melting point 205°C (decomposes)	Packing Group III
Solubility in water 213 g/L (20°C)	Boiling point -	UN Number 2967
	Specific gravity 2.13 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H412 Harmful to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (latex, nitrile, neoprene). Sulfamic acid is a moderately strong acid.
Exposure can cause irritation and severe burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in corneal burns with permanent damage.
Handle in an operating fume cupboard or well-ventilated area away from sources of ignition. Avoid generating and inhaling dust and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Store away from heat and source of ignition.
In aqueous solution, the acid slowly hydrolyses to form ammonium sulfate and bisulfate. When mixed with water, the acid is corrosive to metals, with generation of flammable hydrogen gas.
Store away from oxidising agents and alkalis.
Store with corrosive solids.

APPLICATIONS

General science: diluted, an example of a fairly strong inorganic acid.
Senior chemistry: a primary standard in the determination of basic solutions by titration.
Technical: to remove limescale and rust from glassware.

SPILLS

Wear PPE. Ensure good ventilation.
Solid spill: Scoop up with a non-sparking tool.
Solution spill: Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.
Small spill: Add material slowly to a large volume of water. Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.
Large spill: Place material in a suitable labelled container. Arrange for collection by a licenced contractor.
Wash spill area thoroughly with water.
Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift.
Small quantity: Wear PPE and work in a fume cupboard. Add the waste acid slowly to a large volume of water. Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.
Large quantity: Store in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula S
CAS No. 7704-34-9
User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Yellow, odourless powder, granules, flakes or pastilles.	Molar mass 32.06	ADG Class 4.1
SOLUBILITY Practically insoluble in water. Soluble in toluene. Slightly soluble in acetone, ethanol and diethyl ether.	Melting point 113-119°C	Packing Group III
Solubility in water Practically insoluble.	Boiling point 444-445°C	UN Number 1350
	Specific gravity 1.96-2.07 (20°C)	Poisons Schedule -
	Flammability Flammable	Security -

HAZARD STATEMENTS

H228 Flammable solid
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure to dust or vapour may cause irritation to the skin, eyes, nose, throat and respiratory tract. Symptoms of exposure may include cough, shortness of breath, headache and nausea. Prolonged or repeated exposure can lead to skin sensitisation and dermatitis, and permanent eye damage. Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. The vapour or dust can form combustible mixtures with air. Handle away from heat and sources of ignition. Burning of sulfur generates harmful and irritating sulfur dioxide gas and should be conducted in an operating fume cupboard.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from sources of heat or ignition. Store away from oxidising agents, ammonia, ammonium nitrate, bases, amines, alkali metals, alkali earth metals, metals and halogens. Store with flammable solids (DG Class 4.1).

APPLICATIONS

General science: qualitative properties of the element; conductivity investigations.
Senior chemistry: demonstration simulating the formation of acid rain; demonstration of the formation of copper sulfide from the elements.

SPILLS

Wear PPE. Remove all sources of ignition. Ensure good ventilation.
Solid spill: Collect with a non-sparking tool and treat as for Waste Disposal.
Molten sulfur: Cover with sand or other non-combustible absorbent. Collect with a non-sparking tool and treat as for Waste Disposal.
Ventilate spill area and wash thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: If uncontaminated with hazardous material, waste or surplus sulfur can be applied to soil as a conditioner. The application of sulfur to soil has the effect of lowering the pH over time. Recommended application rates are in the range of 25 to 100 grams of sulfur per square metre, which is dug into the top 10 cm of soil.
Large quantity: Store in a suitable labelled container and arrange for collection by a licenced waste disposal contractor. Be careful not to mix sulfur waste with incompatible chemicals/materials.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical attention.
IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

sulfur dioxide, generated from a reaction

sulphur dioxide; sulfurous oxide

DANGER

Formula SO₂
CAS No. 7446-09-5
User Group Staff



DESCRIPTION	PHYSICAL DATA	
Colourless gas with a pungent, irritating odour.	Molar mass 64.06	Vapour density (air = 1) 2.26
	Melting point -75°C	Liquid density (water = 1) -
	Boiling point -10°C	Flammability Non-combustible
	Solubility in water 228.3 g/L (0°C) 112.7 g/L (20°C)	Flammability Range (% by volume of air) -

HAZARD STATEMENTS

H331 Toxic if inhaled
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (neoprene, nitrile). Sulfur dioxide is toxic and corrosive and has both oxidising and reducing properties; aqueous solutions of the gas are acidic. Exposure may cause irritation and possible burns to the skin, eyes and respiratory tract. Eye exposure can cause permanent eye damage. Inhalation of SO₂ can aggravate respiratory conditions such as asthma.

Preparation and handling of the gas should only be carried out in an operating fume cupboard by trained staff.

Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance can react dangerously with oxidising agents, reducing agents, strong alkalis and strong acids. It is corrosive to most metals in the presence of water, the reaction liberating flammable hydrogen gas.

The use of microscale techniques in the generation of the gas is recommended.

SULFUR DIOXIDE SOLUTION

Sulfur dioxide hydrolyses in water, forming sulfurous acid, H₂SO₃, which is slowly oxidised to sulfuric acid, H₂SO₄, on exposure to air.

