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AUSTRALIAN SCHOOL SCIENCE
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Chemical Management Handbook

FOR

AUSTRALIAN SCHOOLS

EDITION 2

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This handbook has been developed by Dr Virginia Ward.

While reasonable efforts have been made to ensure that the contents of this handbook are factually correct, Science ASSIST does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this handbook.

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INFORMATION SUPPORT FOR
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Chemical Management Handbook

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 most[i] 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)

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[i] The remaining chemicals not covered in this edition of the Chemical Management Handbook will be added in November 2018, thus covering the entire List

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 thickess 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 eliminates 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 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.

REFERENCE

1. Armour, M-A., Ashick, D., Konrad, J. 1999. 'Tested methods for the handling of small-scale spills', Chemical Health and Safety, 6: 24-27

GENERAL REFERENCES

Physical Data, Safe Handling, First Aid

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University of Wollongong. 2016. Selection and use of gloves guidelines, Science, Medicine and Health, University of Wollongong, http://smah.uow.edu.au/content/groups/public/@web/@ohs/documents/doc/uow136685.pdf (June 2016)

Storage

Victorian Department of Education and Early Childhood Development. Guidance Sheet 4 Chemical Spill Management. https://www.eduweb.vic.gov.au/edulibrary/public/ohs/Guidance_Sheet_4_-_Chemical_Spill_Management.pdf

Western Australia Department of Education. Regional Technicians Group.http://www.rtg.wa.edu.au/

Chemical Storage: Nine compatible storage group system, University of Iowa website, https://ehs.research.uiowa.edu/chemical-safety

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Science ASSIST
Chemical
Summary

1-bromobutane

n-butyl bromide; bromobutane

DANGER

Formula	C_4H_9Br
CAS No.	109-65-9
User Group	11-12

DESCRIPTION

Clear, colourless, volatile liquid. Heavier than water.

SOLUBILITY

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

Solubility in water 0.87 g/L (25°C)

PHYSICAL DATA

Molar mass	137.03
Melting point	-112°C
Boiling point	102°C
Specific gravity	1.28 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1126
Poisons Schedule	-
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. Symptoms of overexposure include cough, headache, dizzines and nausea.
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. Vapour is heavier than air and may accumulate in low-lying 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 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 (clay cat litter). Scoop up with a non-sparking tool, place in a suitable labelled container and arrange for collection.

WASTE DISPOSAL

Substance is insoluble in water and is harmful for the aquatic environment; its release to the environment should be avoided.
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

1-chlorobutane

n-butyl chloride; chlorobutane

DANGER

Formula	C_4H_9Cl
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. Symptoms of overexposure include cough, headache, dizziness and nausea.
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.
Vapour is heavier than air and may accumulate in low-lying areas. Vapours may form explosive mixture with air. Vapours may travel to an ignition source and flash back.
This solvent may dissolve some plastics.

SPILLS
Wear PPE. Ensure good ventilation. Remove all sources of ignition. Absorb spill with inert material such as dry sand, vermiculite or bentonite (clay cat litter). Scoop up with a non-sparking tool and place in a suitable labelled container. Arrange for collection by a licenced waste disposal contractor.

WASTE DISPOSAL
Substance is insoluble in water and is harmful for the aquatic environment; its release to the environment should be avoided.
Store waste in a suitable labelled container such as for halogenated organic waste. Arrange for collection by a licenced waste disposal contractor.

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, alkali metals, alkaline earth metals, light metal powders.
Store with flammable liquids in an AS compliant cabinet.

APPLICATIONS
Senior organic chemistry: substitution/elimination reactions and reaction rates

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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
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Science ASSIST
Chemical
Summary

1-iodobutane

n-butyl iodide; iodobutane

WARNING

Formula C_4H_9I
CAS No. 542-69-8
User Group 11-12

DESCRIPTION

Clear, colourless liquid with an ethereal odour. Heavier than water.

SOLUBILITY

Slightly soluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 0.2 g/L (20°C)

PHYSICAL DATA

Molar mass	184.02
Melting point	-103°C
Boiling point	130°C
Specific gravity	1.615 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1993
Poisons Schedule	-
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. Symptoms of overexposure include cough, headache, dizziness and nausea.
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. 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.
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 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 (clay cat litter). Scoop up with a non-sparking tool, place in a suitable labelled container and arrange for collection.

WASTE DISPOSAL

Substance is insoluble in water and is harmful for the aquatic environment; its release to the environment should be avoided.
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. 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

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

2-chloro-2-methylpropane

tert-butyl chloride; trimethylchloromethane

DANGER

Formula C_4H_9Cl
CAS No. 507-20-0
User Group 11-12

DESCRIPTION

Clear, colourless, volatile liquid with an ethereal odour. Lighter than water.

SOLUBILITY

Slightly soluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 2.9 g/L (15°C)

PHYSICAL DATA

Molar mass	92.57
Melting point	-27°C
Boiling point	51°C
Specific gravity	0.84 (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
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. Symptoms of overexposure include headache, dizziness, tiredness and nausea.
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.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.
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 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 (clay cat litter). Scoop up with a non-sparking tool, place in a suitable labelled container and arrange for collection.

WASTE DISPOSAL

Substance is insoluble in water and is harmful for the aquatic environment; its release to the environment should be avoided.
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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

2-methyl-butan-2-ol

tert-amyl alcohol; tert-pentyl alcohol

DANGER

Formula	$C_5H_{12}O$
CAS No.	75-85-4
User Group	11-12

DESCRIPTION

Clear, colourless, volatile liquid with a disagreeable odour and burning taste.

SOLUBILITY

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

Solubility in water 118 g/L (20°C)

PHYSICAL DATA

Molar mass	88.15
Melting point	-8°C
Boiling point	102°C
Specific gravity	0.81 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1105
Poisons Schedule	-
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

2-methyl-propan-1-ol

isobutyl alcohol; isobutanol

DANGER

Formula	$C_4H_{10}O$
CAS No.	78-83-1
User Group	11-12

DESCRIPTION
Clear, colourless liquid with a sweet, musty odour.

SOLUBILITY
Soluble in water, ethanol, acetone and diethyl ether.

Solubility in water 85 g/L (20°C)

PHYSICAL DATA

Molar mass	74.12
Melting point	-108°C
Boiling point	106-108°C
Specific gravity	0.803 (25°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1212
Poisons Schedule	-
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

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

2-methyl-propan-2-ol

tert-butyl alcohol; tert-butanol

DANGER

Formula	$C_4H_{10}O$
CAS No.	75-65-0
User Group	11-12

DESCRIPTION
Clear, colourless, hygroscopic crystals or liquid with a camphor-like odour.

SOLUBILITY
Miscible with water, alcohols, diethyl ether, esters, ketones and aromatic and aliphatic hydrocarbons.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	74.12
Melting point	24-26°C
Boiling point	81-83°C
Specific gravity	0.79 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1120
Poisons Schedule	-
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.

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

3-methyl-butan-1-ol

isoamyl alcohol; isopentyl alcohol

WARNING

Formula	$C_5H_{12}O$
CAS No.	123-51-3
User Group	11-12

DESCRIPTION

Clear, colourless liquid with a disagreeable odour.

SOLUBILITY

Sparingly soluble in water. Miscible with ethanol, diethyl ether, petroleum ether and glacial acetic acid.

Solubility in water 25 g/L (20°C)

PHYSICAL DATA

Molar mass	88.15
Melting point	-117°C
Boiling point	131°C
Specific gravity	0.81 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1105
Poisons Schedule	-
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

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

4-methyl-pentan-2-one

isobutyl methyl ketone; MIBK

DANGER

Formula	$C_6H_{12}O$
CAS No.	108-10-1
User Group	11-12

DESCRIPTION
Clear, colourless, highly volatile, highly flammable liquid with a sharp, agreeable, mint-like odour.

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

Solubility in water 19 g/L (20°C)

PHYSICAL DATA

Molar mass	100.16
Melting point	-84°C
Boiling point	116°C
Specific gravity	0.80 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1245
Poisons Schedule	S5
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

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

acetanilide

N-phenylethanamide; N-acetylaminobenzene

WARNING

Formula C_8H_9NO
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

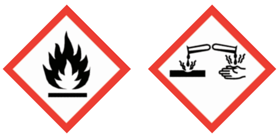
VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

acetic acid glacial

ethanoic acid; methanecarboxylic acid

DANGER



Formula	$C_2H_4O_2$
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 wth 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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

acetone

propanone; dimethyl ketone

DANGER

Formula	C_3H_6O
CAS No.	67-64-1
User Group	7-12

DESCRIPTION

Clear, colourless, highly volatile, highly flammable liquid with a characteristic sweet odour.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	58.08
Melting point	-95°C
Boiling point	56°C
Specific gravity	0.79 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1090
Poisons Schedule	S5
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 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 bioacummulate.
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

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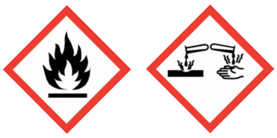
VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

acetyl chloride

ethanoyl chloride; acetic acid chloride

DANGER



Formula C_2H_3ClO
CAS No. 75-36-5
User Group 11-12

DESCRIPTION
Colourless fuming liquid with a pungent odour.

SOLUBILITY
Miscible with diethyl ether, glacial acetic acid and petroleum ether. Soluble in acetone.

Solubility in water Decomposes

PHYSICAL DATA

Molar mass	78.5
Melting point	-112°C
Boiling point	51°C
Specific gravity	1.1 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3 (8)
Packing Group	II
UN Number	1717
Poisons Schedule	-
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

adipoyl chloride

adipoyl dichloride; adipic acid dichloride

DANGER

Formula	$C_6H_8Cl_2O_2$
CAS No.	111-50-2
User Group	11-12

DESCRIPTION

Colourless to yellow liquid with a pungent odour.

SOLUBILITY

Soluble in ethyl acetate and petroleum ether.

Solubility in water Decomposes

PHYSICAL DATA

Molar mass	183.03
Melting point	-
Boiling point	105-107°C
Specific gravity	1.259 (25°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	3265
Poisons Schedule	-
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

aluminium chloride, anhydrous

aluminium trichloride

DANGER

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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium chloride, hexahydrate

aluminium trichloride hexahydrate

WARNING

Formula	$AlCl_3.6H_2O$
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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium hydroxide

aluminium trihydrate; hydrated alumina

Formula	$Al(OH)_3$
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

Ths 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 amphoterism.

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.

VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium nitrate, nonahydrate

aluminium trinitrate nonahydrate; nitric acid, aluminium salt

DANGER

Formula	$Al(NO_3)_3.9H_2O$
CAS No.	7784-27-2
User Group	7-12

DESCRIPTION
Colourless, nearly odourless, deliquescent crystals.

SOLUBILITY
Soluble in water, alcohol and ethylene glycol. Very slightly soluble in acetone. Almost insoluble in ethyl acetate.

Solubility in water 640 g/L (25°C)

PHYSICAL DATA

Molar mass	375.13
Melting point	73°C
Boiling point	135°C decomposes
Specific gravity	1.72
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	1438
Poisons Schedule	-
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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium oxide

alumina; aluminium(III) oxide

Formula	Al_2O_3
CAS No.	1344-28-1
User Group	7-12

DESCRIPTION

Colourless, odourless balls, lumps or powder.

SOLUBILITY

Insoluble in water. Soluble in some concentrated acids and alkalis.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass	101.96
Melting point	2050°C
Boiling point	2980°C
Specific gravity	3.94 (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, 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 amphoterism; 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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium potassium sulfate, dodecahydrate

potassium alum; aluminium potassium disulphate dodecahydrate

Formula	$AlK(SO_4)_2.12H_2O$
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 (-$12H_2O$)
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.

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.

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.

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.

VERSION
27 June 2018

Science ASSIST
Chemical
Summary

aluminium sulfate octadecahydrate

cake alum; sulfate of alumina

DANGER

Formula	$Al_2(SO_4)_3.18H_2O$
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 (-12H_2O)
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

Ths 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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonia, 10-32% solutions

ammonium hydroxide solution

DANGER

Formula	NH_4OH
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 (NH_4OH)
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

cloudy ammonia

ammonium hydroxide solution; household ammonia

DANGER

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

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VERSION
03 Dec 2016

Science ASSIST
Chemical
Summary

ammonium acetate

ammonium ethanoate; acetic acid, ammonium salt

Formula	$CH_3CO_2NH_4$
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.

STORAGE

The susbstance 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.

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.

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

VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium carbonate

diammonium carbonate; crystalline ammonia; salt of hartshorn

WARNING

Formula $(NH_4)_2CO_3$ or mixture: $H_2NCOONH_4$ + $(NH_4)HCO_3$
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 [$(NH_4)_2CO_3$]
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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium chloride

sal ammoniac

WARNING

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.

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.

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.

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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium hydrogen carbonate

ammonium bicarbonate; carbonic acid, monoammonium salt

WARNING

Formula $(NH_4)HCO_3$
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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium iron (III) sulfate dodecahydrate

ferric alum; ammonium ferric sulfate dodecahydrate

WARNING

Formula	$NH_4Fe(SO_4)_2.12H_2O$
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 quantitites 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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium metavanadate

ammonium vanadate; vanadic acid, ammonium salt

DANGER

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

DESCRIPTION

Colourless to yellow, odourless crystalline powder.

SOLUBILITY

Slightly soluble in water. Soluble in ethanolamine and aqueous ammonia solution. Insoluble in alcohol.

Solubility in water 5.1 g/L (20°C)

PHYSICAL DATA

Molar mass	116.98
Melting point	200°C decomposes
Boiling point	-
Specific gravity	2.3 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	6.1
Packing Group	II
UN Number	2859
Poisons Schedule	-
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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium molybdate, tetrahydrate

ammonium heptamolybdate; ammonium paramolybdate

WARNING

Formula	$(NH_4)_6Mo_7O_{24}\cdot4H_2O$
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 (-H_2O)
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.

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.

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.

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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium nitrate

nitrate of ammonia; nitric acid, ammonium salt

WARNING

Formula	NH_4NO_3
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 quantitiy, 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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium oxalate, monohydrate

diammonium oxalate monohydrate; oxalic acid, diammonium salt

WARNING

Formula	$(NH_4)_2C_2O_4.H_2O$
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.

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.

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.

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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium persulfate

ammonium peroxydisulfate; diammonium peroxodisulphate

DANGER

Formula	$(NH_4)_2S_2O_8$
CAS No.	7727-54-0
User Group	Staff

DESCRIPTION

Odourless, white crystals or powder.

SOLUBILITY

Soluble in water.

Solubility in water 620 g/L (20°C)

PHYSICAL DATA

Molar mass	228.2
Melting point	120°C (decomposes)
Boiling point	-
Specific gravity	1.98 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	1444
Poisons Schedule	-
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 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

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

ammonium phosphate, dibasic

diammonium hydrogen phosphate;
phosphoric acid, diammonium salt

Formula	$(NH_4)_2HPO_4$
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

VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium phosphate, monobasic

ammonium dihydrogen phosphate;
phosphoric acid, monoammonium salt

Formula $(NH_4)H_2PO_4$
CAS No. 7722-76-1
User Group 7-12

DESCRIPTION

White odourless crystals or powder.

SOLUBILITY

Soluble in water. Sightly 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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium sulfate

ammonium sulphate; sulfuric acid, diammonium salt

Formula	$(NH_4)_2SO_4$
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.

VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium tartrate

diammonium tartrate; tartaric acid, ammonium salt

Formula	$C_4H_{12}N_2O_6$
CAS No.	3164-29-2
User Group	7-12

DESCRIPTION
Colourless, odourless crystals or granules.

SOLUBILITY
Soluble in water. Very slightly soluble in alcohol.

Solubility in water 439 g/L (20°C)

PHYSICAL DATA

Molar mass	184.15
Melting point	decomposes
Boiling point	-
Specific gravity	1.601 (25°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). 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.

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium thiocyanate

ammonium rhodanide; thiocyanic acid, ammonium salt

WARNING

Formula	NH_4SCN
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.

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.

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.

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

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VERSION
27 June 2018

Science ASSIST
Chemical
Summary

ammonium thiosulfate

ammonium hyposulfite; diammonium thiosulphate

Formula	$(NH_4)_2S_2O_3$
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.

VERSION
27 June 2018

barium hydroxide, octahydrate

caustic baryta

DANGER

Formula $Ba(OH)_2.8H_2O$
CAS No. 12230-71-6
User Group 11-12

DESCRIPTION

Colourless, odourless crystals.

SOLUBILITY

Soluble in water, and dilute hydrochloric acid and dilute nitric acid Slightly soluble in ethanol and methanol. Insoluble in acetone.

Solubility in water 72 g/L

PHYSICAL DATA

Molar mass	315.47
Melting point	78°C
Boiling point	780°C
Specific gravity	2.18 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8 (6.1)
Packing Group	II
UN Number	2923
Poisons Schedule	S6
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

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

benzoic acid

benzenecarboxylic acid

WARNING

Formula $C_7H_6O_2$
CAS No. 65-85-0
User Group 11-12

DESCRIPTION

Colourless crystalline powder with a faint odour.

SOLUBILITY

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

Solubility in water 2.9 g/L (20°C)

PHYSICAL DATA

Molar mass	122.12
Melting point	121-123°C
Boiling point	249°C
Specific gravity	1.27 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

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

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

benzoyl chloride

benzoic acid chloride

DANGER

Formula	C_7H_5ClO
CAS No.	98-88-4
User Group	11-12

DESCRIPTION
Colourless fuming liquid with a disagreeable, pungent odour.