Saturated solutions of sulfurous acid are toxic and corrosive. Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

APPLICATIONS

Demonstration of the preparation and properties of sulfur dioxide gas.

SPILLS

Accidental release of SO₂ into the lab: Evacuate the laboratory. Open external windows. Close internal windows.

Solution spill: Wear PPE. Ensure good ventilation. Dilute spill with a solution of bleach (sodium hypochlorite solution). Absorb spill and wash down the sink.

Rinse spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Wear PPE. Work in an operating fume cupboard. Discharge residual SO₂ gas or solution into a dilute solution of bleach (5.25% sodium hypochlorite). A solution prepared by diluting 10mL of bleach (5.25% sodium hypochlorite) in a large volume of water is sufficient to oxidise 100 mL of SO₂. Immerse contaminated glassware in the bleach solution. Allow the reaction mixture to stand for 1h and then wash to waste. Unused copper turnings can be rinsed, dried and stored for future use.

PREPARATION NOTES

Sulfur dioxide can be prepared by gently heating a mixture of copper turnings and concentrated sulfuric acid or alternatively, by treating a sample of sodium hydrogensulfite with dilute sulfuric acid. The gas is collected directly into the receiving vessel by upward displacement of air.

The sulfuric acid is usually the limiting reagent.

When sufficient gas has been collected, water should be added to the reaction vessel to quench the reaction.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Ingestion of the gas is considered unlikely. In case of ingestion of sulfurous acid solution: Rinse mouth. Do NOT induce vomiting. Seek immediate medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical advice/attention.

POISONS CENTRE: 13 11 26



Formula H₂SO₄
CAS No. 7664-93-9
User Group 11-12

DESCRIPTION

Colourless to slightly yellow, oily, highly corrosive, hygroscopic liquid with a faint acid odour.

SOLUBILITY

Miscible with water and ethanol (mixing generates heat).

Solubility in water Miscible

PHYSICAL DATA

Molar mass 98.08
Melting point -1.1°C (98%)
Boiling point 327.2°C (98%)
Specific gravity 1.84 (20°C, 98%)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 8
Packing Group II
UN Number 1830
Poisons Schedule S6
Security CSC IDM Cat 3

HAZARD STATEMENTS

H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (Viton®, butyl, neoprene; nitrile for splash protection). The concentrated acid is highly corrosive and has powerful dehydrating properties. It should be handled with care.

Exposure to both the liquid and mist can cause severe irritation and burns to the skin, eyes and respiratory tract and on ingestion. Eye contact may result in severe eye damage and permanent injury.

Handle only in an operating fume cupboard. Do not breathe vapour or mist. Avoid contact with skin, eyes and clothing.

Avoid prolonged or repeated exposure.

Dilution of the concentrated acid generates much heat.

When diluting, the mixing vessel should be cooled (ice-water bath) and the acid added cautiously to water.

Never add water to the concentrated acid.

STORAGE

The concentrated acid is hygroscopic. Store in a tightly closed, labelled container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Ensure container is kept upright to prevent leakage. Check container and lid periodically for damage.

Store away from reducing agents, oxidising agents, alkalis, metals, organic substances and combustible materials.

Concentrated sulfuric acid should be stored separately from all other chemicals, on a low shelf, with secondary containment.

APPLICATIONS

General science: an example of a strong inorganic acid.

Senior chemistry: a catalyst in ester preparation; to demonstrate the dehydration of sugar.

SPILLS

Wear PPE. Ensure good ventilation. Absorb spill with non-combustible absorbent such as a 1:1:1 mixture of sodium carbonate, bentonite (clay cat litter) and sand. Scoop up with a non-sparking tool.

Small spill: Add material to a large volume of water.

Neutralise as for waste disposal. Decant the neutral solution down the sink. Dispose of solid material as general waste.

Large spill: Place material in a suitable labelled container.

Arrange for collection by a licenced contractor. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

The acid is harmful to the aquatic environment due to the pH shift.

Small quantity: Wear PPE and work in a fume cupboard.

Add the waste acid slowly to a large volume of water.

Neutralise the solution to between pH 6 and 8 with sodium carbonate, adding the base cautiously in portions until there is no further evolution of CO₂. Dispose of the neutral solution down the sink.

Large quantity: Store in a suitable labelled container.

Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes.

Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISONS CENTRE or doctor.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove immediately all contaminated clothing. Rinse skin thoroughly with water/shower. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISONS CENTRE or doctor.

POISONS CENTRE: 13 11 26



Formula C₄H₆O₆

CAS No. 87-69-4

User Group 7-12

DESCRIPTION

Colourless, odourless crystalline solid. L-tartaric acid is the naturally occurring isomer.

SOLUBILITY

Soluble in water, ethanol, methanol, propanol, diethyl ether, and glycerol.

Solubility in water 1390 g/L (20°C)

PHYSICAL DATA

Molar mass 150.09

Melting point 169°C

Boiling point decomposes

Specific gravity 1.76 (20°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

H315 Causes skin irritation

H319 Causes serious eye irritation

H335 May cause respiratory irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid ingestion and contact with skin, eyes, and clothing.

In aqueous solution, tartaric acid is mildly corrosive to reactive metals such as aluminium, iron, tin and zinc.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents, reducing agents, bases, hydrogen peroxide, silver and silver compounds.

Store with general organic solids.

APPLICATIONS

General science: crystal growing; an ingredient (food grade) in sherbet.

Senior chemistry: titration of a diprotic acid.

Technical: preparation of buffer solutions.

SPILLS

Wear PPE. Ensure good ventilation. Eliminate all ignition sources.

Solid spill: Scoop up with a non-sparking tool. Treat as for waste acid.

Liquid spill: Cover spill with sodium carbonate or a 1:1:1 mixture of sand, sodium carbonate and vermiculite or bentonite (clay cat litter). Scoop up and add to a large volume of water. Neutralise the solution as for Waste Disposal. Decant neutral solution down the sink. Dispose of residual solids as general waste.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Dilute waste to a concentration of about 5% by slowly adding the acid to water with stirring. Neutralise the solution to within pH 6-8 by addition of sodium carbonate in portions (test with pH paper). Flush the neutral solution down the sink with further dilution.

Large quantity: Store in the original container or other suitable labelled container, such as for waste dry organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Call a POISONS CENTRE or doctor if you feel unwell.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with water.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

POISONS CENTRE: 13 11 26

Formula C₁₆H₁₂N₄O₉S₂.3Na

CAS No. 1934-21-0

User Group 11-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Bright orange-yellow, odourless powder.	Molar mass 534.36	ADG Class -
Dye family pyrazolone; azo	Melting point > 300°C	Packing Group -
Solubility water ¹ 300 mg/mL ethanol ¹ 0.8 mg/mL	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 425 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H317 May cause an allergic skin reaction
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. Inhalation or skin contact may induce an allergic reaction in susceptible individuals.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

APPLICATIONS

- histology: contrast stain.
- determination of tartrazine in food.

STORAGE

The substance is hygroscopic.
Store in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.
Store away from acids, bases, oxidising agents and reducing agents. Store with general organic solids or with other dyes and indicators.

References: 1. Aldrich Handbook 2. Sabnis

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation occurs, seek medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. If effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula C₂₇H₃₀O₅S

CAS No. 76-61-9

User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Dark green crystals or powder with a characteristic odour.	Molar mass 466.59	ADG Class -
Dye family sulfonephthalein	Melting point 221-224°C	Packing Group -
Solubility water ¹ 0.6 mg/mL ethanol ¹ 70 mg/mL Soluble in acetic acid and dilute alkali solution.	Flammability Combustible	UN Number None
	Absorption ¹ (λ _{max}) 594 nm, 376 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by inhalation, ingestion or if absorbed through the skin.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with ethanol. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with paper towel dampened with ethanol and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

pH indicator

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle. Arrange for collection by a licenced waste disposal contractor. collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 1.2	pH 2.8	pH 8	pH 9.2
red	yellow	yellow	blue

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation develops or persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

PREPARATION

Dissolve 0.1 g in 50mL ethanol. Make up to 250mL with distilled water.²

References: 1. Aldrich Handbook 2. Gabb & Latchem

Formula Sn
CAS No. 7440-31-5
User Group 7-12

DESCRIPTION

Soft, silver-white, ductile, malleable metal. Tin metal changes to a brittle, grey non-metallic powder over years at temperatures below 13°C.

SOLUBILITY

Insoluble in water. Reacts with hydrochloric acid, sulfuric acid, aqua regia, alkali solution.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass 118.71
Melting point 232°C
Boiling point 2507°C
Specific gravity 7.3
Flammability Poorly flammable
Flammable in powder form

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Elemental tin is of low oral toxicity. Exposure may cause mild irritation to the skin, eyes and respiratory tract. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Handle away from sources of ignition. Tin can react dangerously with oxidising agents and halogens. Combustion produces toxic fumes of tin oxides. More finely divided tin may react when heated with water or steam, producing flammable hydrogen gas.

STORAGE

Tin powder becomes oxidised over time on exposure to air and moisture. Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture. Store away from oxidising agents, acids and alkalis. Store with general inorganic solids.

APPLICATIONS

General science: investigating the properties of metals.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal. Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste tin metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If large amount ingested, seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms occur, seek medical attention.

Formula SnCl₂·2H₂O

CAS No. 10025-69-1

User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
White to yellow, odourless crystals.	Molar mass 225.63	ADG Class 8
SOLUBILITY Soluble in water, alcohol, hydrochloric acid, glacial acetic acid and sodium hydroxide solution.	Melting point 38°C	Packing Group II
Solubility in water 1187 g/L (20°C)	Boiling point 623°C (anhydrous)	UN Number 3260
	Specific gravity 2.71 (20°C)	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

- H314 Causes severe skin burns and eye damage
- H317 May cause an allergic skin reaction
- H332 Harmful if inhaled
- H335 May cause respiratory irritation
- H341 Suspected of causing genetic defects
- H361 Suspected of damaging fertility or the unborn child
- H373 May cause damage to organs through prolonged or repeated exposure
- H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation and burns to the skin, eyes and respiratory tract. Eye exposure may lead to permanent eye damage. High inhalation exposure may lead to metal fume fever. Skin exposure may lead to sensitisation.

Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

Heating to decomposition generates corrosive and toxic fumes of hydrogen chloride.

STORAGE

The salt is moisture-sensitive and absorbs oxygen from the air, forming the insoluble oxychloride.

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Protect from air and moisture.

Store away from acids, alkali metals and oxidising agents.

Store with corrosive solids (DG Class 8).

APPLICATIONS

Senior chemistry: electrochemistry; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with absorbant, non-combustible material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as the original container or with waste heavy metal salts or their solutions. Arrange for collection by a licenced waste disposal contractor.

Tin ions can be precipitated from solution as hydrated tin oxides at approximately pH 7.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. Seek immediate medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

Formula C₁₅H₁₆ClN₃S

CAS No. 92-31-9

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Green crystalline powder with bronze lustre.	Molar mass 305.82	ADG Class -
Dye family phenothiazine	Melting point > 200°C	Packing Group -
Solubility water ¹ 10 mg/mL ethanol ¹ 4 mg/mL Soluble in methanol.	Flammability Combustible	UN Number None
	Absorption ² (λ _{max}) 626 nm, 630 nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. May be harmful by ingestion, inhalation or if absorbed through the skin.

When transferring the solid, or preparing solutions, work in an operating fume cupboard. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

histology: metachromatic dye; stains chromosomes, endoplasmic reticulum, cartilage; in botany, for staining lignin.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH	pH	pH	pH

PREPARATION

0.05% aqueous stain for lignin: Dissolve 0.05 g in 100mL of distilled water.³

References:

1. Aldrich Handbook 2. Sabnis 3. Dungey

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical advice/attention.



Formula C₄H₁₁NO₃

CAS No. 77-86-1

User Group 7-12

DESCRIPTION

Colourless, odourless crystals.

SOLUBILITY

Soluble in water and ethanol. Slightly soluble in acetone, ethyl acetate and ethyl acetate.

Solubility in water 800 g/L (20°C)

PHYSICAL DATA

Molar mass 121.13

Melting point 168-172°C

Boiling point 219-220°C

Specific gravity 1.353 (23°C)

Flammability Combustible

REGULATORY INFORMATION

ADG Class -

Packing Group -

UN Number None

Poisons Schedule -

Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Aqueous solutions are moderately alkaline. Exposure may cause irritation to the skin, eyes and respiratory tract.

Handle in a well-ventilated area. Avoid generating dust. Avoid inhalation and contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from sources of heat or ignition.

Store away from acids, bases and oxidising agents. Store with general organic solids.

APPLICATIONS

Senior biology/Technical: preparation of buffer solutions.

SPILLS

Wear PPE. Ensure good ventilation. Scoop up with a non-sparking tool. Place in a suitable labelled container and store for collection.

Solution spill: Cover with absorbent material such as vermiculite, bentonite (clay cat litter) and/or sand. Scoop up into a plastic container. Dilute with water, and neutralise as for Waste Disposal. Decant the neutral solution down the sink and dispose of residual solid material as general waste.

WASTE DISPOSAL

Waste solution: Neutralise the solution to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink.

Waste buffer solution (pH ~ 7): Flush down the sink with further dilution.

Waste solid: Store in the original container or other suitable labelled container such as for waste organic solids. Arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing. Rinse skin thoroughly with water. If symptoms occur, seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

ANGER

Formula n/a
CAS No. n/a
User Group 7-12S (Note E)



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Green solution with an ethanolic odour, which turns a red over time. Mixture of four indicators in ethanol/water.	Molar mass -	ADG Class 3
Solubility water soluble ethanol soluble Soluble in n-octanol, methanol, and acetone.	Melting point -37°C	Packing Group II
	Specific gravity ca 0.8	UN Number 1933
	Flammability Highly flammable	Poisons Schedule -
		Security -

HAZARD STATEMENTS

H225 Highly flammable liquid and vapour
H319 Causes serious eye irritation

STORAGE

Store in a cool, dry, well-ventilated place away from light.
Store away from heat and sources of ignition.
Store away from oxidising agents.
Store with flammable liquids (DG Class 3) in an AS compliant cabinet.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). May cause irritation to the skin, eyes and respiratory tract. Ingestion or inhalation may lead to CNS effects. Eye exposure may cause eye damage.
Contains phenolphthalein which has been evaluated by the IARC as possibly carcinogenic to humans.
Avoid generating or inhaling vapour, aerosols or dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.
There is potential for the vapour to collect in low-lying areas. The vapour can form explosive mixtures with air and can travel to an ignition source and flash back. Handle away from sources of heat and ignition.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Cover spill with paper towel, sand, vermiculite or bentonite. Collect material with a non-sparking tool and transfer to a suitable labelled container.
Wash the spill area thoroughly with water and detergent.
Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in the original container or other suitable labelled container such as for non-halogenated liquid waste. Arrange for collection by a licenced waste disposal contractor.