SOLUBILITY
Miscible with diethyl ether and oils.

Solubility in water Decomposes

PHYSICAL DATA

Molar mass	140.57
Melting point	-1°C
Boiling point	197°C
Specific gravity	1.22 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	1736
Poisons Schedule	-
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 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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

boric acid

boracic acid; orthoboric acid

DANGER

Formula H_3BO_3
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 CO_2. 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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

bromine water

bromine aqueous solution

DANGER

Formula	Br_2
CAS No.	7726-95-6 (bromine)
User Group	11-12 (Note L)

DESCRIPTION

Clear, dark orange liquid with a pungent odour.

SOLUBILITY

Miscible with water.
Bromine is soluble in ethanol, diethyl ether, non-polar solvents and halogenated solvents.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	79.904 (bromine)
Melting point	-
Boiling point	ca. 100°C
Specific gravity	ca. 1.0
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8 (6.1)
Packing Group	I
UN Number	1744
Poisons Schedule	-
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 bunding 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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

butan-1-ol

1-butanol; n-butyl alcohol

DANGER

Formula	$C_4H_{10}O$
CAS No.	71-36-3
User Group	11-12

DESCRIPTION

Clear, colourless, volatile liquid with a sweet, ethanol-like odour.

SOLUBILITY

Soluble in water, ethanol, diethyl ether and other organic solvents.

Solubility in water 77 g/L (20°C)

PHYSICAL DATA

Molar mass	74.12
Melting point	-89°C
Boiling point	118°C
Specific gravity	0.81 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1120
Poisons Schedule	-
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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

butan-2-ol

sec-butanol; 2-butyl alcohol

WARNING

Formula $C_4H_{10}O$
CAS No. 78-92-2
User Group 11-12

DESCRIPTION

Clear, colourless volatile liquid with a sweet, alcohol-like odour.

SOLUBILITY

Miscible with ethanol and diethyl ether.
Soluble in water and acetone.

Solubility in water 125 g/L (20°C)

PHYSICAL DATA

Molar mass	74.12
Melting point	-115°C
Boiling point	99°C
Specific gravity	0.81 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1120
Poisons Schedule	-
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. Potect 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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

butan-2-one

methyl ethyl ketone; MEK

DANGER

Formula	C_4H_8O
CAS No.	78-93-3
User Group	11-12

DESCRIPTION

Colourless, highly volatile, highly flammable liquid with a sweet, sharp odour.

SOLUBILITY

Soluble in water, ethanol, diethyl ether and acetone.

Solubility in water 292 g/L (20°C)

PHYSICAL DATA

Molar mass	72.11
Melting point	-86°C
Boiling point	80°C
Specific gravity	0.805 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1193
Poisons Schedule	S5
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

butanoic acid

butyric acid; 1-propanecarboxylic acid

DANGER

Formula $C_4H_8O_2$
CAS No. 107-92-6
User Group 11-12

DESCRIPTION

Colourless, oily liquid with disagreeable, rancid odour.

SOLUBILITY

Miscible with water. Soluble in ethanol and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	88.11
Melting point	-8 to -5°C
Boiling point	163.5°C
Specific gravity	0.96 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	2820
Poisons Schedule	S6
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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

butyl acetate

butyl ethanoate; acetic acid, butyl ester

DANGER

Formula	$C_6H_{12}O_2$
CAS No.	123-86-4
User Group	11-12

DESCRIPTION

Clear, colourless, volatile liquid with a pleasant banana-like odour.

SOLUBILITY

Slightly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone and most hydrocarbons.

Solubility in water 4.3 g/L (20°C)

PHYSICAL DATA

Molar mass	116.16
Melting point	-77°C
Boiling point	127°C
Specific gravity	0.88 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1123
Poisons Schedule	-
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

butyl butanoate

n-butyl butyrate; butyric acid, butyl ester

WARNING

Formula	$C_8H_{16}O_2$
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.

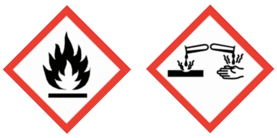
VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

butyl propanoate

n-butyl propionate; propionic acid, butyl ester

WARNING



Formula	$C_7H_{14}O_2$
CAS No.	590-01-2
User Group	11-12

DESCRIPTION
Clear, colourless liquid with an apple-like odour.

SOLUBILITY
Slightly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 1.5 g/L (20°C)

PHYSICAL DATA

Molar mass	130.19
Melting point	-90°C
Boiling point	146°C
Specific gravity	0.87 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1914
Poisons Schedule	-
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.

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VERSION
9 Nov 2016

calcium carbonate

calcite; chalk; limestone

Formula	$CaCO_3$
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.

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.

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.

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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium chloride, anhydrous

calcium dichloride

WARNING

Formula	$CaCl_2$
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 preparating 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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium citrate, tetrahydrate

calcium citrate tribasic

Formula	$Ca_3(C_6H_5O_7)_2.4H_2O$
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 (-$4H_2O$)
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.

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.

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.

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.

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium hydroxide

slaked lime; hydrated lime

DANGER

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.

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.

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.

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

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium hydroxide solution

limewater

DANGER

Formula	n/a
CAS No.	n/a
User Group	7-12

DESCRIPTION

Clear, colourless, odourless liquid. Turns cloudy on absorption of carbon dioxide.

SOLUBILITY

Soluble in water.

Solubility in water Soluble

PHYSICAL DATA

Molar mass	-
Melting point	-
Boiling point	ca. 100°C
Specific gravity	-
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	1719
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 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

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium hypochlorite

pool chlorine; hypochlorous acid, calcium salt

DANGER

Formula	$Ca(OCl)_2$
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 orginal 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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

calcium nitrate, tetrahydrate

calcium saltpeter; nitric acid, calcium salt, tetrahydrate

WARNING

Formula	$Ca(NO_3)_2.4H_2O$
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 ($-4H_20$)
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

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium oxide

quicklime

DANGER

Formula CaO
CAS No. 1305-78-8
User Group 7-12

DESCRIPTION
White or grey, odourless, hygroscopic powder or granules.

SOLUBILITY
Reacts with water. Soluble in acids, glycerol and sugar solution. Practically insoluble in ethanol.

Solubility in water 1.65 g/L (20°C)
rapid hydrolysis

PHYSICAL DATA

Molar mass	56.08
Melting point	2580°C
Boiling point	2850°C
Specific gravity	3.37 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

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

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium phosphate, dibasic, dihydrate

calcium hydrogen phosphate dihydrate

Formula	$CaHPO_4.2H_2O$
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 (-$2H_2O$) 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.

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

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 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.

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium phosphate, monobasic, monohydrate

calcium dihydrogen phosphate monohydrate

WARNING

Formula $Ca(H_2PO_4)_2.H_2O$
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

SAFE HANDLING

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.

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.

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

VERSION
24 Nov 2016

calcium phosphate, tribasic

tricalcium phosphate; bone phosphate

Formula	$Ca_3(PO_4)_2$
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.

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.

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 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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium sulfate, dihydrate

gypsum

Formula	$CaSO_4.2H_2O$
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 $(-\tfrac{3}{2}H_2O)$ 163°C $(-\tfrac{1}{2}H_2O)$
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.

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

calcium sulfate, hemihydrate

Plaster of Paris

Formula	$CaSO_4.½H_2O$
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 (-½H_2O)
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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

carbon, blocks or rods

charcoal

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.

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.

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.

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.

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

carbon powder

charcoal powder

Formula	C
CAS No.	7440-44-0
User Group	7-12

DESCRIPTION

Black, odourless, amorphous powder.

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.
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.

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

charcoal, activated

activated carbon

WARNING

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).

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

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.

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.

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

chromium (III) chloride hexahydrate

chromic chloride hexahydrate; chromium trichloride hexahydrate

WARNING

Formula $CrCl_3 \cdot 6H_2O$
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

chromium (III) nitrate, nonahydrate

chromic nitrate nonahydrate; chromium trinitrate nonahydrate

WARNING

Formula	$Cr(NO_3)_3.9H_2O$
CAS No.	7789-02-8
User Group	11-12S (Note B)

DESCRIPTION

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.

SOLUBILITY

Soluble in water, alcohol, acetone and alkali.

Solubility in water 810 g/L (20°C)

PHYSICAL DATA

Molar mass	400.15
Melting point	60°C
Boiling point	>100°C decomposes
Specific gravity	1.8
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	2720
Poisons Schedule	-
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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

cinnamic acid

trans-cinnamic acid; benzenepropenoic acid

Formula	$C_9H_8O_2$
CAS No.	621-82-9
User Group	11-12

DESCRIPTION
Colourless crystalline powder with slight balsamic odour.

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

Solubility in water 500 mg/L

PHYSICAL DATA

Molar mass	148.16
Melting point	134°C
Boiling point	decomposes
Specific gravity	1.2475 (4°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 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.