APPLICATIONS

- pH indicator

FIRST AID

IF IN EYES: Immediately irrigate with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If rapid recovery does not occur, obtain medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. If effects persist, seek medical advice.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If persistent irritation occurs, obtain medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms appear, seek medical attention.

COLOUR CHANGE

From red through to purple over the range of pH 3-11

Formula n/a
CAS No. 64742-82-1
User Group 7-12



DESCRIPTION

Clear colourless liquid with a paraffinic odour. A mixture of hydrocarbons with a carbon number predominantly in the range C7-C12. Less dense than water.

SOLUBILITY

Miscible with aromatic and aliphatic petroleum solvents.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass -
Melting point -
Boiling point 90-230°C
Specific gravity 0.78 (15°C)
Flammability Flammable

REGULATORY INFORMATION

ADG Class 3
Packing Group III
UN Number 1300
Poisons Schedule S5
Security -

HAZARD STATEMENTS

H226 Flammable liquid and vapour
H304 May be fatal if swallowed and enters airways
H315 Causes skin irritation
H412 Harmful to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). White spirit is flammable and has a low flash point. Inhalation exposure may cause respiratory irritation, drowsiness and dizziness. Skin or eye contact may cause mild irritation. Prolonged or repeated skin contact may cause dryness, cracking and dermatitis. Prolonged or repeated exposure may lead to hearing loss. There is a risk of aspiration into the lungs if ingested. Handle in an operating fume cupboard or well-ventilated area. Avoid inhalation of vapour or mist. Avoid contact with skin, eyes and clothing. There is potential for the vapour to collect in low-lying, confined areas. Vapours will form explosive mixtures with air. Vapours will travel to the source of ignition and flash back. Handle away from heat and sources of ignition.

STORAGE

Store in a tightly closed container in a cool, dry well-ventilated place away from light. Ensure container is kept upright to prevent leakage. Store away from sources of heat or ignition. Store away from oxidising agents, acids and bases. Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS

General science: solvent for extracting non-polar compounds; solvent for chromatography.

SPILLS

Wear PPE. Ensure good ventilation. Remove all sources of ignition.

Small spill: Absorb with paper towel or cover with non-combustible absorbent such as sand, vermiculite or bentonite (clay cat litter), collect with a non-sparking tool and place in a shallow vessel. Allow the solvent to evaporate in an operating fume cupboard. Dispose of the absorbent material as general waste.

Large spill: Cover with non-combustible absorbent (see above). Scoop up with a non-sparking tool. Place in a suitable labelled container and store for collection. Ventilate the spill area and wash with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Small quantity: Absorb onto paper towel or place in a shallow vessel. Allow the solvent to evaporate in an operating fume cupboard.

Large quantity: Store in original container or other suitable labelled container, such as for non-halogenated organic liquid waste, and arrange for collection by a licenced waste disposal contractor.

Empty containers can contain explosive vapours. Empty containers should be rinsed thoroughly with water and the rinsings absorbed onto inert material such as vermiculite or bentonite and treated as for spills. Washed empty containers can be disposed of as general waste.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Call a POISONS CENTRE or doctor if you feel unwell.

POISONS CENTRE: 13 11 26

WARNING



Formula $C_{25}H_{27}N_2O_6S_2.Na$

CAS No. 2650-17-1

User Group 11-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Blue to dark green crystals or powder.	Molar mass 538.61	ADG Class -
Solubility water 1 g/L (20°C)	Melting point 295°C decomposes	Packing Group -
	Flammability Combustible	UN Number None
		Poisons Schedule -
		Security -

HAZARD STATEMENTS

H315 Causes skin irritation
H319 Causes serious eye irritation
H335 May cause respiratory irritation

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.
Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.
Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container. Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- tracking dye in gel electrophoresis;
- component of 'screened methyl orange' (pH indicator).

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.
Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

pH 3.2

violet

pH 4.2

green

PREPARATION

Gel electrophoresis: 0.03% when mixed with the sample.
Screened methyl orange: Dissolve 0.2 g methyl orange and 0.28 g xylene cyanol in 50mL ethanol. Make up to 100mL with distilled water.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical advice/attention.



Formula $C_{31}H_{28}N_2O_{13}S \cdot 4Na$

CAS No. 3618-43-7

User Group 7-12S (Note E)

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Brown-purple solid with a characteristic odour.	Molar mass 760.58	ADG Class -
Dye family sulfonephthalein	Melting point 210°C decomposes	Packing Group -
Solubility water 510 g/L	Flammability Combustible	UN Number None
	Absorption (λ_{max}) 433nm, 573nm	Poisons Schedule -
		Security -

HAZARD STATEMENTS

Not classified as hazardous

STORAGE

Store in a cool, dry, well-ventilated place away from heat and light.

Store away from oxidising agents.

Store with dyes and indicators or with general organic solids.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation to the skin, eyes and respiratory tract.

When transferring the solid, or preparing solutions, ensure there is good ventilation. Avoid generating or inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

SPILLS

Wear PPE. Ensure good ventilation. Remove ignition sources from the spill area.

Solid: Do not dry-sweep up a fine powder. Dampen spill with water. Collect spill with a non-sparking tool and transfer to a suitable labelled container.