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

citric acid, monohydrate

2-hydroxypropanetricarboxylic acid monohydrate

WARNING

Formula	$C_6H_8O_7.H_2O$
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

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

cobalt (II) chloride hexahydrate

cobalt dichloride hexahydrate; cobaltous chloride hexahydrate

DANGER

Formula	$CoCl_2.6H_2O$
CAS No.	7791-13-1
User Group	11-12S (Note B)

DESCRIPTION

Pink to red, odourless crystals, becoming violet and then blue on heating, with loss of water.

SOLUBILITY

Soluble in water, alcohols, glycerol, acetone and diethyl ether.

Solubility in water 586 g/L (20°C)

PHYSICAL DATA

Molar mass	237.93
Melting point	52-56°C (-4H_2O) 100°C (-H_2O) 120-140°C (-H_2O) 735°C (anhydrous salt)
Boiling point	1049°C
Specific gravity	1.92 (25°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	6.1
Packing Group	III
UN Number	3288
Poisons Schedule	-
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

cobalt (II) nitrate, hexahydrate

cobalt dinitrate hexahydrate; cobaltous nitrate hexahydrate

DANGER

Formula	$Co(NO_3)_2.6H_2O$
CAS No.	10026-22-9
User Group	11-12S (Note B)

DESCRIPTION
Red-brown, deliquescent, odourless crystals.

SOLUBILITY
Soluble in water, ethanol and acetone.

Solubility in water	1330 g/L (0°C) 2170 g/L (100°C)

PHYSICAL DATA

Molar mass	291.03
Melting point	55-57°C
Boiling point	>74°C decomposes
Specific gravity	1.87 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	II
UN Number	1477
Poisons Schedule	-
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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

copper (I) chloride

cuprous chloride; copper monochloride

DANGER

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

SAFE HANDLING

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.

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:

$$2Cu^{+} \text{ --> } Cu^{0} + Cu^{2+}$$

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.

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.

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

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VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (I) oxide

cuprous oxide;copper oxide red

WARNING

Formula Cu_2O
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:

$2Cu^{+}$ --> $Cu^{0} + Cu^{2+}$

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 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

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VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) acetate, monohydrate

cupric diacetate monohydrate; copper diacetate hydrate

DANGER

Formula	$C_4H_6CuO_4.H_2O$
CAS No.	6046-93-1
User Group	11-12

DESCRIPTION
Dark green crystals or powder with a faint odour of acetic acid.

SOLUBILITY
Soluble in water and ethanol. Slightly soluble in glycerol and ether. Slowly soluble in aqueous solutions of ammonia.

Solubility in water 72 g/L (20°C)

PHYSICAL DATA

Molar mass	199.65
Melting point	115°C
Boiling point	240°C (decomposes)
Specific gravity	1.88 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	1759
Poisons Schedule	S6
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) carbonate hydroxide

basic copper carbonate; dicopper carbonate dihydroxide

WARNING

Formula	$CuCO_3.Cu(OH)_2$
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

SAFE HANDLING
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.

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.

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.

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.

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

VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) chloride, dihydrate

cupric chloride dihydrate; copper dichloride dihydrate

DANGER

Formula	$CuCl_2.2H_2O$
CAS No.	10125-13-0
User Group	7-12S

DESCRIPTION
Green-blue, odourless, hygroscopic powder.

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

Solubility in water 1150 g/L (20°C)

PHYSICAL DATA

Molar mass	170.48
Melting point	100°C (decomposes)
Boiling point	-
Specific gravity	2.51
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	2802
Poisons Schedule	S6
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.

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.

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

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.

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

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VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) nitrate, trihydrate

cupric nitrate trihydrate; copper dinitrate trihydrate

DANGER

Formula	$Cu(NO_3)_2.3H_2O$
CAS No.	10031-43-3
User Group	7-12

DESCRIPTION
Blue, odourless, deliquescent crystals.

SOLUBILITY
Soluble in water and ethanol. Practically insoluble in ethyl acetate.

Solubility in water 2670 g/L (20°C)

PHYSICAL DATA

Molar mass	241.6
Melting point	114°C
Boiling point	170°C (decomposes)
Specific gravity	2.05 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	II
UN Number	1477
Poisons Schedule	S6
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:
(i) Allow the water to evaporate 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.

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

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VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) oxide

cupric oxide; copper oxide black

WARNING

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 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

VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) sulfate, anhydrous

cupric sulfate anhydrous; copper sulphate, anhydrous

WARNING

Formula $CuSO_4$
CAS No. 7758-98-7
User Group 7-12

DESCRIPTION

Greyish-white to greenish-white, odourless, hygroscopic powder.

SOLUBILITY

Soluble in water and methanol. Soluble in solutions of ammonia. Insoluble in ethanol.

Solubility in water 203 g/L (20°C)

PHYSICAL DATA

Molar mass	159.61
Melting point	200°C (slight decomposition)
Boiling point	560°C (decomposes)
Specific gravity	3.60 (20°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
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

VERSION
2 Dec 2016

Science ASSIST
Chemical
Summary

copper (II) sulfate, pentahydrate

cupric sulfate pentahydrate; blue vitriol

WARNING

Formula	$CuSO_4.5H_2O$
CAS No.	7758-99-8
User Group	7-12

DESCRIPTION

Blue, odourless, efflorescent crystals or powder with an unpleasant metallic taste.

SOLUBILITY

Soluble in water, methanol and glycerol. Slightly soluble in ethanol.

Solubility in water 317 g/L (20°C)

PHYSICAL DATA

Molar mass	249.68
Melting point	30°C ($-2H_2O$) 110°C ($-4H_2O$) 250°C ($-5H_2O$)
Boiling point	560°C (decomposes)
Specific gravity	2.286 (15.6°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
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:
(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. 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

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VERSION
2 Dec 2016

cyclohexane

hexahydrobenzene; hexamethylene

DANGER

Formula	C_6H_{12}
CAS No.	110-82-7
User Group	11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with a sweetish odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Miscible with ethanol, diethyl ether, acetone and petroleum ether. Moderately soluble in methanol.

Solubility in water 0.06 g/L (20°C)

PHYSICAL DATA

Molar mass	84.16
Melting point	7°C
Boiling point	81°C
Specific gravity	0.78 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1145
Poisons Schedule	S5
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 depression, headache, drowsiness and dizziness. 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 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. Place paper towel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.
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.
Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Cyclohexane is highly toxic for aquatic life, does not readily biodegrade and can bioaccumulate. Avoid release to the environment. Do not dispose of down the sink.
Small quantity: Place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate.
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.
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

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VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

cyclohexanol

cyclohexyl alcohol

WARNING

Formula	$C_6H_{12}O$
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. Potect 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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

cyclohexene

tetrahydrobenzene

DANGER

Formula	C_6H_{10}
CAS No.	110-83-8
User Group	11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with an aromatic odour. Less dense than water.

SOLUBILITY

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

Solubility in water 0.21 g/L (20°C)

PHYSICAL DATA

Molar mass	82.15
Melting point	-104°C
Boiling point	83°C
Specific gravity	0.81 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	2256
Poisons Schedule	S5
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 depression, headache, drowsiness and dizziness. 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 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 in an AS compliant cabinet. 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 (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. Ventilate spill area then wash area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Cyclohexene is toxic for aquatic life on an acute basis. It is expected to biodegrade slowly under environmental conditions and has a moderate potential for bioaccumulation. Avoid release to the environment. Do not dispose of down the sink.
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

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VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

dichloromethane

methylene chloride; DCM

WARNING

Formula CH_2Cl_2
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). Dichloromethane is classed as *Group 2A probably carcinogenic to humans*. Exposure may cause irritation of the skin, eyes and respiratory tract. Symptoms of overexposure include headache, dizziness and nausea. Detection of dichloromethane odour occurs above the TWA
(odour threshold: 205-307ppm; TWA: 50ppm).
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.
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 (clay cat litter). Scoop up with a non-sparking tool, place in a suitable labelled container and arrange for collection.

WASTE DISPOSAL

Substance is insoluble in water and is harmful for the aquatic environment; its release to the environment should be avoided.
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

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

dodecan-1-ol

lauryl alcohol; n-dodecanol

WARNING

Formula	$C_{12}H_{26}O$
CAS No.	112-53-8
User Group	11-12

DESCRIPTION

Colourless liquid or crystals with a sweet odour.

SOLUBILITY

Practically insoluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 4 mg/L (25°C)

PHYSICAL DATA

Molar mass	186.33
Melting point	24°C
Boiling point	261°C
Specific gravity	0.83 (24°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	9
Packing Group	III
UN Number	3077
Poisons Schedule	-
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.

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

hydrogen peroxide 3%

dihydrogen peroxide

Formula H_2O_2
CAS No. 7722-84-1 (H_2O_2)
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 (H_2O_2)
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:

$$2H_2O_2 \longrightarrow O_2 + 2H_2O$$

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

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VERSION
11 Dec 2016

Science ASSIST
Chemical
Summary

hydrogen peroxide 6%

dihydrogen peroxide

WARNING

Formula	H_2O_2
CAS No.	7722-84-1 (H_2O_2)
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 (H_2O_2)
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.

$$2H_2O_2 \longrightarrow O_2 + 2H_2O$$

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

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VERSION
11 Dec 2016

Science ASSIST
Chemical
Summary

hydrogen peroxide 35%

dihydrogen peroxide

DANGER

Formula H_2O_2
CAS No. 7722-84-1 (H_2O_2)
User Group Staff

DESCRIPTION
Colourless liquid with a slightly acrid odour.

SOLUBILITY
Miscible with water and alcohols, glycols and acetone. Can react explosively with organic solvents.

Solubility in water
Miscible in all proportions

PHYSICAL DATA

Molar mass	34.01 (H_2O_2)
Melting point	-33°C
Boiling point	107°C (decomposes)
Specific gravity	1.13 (20°C)
Flammability	Non-combustible oxidising liquid

REGULATORY INFORMATION

ADG Class	5.1 (8)
Packing Group	II
UN Number	2014
Poisons Schedule	S6
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.

$$2H_2O_2 \longrightarrow O_2 + 2H_2O$$

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

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VERSION
11 Dec 2016

hydrogen peroxide

Formula H_2O_2
CAS No. 7722-84-1 (H_2O_2)
MW 34.01 (H_2O_2)
Solubility in water Miscible in all proportions

LABORATORY NOTES

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 spills[1]

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 H_2O_2 concentration, dilute further as necessary, so that the H_2O_2 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 H_2O_2 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 solutions[1]

Principle: Hydrogen peroxide is reduced by its reaction with metabisulfite:

$$2H_2O_2 + S_2O_5^{2-} \longrightarrow 2SO_4^{2-} + H_2O + 2H^+$$

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 ($Na_2S_2O_5$) 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 increas 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.

VERSION
11 Dec 2016

AUSTRALIAN SCHOOL SCIENCE
INFORMATION SUPPORT FOR
TEACHERS AND TECHNICIANS

enzymes

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. e following should indicate the conditions required. This may mean that the enzyme is dissolved in a dilute acid or buffer solution, rather than water.

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. It is best to use the lowest concentration and smallest amount possible.

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 Bendict'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.

VERSION
28 Nov 2016

enzymes

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.

VERSION
28 Nov 2016

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.

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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.

VERSION
28 Nov 2016

enzymes

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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.

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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.

VERSION
28 Nov 2016

enzymes

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.

VERSION
28 Nov 2016

Science ASSIST
Chemical
Summary

ethanol

ethyl alcohol;

DANGER

Formula	C_2H_6O
CAS No.	64-17-5
User Group	7-12

DESCRIPTION

Colourless highly volatile liquid with a sweet, fragrant odour.

SOLUBILITY

Miscible with water, methanol, diethyl ether and acetone.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	46.07
Melting point	-117°C (100%) -114°C (95%)
Boiling point	78°C
Specific gravity	0.79 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1170
Poisons Schedule	-
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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

ethanol, denatured

methylated spirits; industrial alcohol

DANGER

Formula	C_2H_6O
CAS No.	64-17-5
User Group	7-12

DESCRIPTION
Colourless highly volatile liquid with an ethereal odour.

SOLUBILITY
Miscible with water, methanol, diethyl ether and acetone.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	46.07 (ethanol)
Melting point	-114°C (ethanol)
Boiling point	78°C (ethanol)
Specific gravity	0.79 (20°C) (ethanol)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1170
Poisons Schedule	S5
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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

ethyl acetate

ethyl ethanoate; acetic acid, ethyl ester

DANGER

Formula	$C_4H_8O_2$
CAS No.	141-78-6
User Group	11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with a fruity odour.

SOLUBILITY

Miscible with ethanol and diethyl ether. Soluble in water and acetone.

Solubility in water 85.3 g/L (20°C)

PHYSICAL DATA

Molar mass	88.11
Melting point	-83°C
Boiling point	77°C
Specific gravity	0.90 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1173
Poisons Schedule	-
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

ethyl benzoate

benzoic acid, ethyl ester

WARNING

Formula	$C_9H_{10}O_2$
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

ethyl butanoate

ethyl butyrate; butanoic acid ethyl ester

WARNING

Formula	$C_6H_{12}O_2$
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

ethyl cinnamate

ethyl 3-phenyl-2-propenoate; cinnamic acid, ethyl ester

Formula	$C_{11}H_{12}O_2$
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

ethylene glycol

1,2-dihydroxyethane; 1,2-ethanediol

WARNING

Formula	$C_2H_6O_2$
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

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

ethyl propanoate

ethyl propionate; propanoic acid, ethyl ester

DANGER

Formula	$C_5H_{10}O_2$
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

fumaric acid

trans-2-butenedioic acid; trans-1,2-ethenedicarboxylic acid

WARNING

Formula $C_4H_4O_4$
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.

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

glycerol

glycerin; 1,2,3-propanetriol

Formula	$C_3H_8O_3$
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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

heptan-1-ol

enanthic alcohol; n-heptyl alcohol

WARNING

Formula	$C_7H_{16}O$
CAS No.	111-70-6
User Group	11-12

DESCRIPTION
Clear, colourless liquid with a fragrant odour.

SOLUBILITY
Slightly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 1 g/L (18°C)

PHYSICAL DATA

Molar mass	116.2
Melting point	-34°C
Boiling point	175°C
Specific gravity	0.82 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

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

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.

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.

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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

heptane

n-heptane

DANGER

Formula	C_7H_{16}
CAS No.	142-82-5
User Group	11-12

DESCRIPTION

Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Miscible with diethyl ether, and petroleum ether. Soluble in ethanol. Immiscible with methanol.

Solubility in water 2.2 mg/L (25°C)

PHYSICAL DATA

Molar mass	100.2
Melting point	-91°C
Boiling point	98°C
Specific gravity	0.68 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1206
Poisons Schedule	S5
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 depression, headache, drowsiness and dizziness. 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 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. Place paper towel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.
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.
Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Heptane is highly toxic for aquatic life and can bioaccumulate. Avoid release to the environment. Do not dispose of down the sink.
Small quantity: Place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate.
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.
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

VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

hex-1-ene

1-hexene; n-hexene

DANGER

Formula C_6H_{12}
CAS No. 592-41-6
User Group 11-12

DESCRIPTION

Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Soluble in ethanol, diethyl ether and petroleum ether.

Solubility in water 0.05 g/L (20°C)

PHYSICAL DATA

Molar mass	84.16
Melting point	-140°C
Boiling point	63°C
Specific gravity	0.67 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	2370
Poisons Schedule	S5
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, headache, drowsiness and dizziness. 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 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.

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

WASTE DISPOSAL

Hexene is toxic for aquatic life on an acute basis. It is expected to biodegrade slowly under environmental conditions and has a moderate potential for bioaccumulation. Avoid release to the environment. Do not dispose of down the sink.
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.

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 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.

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

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VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

hexadecan-1-ol

cetyl alcohol; palmityl alcohol

WARNING

Formula $C_{16}H_{34}O$
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.

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

hexamine

hexamethylenetetramine; HMTA

WARNING

Formula	$C_6H_{12}N_4$
CAS No.	100-97-0
User Group	Staff

DESCRIPTION

White hygroscopic powder or crystals with a mild ammonia odour.

SOLUBILITY

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

Solubility in water 490 g/L (20°C)

PHYSICAL DATA

Molar mass	140.19
Melting point	280°C
Boiling point	263°C (sublimes, with partial decomposition)
Specific gravity	1.33 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	4.1
Packing Group	III
UN Number	1328
Poisons Schedule	-
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.

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

hexan-1-ol

caproyl alcohol; n-hexyl alcohol

WARNING

Formula	$C_6H_{14}O$
CAS No.	111-27-3
User Group	11-12

DESCRIPTION
Clear, colourless flammable liquid with a sweet, fruity odour.

SOLUBILITY
Slightly soluble in water. Miscible with diethyl ether. Soluble in ethanol and acetone.

Solubility in water 5.9 g/L (20°C)

PHYSICAL DATA

Molar mass	102.18
Melting point	-45°C
Boiling point	157°C
Specific gravity	0.82 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	2282
Poisons Schedule	-
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.

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

hexane

n-hexane

DANGER

Formula C_6H_{14}
CAS No. 110-54-3
User Group 11-12

DESCRIPTION

Clear, colourless, volatile liquid with a petrol-like odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Soluble in ethanol, diethyl ether and petroleum ether. Immiscible with methanol.