Solution: Cover spill with paper towel, sand, vermiculite or bentonite and transfer to a suitable labelled container.

Pick up any residual material with dampened paper towel and transfer to the waste container. Wash the spill area thoroughly with water and detergent. Wash any contaminated clothing before reuse.

APPLICATIONS

- complexation agent: for titrimetric determination of Fe(III) and other multivalent metal ions.

WASTE DISPOSAL

Solid waste: Store in the original container or other suitable labelled container such as for dry organic solid waste.

Solution waste: Store for collection. Alternatively, add ethanolic solutions to the non-halogenated waste bottle, add aqueous waste to the aqueous waste bottle. Arrange for collection by a licenced waste disposal contractor.

COLOUR CHANGE

FREE

red

CHELATED

yellow

PREPARATION

Dissolve 0.1 g in 100mL of distilled water.¹

Reference: 1. Gabb & Latchem

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth thoroughly with water. Do NOT induce vomiting. Give water to drink. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation persists, seek medical attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms persist, seek medical advice/attention.

Formula Zn
CAS No. 7440-66-6
User Group 7-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Bluish-grey, odourless, lustrous metal. Becomes malleable when heated to 100-150°C.	Molar mass 65.39	ADG Class -
SOLUBILITY Insoluble in water. Reacts with acids and alkalis.	Melting point 419°C	Packing Group -
Solubility in water Insoluble	Boiling point 907°C	UN Number None
	Specific gravity 7.14	Poisons Schedule -
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mild irritation to the skin, eyes and respiratory tract.

Avoid contact with skin and eyes.

If reacted to give salts or zinc oxide, high acute exposure to dust or fumes may result in metal fume fever. Zinc in compact form, such as sheet or granules, does not pose a flammability hazard. The reaction with acid or alkali generates flammable hydrogen gas.

In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

On exposure to moist air, zinc will gradually develop a white passivating layer of zinc carbonate.

Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture.

Store away from acids, alkalis and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

General science: investigating the physical and chemical properties of metals.

Senior chemistry: electrochemistry, redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Sweep up material with a non-sparking tool. Treat as for Waste Disposal.

Wash spill area with water and detergent. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container for waste zinc metal. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Give water to drink. If large amount ingested or if effects persist, seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If symptoms occur, seek medical attention.



Formula Zn
CAS No. 7440-66-6
User Group 11-12

DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Odourless, grey powder.	Molar mass 65.39	ADG Class 9
SOLUBILITY Reacts with water, acid or alkali.	Melting point 419°C	Packing Group III
Solubility in water Decomposes	Boiling point 907°C	UN Number 3077
	Specific gravity 7.14	Poisons Schedule -
	Flammability Combustible Poorly flammable	Security -

HAZARD STATEMENTS

H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause mild irritation to the skin, eyes and respiratory tract. Inhalation exposure to zinc oxide fumes may lead to metal fume fever.

Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Keep away from heat and ignition sources.

The powder reacts violently with acid or alkali, with evolution of flammable hydrogen gas. There is a risk of explosion with halogens, or oxidising agents or if heated with sulfur. Zinc powder poses a risk of a dust explosion in the presence of an ignition source.

In case of fire, use sand or dry chemical as the extinguishing agent.

STORAGE

On exposure to moist air, zinc will gradually develop a white passivating layer of zinc carbonate. Store in a tightly closed container in a cool, dry place away from heat and light. Protect from moisture.

Store away from acids, alkalis and oxidising agents. Store with general inorganic solids.

APPLICATIONS

Senior chemistry: electroplating/alloys - turning copper coins silver and gold.

SPILLS

Wear PPE. Ensure good ventilation. Remove any ignition sources. Using a non-sparking tool, collect spill material and transfer to a suitable non-reactive container. Treat as for Waste Disposal.

Wipe surfaces with dampened paper towel to remove residual zinc dust. Ensure that the zinc dust is destroyed by treating the paper towel with dilute acid (0.1M HCl), then rinse the paper towel under water and dispose of as general waste.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in the original container or other suitable labelled container. Arrange for collection by a licenced waste disposal contractor or metal recycling facility.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Seek medical advice/attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.



zinc acetate, dihydrate

zinc diacetate; zinc (II) acetate, dihydrate

WARNING



Formula $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$

CAS No. 5970-45-6

User Group 7-12

DESCRIPTION

Colourless crystals with a weak odour of acetic acid and an astringent taste.

SOLUBILITY

Soluble in water and alcohol.

Solubility in water 430 g/L (20°C)

PHYSICAL DATA

Molar mass 219.51°C

Melting point >100°C (-2H₂O)
237°C

Boiling point -

Specific gravity 1.74 (20°C)

Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 9

Packing Group III

UN Number 3077

Poisons Schedule -

Security -

HAZARD STATEMENTS

H302 Harmful if swallowed

H319 Causes serious eye irritation

H410 Very toxic to aquatic life with long lasting effects

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solutions: Store in a bottle for waste heavy metal solutions and arrange for collection. Zn (II) ions can be precipitated from solution as the hydroxide at pH 9.5.