Solubility in water 10 mg/L (20°C)

PHYSICAL DATA

Molar mass	86.18
Melting point	-95°C
Boiling point	69°C
Specific gravity	0.66 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1208
Poisons Schedule	S5
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 depression, headache, drowsiness and dizziness. 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 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. Place paper towel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.
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.
Ventilate spill area and allow the solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Hexane is toxic for aquatic life. Avoid release to the environment. Do not dispose of down the sink.
Small quantity: Place in a shallow vessel in an operating fume cupboard and allow the solvent to evaporate.
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.
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

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VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

hexane-1,6-diamine

hexamethylenediamine; HMDA

DANGER

Formula $C_6H_{16}N_2$
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

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VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

hexanoic acid

caproic acid; n-hexanoic acid

DANGER

Formula $C_6H_{12}O_2$
CAS No. 142-62-1
User Group 11-12

DESCRIPTION
Clear, colourless to pale yellow, oily liquid with characteristic unpleasant odour.

SOLUBILITY
Slightly soluble in water. Soluble in ethanol and diethyl ether.

Solubility in water 9.7 g/L (20°C)

PHYSICAL DATA

Molar mass	116.16
Melting point	-4°C
Boiling point	206°C
Specific gravity	0.9212 (25°C)
Flammability	Combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	2829
Poisons Schedule	-
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.

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

hydrochloric acid

muriatic acid; spirits of salt

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 CO_2. 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

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VERSION
9 Dec 2016

iodine

diiodine

WARNING

Formula	I_2
CAS No.	7553-56-2
User Group	11-12

DESCRIPTION

Heavy, violet-black crystals or granules with a metallic lustre and a pungent odour.

SOLUBILITY

Very slightly soluble in water. Soluble in ethanol, diethyl ether, cyclohexane, glycerol and aqueous alkaline iodide solutions.

Solubility in water 340 mg/L (20°C)

PHYSICAL DATA

Molar mass	253.81
Melting point	114°C
Boiling point	184°C
Specific gravity	4.93 (25°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8 (6.1)
Packing Group	III
UN Number	3495
Poisons Schedule	S6
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 sublimes 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 bunding 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.

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

APPLICATIONS

General science: demonstration of sublimation.
Biology: (in solution) to indicate the presence of starch.
Forensic science: visualisation agent for fingerprinting.
Senior chemistry: (in solution) iodometric titrations; visualisation agent for thin layer chromatography; Iodine-Clock reaction.

VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

isoamyl acetate

isopentyl acetate; acetic acid, isoamyl ester

WARNING

Formula $C_7H_{14}O_2$
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

kerosene

lamp oil

DANGER

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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
15 Nov 2016

Science ASSIST
Chemical
Summary

lactic acid, aqueous solution

2-hydroxypropionic acid; milk acid

DANGER

Formula $C_3H_6O_3$
CAS No. 50-21-5 (n.o.s.); 598-82-3 (DL)
User Group 11-12

DESCRIPTION

Colourless or yellowish, odourless, hygroscopic, syrupy liquid. Available as an 85-90%w/w aqueous solution.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water Soluble

PHYSICAL DATA

Molar mass	90.078
Melting point	16.8°C (DL)
Boiling point	122°C (DL)
Specific gravity	1.2060 (21°C, DL)
Flammability	Combustible

REGULATORY INFORMATION

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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

lead (II) nitrate

lead dinitrate; plumbous nitrate

DANGER

Formula	$Pb(NO_3)_2$
CAS No.	10099-74-8
User Group	7-12S (Note C)

DESCRIPTION

White to off-white, almost odourless crystals.

SOLUBILITY

Soluble in water. Slightly soluble in ethanol and methanol.

Solubility in water 486 g/L (20°C)

PHYSICAL DATA

Molar mass	331.20
Melting point	470°C decomposes
Boiling point	-
Specific gravity	4.49 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1 (6.1)
Packing Group	II
UN Number	1469
Poisons Schedule	S6
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

lead (II) oxide

lead monoxide; yellow lead oxide; litharge; plumbous oxide

DANGER

Formula	PbO
CAS No.	1317-36-8
User Group	11-12

DESCRIPTION
Yellow to reddish, very dense, odourless crystals or powder.

SOLUBILITY
Practically insoluble in water. Soluble in acetic acid, dilute nitric acid and warm alkali hydroxide solutions. Insoluble in ethanol.

Solubility in water 0.017 g/L (20°C)

PHYSICAL DATA

Molar mass	223.20
Melting point	888°C
Boiling point	1470°C
Specific gravity	9.53 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	6.1
Packing Group	III
UN Number	2291
Poisons Schedule	S6
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

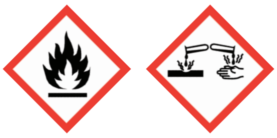
VERSION
28 June 2018

Science ASSIST
Chemical
Summary

lithium

lithium, elemental

DANGER



Formula Li
CAS No. 7439-93-2
User Group Staff

DESCRIPTION

Silvery-white, ductile, light, soft metal; becomes yellowish on exposure to air and moisture.

SOLUBILITY

Reacts readily with water, releasing flammable hydrogen gas. Soluble in liquid ammonia, giving a blue solution.

Solubility in water Reacts with water

PHYSICAL DATA

Molar mass 6.94

Melting point 180.5°C

Boiling point 1342°C

Specific gravity 0.534 (20°C)

Flammability Flammable solid

REGULATORY INFORMATION

ADG Class 4.3

Packing Group I

UN Number 1415

Poisons Schedule

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). 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 CO_2 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

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

lithium hydroxide

lithine

DANGER

Formula	LiOH
CAS No.	1310-66-3
User Group	11-12

DESCRIPTION
Colourless, odourless crystals.

SOLUBILITY
Soluble in water.

Solubility in water 124 g/L (20°C)

PHYSICAL DATA

Molar mass	23.95
Melting point	4.71°C
Boiling point	924°C decomposes
Specific gravity	2.54
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	2680
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 (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 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, oxidising agents and metals.
Store with corrosive solids.

APPLICATIONS
Senior chemistry: an example of a strong base.

SPILLS
Wear PPE. Ensure good ventilation. Scoop up into a suitable labelled container and store for collection. Wash spill area thoroughly with water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL
Waste solid: Store in original container or other suitable labelled container and arrange for collection by a licenced chemical waste contractor.
Small quantity of waste solution: Wear PPE and work in a fume cupboard. Neutralise to within pH 6 - 8 by addition of 5% hydrochloric acid, with stirring. Flush the neutral solution down the sink with further dilution.

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 if you feel unwell.
POISONS CENTRE: 13 11 26

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

maleic acid

cis-butenedioic acid; toxilic acid

WARNING

Formula $C_4H_4O_4$
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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

malonic acid

1,3-propanedioic acid; methanedicarboxylic acid

DANGER

Formula	$C_3H_4O_4$
CAS No.	141-82-2
User Group	11-12

DESCRIPTION

Colourless crystals or crystalline powder.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water 1390 g/L 20°C)

PHYSICAL DATA

Molar mass	104.06
Melting point	135°C (decomposes)
Boiling point	-
Specific gravity	1.63 (20°C)
Flammability	Combustible

REGULATORY INFORMATION

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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

methanol

methyl alcohol; wood alcohol

DANGER

Formula	CH_4O
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

methyl acetate

methyl ethanoate; acetic acid, methyl ester

DANGER

Formula	$C_3H_6O_2$
CAS No.	79-20-9
User Group	11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with a fruity odour.

SOLUBILITY

Soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 240-250 g/L (20°C)

PHYSICAL DATA

Molar mass	74.08
Melting point	-98°C
Boiling point	57°C
Specific gravity	0.93 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1231
Poisons Schedule	-
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

methyl benzoate

benzoic acid, methyl ester

WARNING

Formula	$C_8H_8O_2$
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

methyl butanoate

methyl butyrate; butanoic acid, methyl ester

DANGER

Formula	$C_5H_{10}O_2$
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

methyl salicylate

methyl 2-hydroxybenzoate; oil of wintergreen

WARNING

Formula	$C_8H_8O_3$
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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

mineral turpentine

turpentine substitute

DANGER

Formula n/a
CAS No. mixture: 64742-82-1, 64742-95-6
User Group 7-12

DESCRIPTION

Clear, colourless liquid with an aromatic odour. A mixture of aliphatic and aromatic hydrocarbons. Less dense than water.

SOLUBILITY

Miscible with other petroleum solvents.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass	-
Melting point	-
Boiling point	135-210°C
Specific gravity	ca. 0.78-0.82 (25°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
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
15 Nov 2016

Science ASSIST
Chemical
Summary

naphthalene

naphthalin; camphor tar

WARNING

Formula $C_{10}H_8$
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 (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.
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 thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Naphthalene is toxic for aquatic life, is biodegradable and has a moderate potential for bioaccumulation. Avoid release to the environment. Do not dispose of down the sink.
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

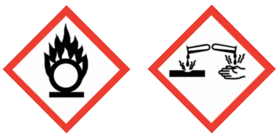
VERSION
8 Dec 2016

Science ASSIST
Chemical
Summary

nitric acid

aqua fortis; azotic acid

DANGER



Formula	HNO_3
CAS No.	7697-37-2
User Group	Staff

DESCRIPTION

Clear, colourless to slightly yellow liquid with a sharp, pungent, suffocating odour. Concentrated nitric acid usually refers to a 68% w/w aqueous solution.