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile). Exposure may cause irritation and possible burns to the skin and eyes and gastrointestinal tract. Inhalation may cause respiratory tract irritation and possible lung damage. Handle in a well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from alkalis and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; displacement reactions; redox reactions.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If effects persist, seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms appear, seek medical attention.

POISONS CENTRE: 13 11 26

Formula $[\text{ZnCO}_3]_2 \cdot [\text{Zn}(\text{OH})_2]_3$

CAS No. 5263-02-5

User Group 7-12

DESCRIPTION

White, odourless powder.

SOLUBILITY

Practically insoluble in water. Soluble in dilute acids with evolution of carbon dioxide, and in dilute alkalis.

Solubility in water Practically insoluble

PHYSICAL DATA

Molar mass	548.96
Melting point	ca 1970°C
Boiling point	-
Specific gravity	3.5 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
Security	-

HAZARD STATEMENTS

Not classified as hazardous

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Prolonged inhalation exposure may lead to symptoms of metal fume fever.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

The substance reacts explosively when heated with powdered magnesium or aluminium.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.

Store away from acids and oxidising agents.

Store with general inorganic solids.

APPLICATIONS

Senior chemistry: thermal decomposition of zinc carbonate to form zinc oxide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula ZnCl₂
CAS No. 7646-85-7
User Group 11-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless deliquescent crystals or powder with an acrid odour.	Molar mass 136.3	ADG Class 8
SOLUBILITY Soluble in water, alcohol, glycerol and diethyl ether.	Melting point ca 290°C	Packing Group III
Solubility in water 851 g/L (25°C)	Boiling point 732°C	UN Number 2331
	Specific gravity 2.91 (25°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H314 Causes severe skin burns and eye damage
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The salt is corrosive and forms acidic aqueous solutions. Exposure may cause irritation and corrosive injury to the skin, eyes and respiratory tract and on ingestion. Inhalation may lead to metal fume fever. Eye contact may cause permanent eye damage. Handle in an operating fume cupboard. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Aqueous solutions of the salt are corrosive to most metals. Contact with acids will generate toxic and corrosive fumes of hydrogen chloride gas. Heating to decomposition generates fumes of hydrogen chloride and zinc oxide.

STORAGE

The substance is hygroscopic and deliquescent. Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture. Store away from alkali metals and oxidising agents. Store with corrosive solids (DG Class 8).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; displacement reactions; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Neutralise to within pH 6-8 and transfer to a bottle for waste heavy metal solutions and arrange for collection. Zn (II) ions may be precipitated from solution as the hydroxide at pH 9.5.

FIRST AID

IF IN EYES: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Do not attempt to neutralise. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek immediate medical attention.

POISONS CENTRE: 13 11 26



Formula ZnO
CAS No. 1314-13-2
User Group 7-12

DESCRIPTION

Odourless, white or greyish granules or powder.

SOLUBILITY

Practically insoluble in water. Insoluble in alcohol. Soluble in acids and alkalis.

Solubility in water 0.0016 g/L (29°C)

PHYSICAL DATA

Molar mass 81.39
Melting point 1975°C
Boiling point -
Specific gravity 5.61 (20°C)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class 9
Packing Group III
UN Number 3077
Poisons Schedule -
Security -

HAZARD STATEMENTS

H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Prolonged inhalation exposure may lead to metal fume fever.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: redox reactions; sunscreen chemistry.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical advice/attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. If effects persist, seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. If irritation persists, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical advice/attention.

Formula Zn(NO₃)₂·6H₂O

CAS No. 10196-18-6

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless crystals or powder with a slight odour of nitric acid.	Molar mass 297.48	ADG Class 5.1
SOLUBILITY Soluble in water and alcohol.	Melting point ca 36°C 105-131°C (-6H ₂ O)	Packing Group II
Solubility in water 1843 g/L (20°C)	Boiling point -	UN Number 1514
	Specific gravity 2.065 (20°C)	Poisons Schedule -
	Flammability Non-combustible oxidising solid	Security -

HAZARD STATEMENTS

H272 May intensify fire; oxidizer
H302 Harmful if swallowed
H315 Causes skin irritation
H319 Causes serious eye irritation

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). The salt is a strong oxidising agent and may be harmful by ingestion or inhalation. Exposure may cause severe irritation to the skin and eyes, and respiratory and gastrointestinal tracts. Eye contact may lead to permanent eye damage.

Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Handle away from heat and sources of ignition.

There is a risk of fire and explosion if mixed with combustible or readily oxidisable materials.

In case of fire, use water as the extinguishing agent.

The preparation of explosive mixtures is not recommended.

STORAGE

The substance is hygroscopic. Store in a tightly closed container in a cool, dry, well-ventilated place away from light. Protect from moisture. Store away from sources of heat and ignition. Do not store on wooden surfaces.

Store away from acids, alkalis, metal powders, reducing agents, organic substances and combustible materials. Store with oxidising substances (DG Class 5.1).

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; electrolytic cells; redox reactions.

SPILLS

Wear PPE. Ensure good ventilation. Remove any combustible material or ignition sources from the spill area.

Solid spill: Collect spill material with a non-sparking tool and treat as for Waste Disposal.

Solution spill: Cover spill with non-combustible material such as sand, vermiculite or bentonite. Collect material with a non-sparking tool and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor. Do not mix with any other waste.

Solution: Adjust to within pH 6-8 and transfer to suitable labelled bottle for heavy metal salt solutions. The water can be allowed to evaporate in a fume cupboard and the sludge stored as for solid waste. Do not heat the solution to evaporate and do not evaporate to dryness. Zinc ions can be precipitated from solution as the hydroxide at approximately pH 9.5.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water. Seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention.

POISONS CENTRE: 13 11 26

zinc sulfate heptahydrate

zinc (II) sulphate, hydrate; white vitriol

DANGER

Formula $\text{Zn}(\text{CH}_3\text{COO})_2$

CAS No. 7446-20-0

User Group 7-12



DESCRIPTION	PHYSICAL DATA	REGULATORY INFORMATION
Colourless, odourless granules or crystalline powder with an astringent, metallic taste.	Molar mass 287.54	ADG Class 9
SOLUBILITY Soluble in water and glycerol. Insoluble in alcohol.	Melting point 39-280°C (-7H ₂ O)	Packing Group III
Solubility in water 965 g/L (20°C)	Boiling point ca 680°C decomposes	UN Number 3077
	Specific gravity 1.97 (20°C)	Poisons Schedule S6
	Flammability Non-combustible	Security -

HAZARD STATEMENTS

H302 Harmful if swallowed
H318 Causes serious eye damage
H410 Very toxic to aquatic life with long lasting effects

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Aqueous solutions of the salt are acidic. Exposure may cause irritation and possible burns to the skin and eyes and respiratory and gastrointestinal tracts. Prolonged skin exposure may cause dermatitis. Handle in an operating fume cupboard or well-ventilated area. Avoid generating and inhaling dust or aerosols. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Mixing of the salt with water produces sulfuric acid. Heating to decomposition generates toxic and corrosive fumes of sulfur oxides and zinc oxide.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light. Protect from moisture.

Store away from oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative inorganic analysis; displacement reactions; redox reactions; electrochemistry.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Solid: Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

Solution: Store in a bottle for waste heavy metal solutions and arrange for collection. Zn (II) ions can be precipitated from solution as the hydroxide at approximately pH 9.5.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek immediate medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek immediate medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with soap and plenty of water. If irritation occurs, seek medical advice/attention.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. If respiratory symptoms occur, seek medical attention.

POISONS CENTRE: 13 11 26

Formula ZnS
CAS No. 1314-98-3
User Group 11-12

DESCRIPTION

Odourless, white to yellow crystals or granules. Exists in two crystalline forms: alpha (wurtzite) and beta (sphalerite).

SOLUBILITY

Practically insoluble in water. Soluble in dilute mineral acids. Insoluble in alkalis.

Solubility in water 0.0069 g/L (18°C, α)
0.0065 g/L (18°C, β)

PHYSICAL DATA

Molar mass 97.43
Melting point 1700°C
1020°C $\beta \rightarrow \alpha$ form
Boiling point -
Specific gravity 4.04 (20°C, α)
4.09 (20°C, β)
Flammability Non-combustible

REGULATORY INFORMATION

ADG Class -
Packing Group -
UN Number None
Poisons Schedule -
Security -

HAZARD STATEMENTS

AUH031 Contact with acid liberates toxic gas

SAFE HANDLING

Maintain safe laboratory work practices. Wash hands before breaks and at the end of work.

Wear PPE: safety glasses, closed shoes, lab coat, gloves (nitrile, latex). Exposure may cause irritation to the skin, eyes and respiratory tract. Prolonged inhalation exposure may lead to metal fume fever. Highly toxic hydrogen sulfide is produced on ingestion of the substance, from its reaction with gastric acid.

Handle in a well-ventilated area. Avoid generating and inhaling dust. Avoid contact with skin, eyes and clothing. Avoid prolonged or repeated exposure. Mixing with acids yields highly toxic hydrogen sulfide gas.

SPILLS

Wear PPE. Ensure good ventilation.

Solid spill: Collect spill material and treat as for Waste Disposal.

Solution (slurry) spill: Cover spill with absorbent material such as sand, vermiculite or bentonite. Collect material and treat as for Waste Disposal.

Wash spill area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Store in a suitable labelled container such as for heavy metal waste and arrange for collection by a licenced waste disposal contractor.

STORAGE

Store in a tightly closed container in a cool, dry, well-ventilated place away from heat and light.
Store away from acids and oxidising agents.
Store with general inorganic solids.

APPLICATIONS

Senior chemistry: qualitative analysis; redox reactions; demonstration of the preparation and reactivity of hydrogen sulfide.

FIRST AID

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

IF SWALLOWED: Rinse mouth. Give water to drink. Do NOT induce vomiting. Seek medical attention.

IF ON SKIN: Remove contaminated clothing and wash before reuse. Wash skin thoroughly with plenty of water and soap. Seek medical advice.

IF INHALED: Move patient to fresh air and keep at rest in a position comfortable for breathing. Seek medical advice.