SOLUBILITY

Miscible with water. Reacts with many organic solvents.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	63.01
Melting point	-47°C (65%)
Boiling point	122°C (69%)
Specific gravity	1.4 (20°C, 65%)
Flammability	Non-combustible oxidising liquid

REGULATORY INFORMATION

ADG Class	8 (5.1)
Packing Group	II
UN Number	2031
Poisons Schedule	S6
Security	CSC

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 CO_2. 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

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

oct-1-ene

caprylene; 1-octene

DANGER

Formula C_8H_{16}
CAS No. 111-66-0
User Group 11-12

DESCRIPTION

Colourless, volatile liquid with a petrol-like odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Miscible with ethanol. Soluble in diethyl ether, acetone and petroleum ether.

Solubility in water 4.1 mg/L (25°C)

PHYSICAL DATA

Molar mass	112.22
Melting point	-102°C
Boiling point	121°C
Specific gravity	0.71 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	3295
Poisons Schedule	S5
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, headache, drowsiness and dizziness. 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 periodically and before use. If crystals or a precipate 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 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 (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.
Ventilate spill area, then wash area thoroughly with detergent and water. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Octene is toxic for aquatic life on an acute basis. It is expected to biodegrade slowly under environmental conditions and has a moderate-to-high potential for bioaccumulation. Avoid release to the environment. Do not dispose of down the sink.
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

VERSION
8 Dec 2016

octadecan-1-ol

stearyl alcohol; n-octadecanol

Formula	$C_{18}H_{38}O$
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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

octan-1-ol

capryl alcohol; n-octyl alcohol

WARNING

Formula	$C_8H_{18}O$
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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

octan-2-ol

2-octyl alcohol; sec-capryl alcohol

DANGER

Formula	$C_8H_{18}O$
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

octane

n-octane

DANGER

Formula C_8H_{18}
CAS No. 111-65-9
User Group 11-12

DESCRIPTION

Colourless, volatile liquid with a petrol-like odour. Less dense than water.

SOLUBILITY

Practically insoluble in water. Miscible with ethanol and acetone and petroleum ether.

Solubility in water 0.7 mg/L (20°C)

PHYSICAL DATA

Molar mass	114.23
Melting point	-57°C
Boiling point	126°C
Specific gravity	0.70 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1262
Poisons Schedule	S5
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 depression, headache, drowsiness and dizziness. 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 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. Place paper towel in an operating fume cupboard and allow the solvent to evaporate. Dispose of paper towel as general waste.
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.
Ventilate the spill area and allow any residual solvent to evaporate. Wash any contaminated clothing before reuse.

WASTE DISPOSAL

Octane is highly toxic for aquatic life, does not readily biodegrade and can bioaccumulate. Avoid release to the environment. Do not dispose of down the sink.
Very small quanities can be evaporated in an operating fume cupboard.
Larger quantities: Store 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 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

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VERSION
8 Dec 2016

oxalic acid, dihydrate

ethanedioic acid dihydrate

DANGER

Formula	$C_2H_2O_4.2H_2O$
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

paraffin oil

white mineral oil

DANGER

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.

VERSION
15 Nov 2016

Science ASSIST
Chemical
Summary

paraffin wax

Formula	n/a
CAS No.	8002-74-2
User Group	F-12

DESCRIPTION

Colourless, translucent or white, waxy solid with a faint odour. A mixture of predominantly straight chain hydrocarbons with carbon number >C20.

SOLUBILITY

Soluble in petroleum ether, warm alcohol, diethyl ether, oils and some esters.

Solubility in water Insoluble

PHYSICAL DATA

Molar mass	-
Melting point	45 - 95°C
Boiling point	>300°C
Specific gravity	ca. 0.90 (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). 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.

VERSION
15 Nov 2016

Science ASSIST
Chemical
Summary

pentan-1-ol

n-amyl alcohol; n-pentyl alcohol

WARNING

Formula	$C_5H_{12}O$
CAS No.	71-41-0
User Group	11-12

DESCRIPTION

Clear, colourless liquid with a mild, sweet, fusel-like odour.

SOLUBILITY

Sparingly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone.

Solubility in water 22 g/L (20°C)

PHYSICAL DATA

Molar mass	88.15
Melting point	-78°C
Boiling point	138°C
Specific gravity	0.81 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1105
Poisons Schedule	-
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

pentan-2-ol

sec-amyl alcohol; 2-pentanol

WARNING

Formula	$C_5H_{12}O$
CAS No.	6032-29-7
User Group	11-12

DESCRIPTION

Clear, colourless, flammable, moderately volatile liquid with a strong, disagreeable odour.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water 166 g/L (20°C)

PHYSICAL DATA

Molar mass	88.15
Melting point	-50°C
Boiling point	119°C
Specific gravity	0.81 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	III
UN Number	1105
Poisons Schedule	-
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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

petrolatum

vaseline; petroleum jelly

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

SAFE HANDLING

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.

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.
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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
15 Nov 2016

Science ASSIST
Chemical
Summary

phosphoric acid

orthophosphoric acid; phosphoric acid, 85%

DANGER

Formula H_3PO_4
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 CO_2. 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

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

potassium acetate

potassium ethanoate; acetic acid, potassium salt

Formula	CH_3COOK
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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium bromide

bromide salt of potassium

WARNING

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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium carbonate

potash; dipotassium carbonate

WARNING

Formula K_2CO_3
CAS No. 6381-79-9
User Group 7-12

DESCRIPTION
Colourles, 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.

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VERSION
24 Nov 2016

Potassium chloride

muriate of potash; hydrochloric acid, potassium salt

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.

VERSION
30 Nov 2016

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

	final volume of solution			
concentration	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.

VERSION
12 Dec 2016

Science ASSIST
Chemical
Summary

Potassium citrate, monohydrate

tripotassium citrate hydrate; citric acid, tripotassium salt monohydrate

Formula $K_3C_6H_8O_7.H_2O$
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 (-H_2O)
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.

VERSION
30 Nov 2016

Potassium citrate, monohydrate

Formula $K_3C_6H_8O_7.H_2O$
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

	final volume of solution			
concentration	1000 mL	500 mL	250 mL	100 mL
0.1 Ma	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

	Volume of component required for 100mL	
pH	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.

VERSION
12 Dec 2016

Science ASSIST
Chemical
Summary

potassium dichromate

bichromate of potash; dipotassium dichromate

DANGER

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 treament 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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

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 ferroxyl 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.

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VERSION
28 June 2018

potassium ferrocyanide, trihydrate

tetrapotassium hexacyanoferrate (II); yellow prussiate of potash

Formula	$K_4[Fe(CN)_6].3H_2O$
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 (-3H_2O)
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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium hydrogen phthalate

potassium biphthalate; potassium 2-carboxybenzoate

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.

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VERSION
28 June 2018

potassium hydrogen sulfate

potassium bisulfate; sulfuric acid, potassium salt

DANGER

Formula	$KHSO_4$
CAS No.	7646-93-7
User Group	7-12

DESCRIPTION
Colourless, odourless crystals or powder.

SOLUBILITY
Soluble in water. Insoluble in alcohol and acetone.

Solubility in water 490 g/L

PHYSICAL DATA

Molar mass	136.17
Melting point	195°C decomposes
Boiling point	-
Specific gravity	2.24 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	2509
Poisons Schedule	-
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium hydroxide

caustic potash; potash lye

DANGER

Formula KOH
CAS No. 1310-58-3
User Group 7-12

DESCRIPTION

Colourless, hygroscopic pellets or flakes.

SOLUBILITY

Soluble in water, alcohol and glycerol.

Solubility in water 1130 g/L (20°C)

PHYSICAL DATA

Molar mass	56.11
Melting point	360°C
Boiling point	1327°C
Specific gravity	2.04 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	1813
Poisons Schedule	S6
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

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

potassium iodate

iodic acid, potassium salt

DANGER

Formula	KIO_3
CAS No.	7758-05-6
User Group	11-12

DESCRIPTION

White, odourless crystals or powder.

SOLUBILITY

Soluble in water and dilute sulfuric acid.
Insoluble in alcohol and nitric acid.

Solubility in water 92 g/L (25°C)

PHYSICAL DATA

Molar mass	214.00
Melting point	560°C (decomposes)
Boiling point	-
Specific gravity	3.89
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	II
UN Number	1479
Poisons Schedule	-
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, CO_2 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

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

Potassium iodide

potassium monoiodide

DANGER

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.

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VERSION
30 Nov 2016

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

	final volume of solution			
concentration	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.

VERSION
12 Dec 2016

Science ASSIST
Chemical
Summary

potassium metabisulfite

potassium disulfite; dipotassium pyrosulfite

DANGER

Formula	$K_2S_2O_5$
CAS No.	16731-55-8
User Group	7-12

DESCRIPTION

Colourless crystals, granules or powder with a slight odour of sulfur dioxide.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 450 g/L (20°C)

PHYSICAL DATA

Molar mass	222.33
Melting point	150°C decomposes
Boiling point	-
Specific gravity	2.34
Flammability	Non-combustible

REGULATORY INFORMATION

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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

Potassium nitrate

saltpetre; nitrate of potash

WARNING

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.

VERSION
30 Nov 2016

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

	Final volume of solution			
Concentration	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.

VERSION
12 Dec 2016

Science ASSIST
Chemical
Summary

potassium oxalate monohydrate

dipotassium ethanedioate monohydrate; oxalic acid, dipotassium salt

WARNING

Formula	$K_2C_2O_4.H_2O$
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 (-H_2O) 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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium permanganate

Condy's crystals; permanganate of potash

DANGER

Formula	$KMnO_4$
CAS No.	7722-64-7
User Group	7-12

DESCRIPTION

Dark violet, odourless crystals.

SOLUBILITY

Soluble in water. Decomposed by alcohol.

Solubility in water 64 g/L (20°C)

PHYSICAL DATA

Molar mass	158.03
Melting point	> 240°C (decomposes)
Boiling point	-
Specific gravity	2.70 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	II
UN Number	1490
Poisons Schedule	S6
Security	IDM Cat 3

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 (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

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

potassium persulfate

potassium peroxydisulfate; dipotassium peroxodisulphate

DANGER

Formula	$K_2S_2O_8$
CAS No.	7727-21-1
User Group	11-12S (Note D)

DESCRIPTION

White, odourless crystals or powder.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 50 g/L (20°C)

PHYSICAL DATA

Molar mass	270.32
Melting point	ca.100°C (decomposes)
Boiling point	-
Specific gravity	2.48 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	1492
Poisons Schedule	-
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

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

potassium phosphate, dibasic

dipotassium hydrogen phosphate;
phosphoric acid, dipotassium salt

Formula K_2HPO_4
CAS No. 7758-11-4
User Group 7-12

DESCRIPTION

Colourless, odourless crystals or powder.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 1600 g/L (20°C)

PHYSICAL DATA

Molar mass	174.18
Melting point	>180°C decomposes
Boiling point	-
Specific gravity	2.44 (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

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 quanitities 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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

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 quanitities 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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

Potassium sodium tartrate, tetrahydrate

Rochelle salt; Seignette salt

WARNING

Formula	$KNaC_4H_4O_6.4H_2O$
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_2O) 130-140°C (-4H_2O) 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

SAFE HANDLING

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.

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 distiguish 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.

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.

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.

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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
30 Nov 2016

Potassium sodium tartrate, tetrahydrate

Formula $KNaC_4H_4O_6.4H_2O$
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

	final volume of solution			
concentration	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 ($CuSO_4.5H_2O$) in approximately 300mL of distilled water. Make up the solution to 500mL.

Fehling's solution B: Mix 173 g potassium sodium tartrate tetrahydrate ($KNaC_4H_4O_6.4H_2O$) and 50 g sodium hydroxide (NaOH) with approximately 350mL of distilled water and stir until dissolved. Make up the solution to 500mL.

VERSION
12 Dec 2016

Science ASSIST
Chemical
Summary

potassium sulfate

potassium sulphate; sulfate of potash; sulfuric acid, dipotassium salt

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.

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.

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.

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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

potassium thiocyanate

potassium rhodanate; potassium rhodanide; potassium sulfocyanate

WARNING

Formula KSCN
CAS No. 333-20-0
User Group 11-12

DESCRIPTION
Colourless, odourless crystals or powder.

SOLUBILITY
Soluble in water, alcohol and acetone.

Solubility in water 2170 g/L

PHYSICAL DATA

Molar mass	97.18
Melting point	173-175°C
Boiling point	500°C decomposes
Specific gravity	1.89
Flammability	Non-combustible

REGULATORY INFORMATION

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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

propan-1-ol

1-propanol; n-propyl alcohol

DANGER

Formula	C_3H_8O
CAS No.	71-23-8
User Group	11-12

DESCRIPTION

Clear, colourless, highly volatile liquid with a sweet, pleasant odour.

SOLUBILITY

Miscible with water, ethanol and other alcohols, diethyl ether and propylene glycol. Soluble in acetone.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	60.1
Melting point	-126°C
Boiling point	97°C
Specific gravity	0.8 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1274
Poisons Schedule	-
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

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer's SDS should be consulted for information specific to the chemical used.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

propan-2-ol

isopropanol; isopropyl alcohol

DANGER

Formula	C_3H_8O
CAS No.	67-63-0
User Group	7-12

DESCRIPTION

Clear, colourless, volatile liquid with a musty odour of rubbing alcohol.

SOLUBILITY

Miscible with water. Soluble in ethanol, acetone and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	60.1
Melting point	-89°C
Boiling point	82°C
Specific gravity	0.78 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1219
Poisons Schedule	-
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.

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

APPLICATIONS

Senior chemistry: to observe the reactivity of a secondary alcohol; heat of combustion investigations.

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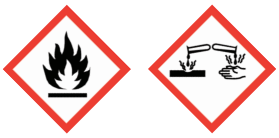
VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

propanoic acid

propionic acid

DANGER



Formula	$C_3H_6O_2$
CAS No.	79-09-4
User Group	11-12

DESCRIPTION

Colourless, oily liquid with a slightly pungent, disagreeable odour.

SOLUBILITY

Soluble in water, ethanol and diethyl ether.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	74.08
Melting point	-21°C
Boiling point	141°C
Specific gravity	0.99 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	8 (3)
Packing Group	II
UN Number	3463
Poisons Schedule	S6
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.

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

propyl acetate

n-propyl ethanoate; acetic acid, propyl ester

DANGER

Formula	$C_5H_{10}O_2$
CAS No.	109-60-4
User Group	11-12

DESCRIPTION

Colourless, highly volatile liquid with a pear-like odour.

SOLUBILITY

Sparingly soluble in water. Miscible with ethanol and diethyl ether.

Solubility in water 21.2 g/L (20°C)

PHYSICAL DATA

Molar mass	102.13
Melting point	-93°C
Boiling point	102°C
Specific gravity	0.89 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	1276
Poisons Schedule	-
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

propyl butyrate

n-propyl butyrate; butanoic acid, propyl ester

WARNING

Formula	$C_7H_{14}O_2$
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

propyl propionate

n-propyl propanoate; propionic acid, propyl ester

DANGER

Formula	$C_6H_{12}O_2$
CAS No.	106-36-5
User Group	11-12

DESCRIPTION
Colourless liquid with a pear-like odour.

SOLUBILITY
Slightly soluble in water. Miscible with ethanol and diethyl ether. Soluble in acetone.

Solubility in water 5 g/L (20°C)

PHYSICAL DATA

Molar mass	116.16
Melting point	-76°C
Boiling point	122°C
Specific gravity	0.88 (20°C)
Flammability	Highly flammable

REGULATORY INFORMATION

ADG Class	3
Packing Group	II
UN Number	3272
Poisons Schedule	-
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.

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VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

propylene glycol

propan-1,2-diol; methylethylene glycol

Formula	$C_3H_8O_2$
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.

VERSION
19 Nov 2016

sebacoyl chloride

decanedioyl dichloride; sebacoyl dichloride

DANGER

Formula	$C_{10}H_{16}Cl_2O_2$
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 of 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.

VERSION
9 Nov 2016

Science ASSIST
Chemical
Summary

silicon, bulk form

silicon pieces; elemental silicon

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 CO_2 extinguisher.

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.

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 quanitities of bulk silicon can be disposed of as general waste; the expected environmental fate of elemental silicon is its slow oxidation to form silica.

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.

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

silicon powder

silicon powder, amorphous; elemental silicon

WARNING

Formula	Si
CAS No.	7440-21-3
User Group	11-12

DESCRIPTION

Odourless, dark brown powder.

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	Flammable

REGULATORY INFORMATION

ADG Class	4.1
Packing Group	III
UN Number	1346
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 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 CO_2 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.

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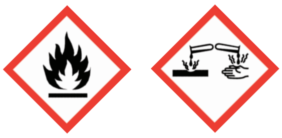
VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

sodium

sodium, elemental

DANGER



Formula	Na
CAS No.	7440-23-5
User Group	Staff

DESCRIPTION

Silvery-white, ductile, light, soft metal; rapidly tarnishes on exposure to air, becoming greyish-white.

SOLUBILITY

Reacts violently with water, releasing flammable hydrogen gas. Soluble in liquid ammonia, giving a blue solution.

Solubility in water Reacts with water

PHYSICAL DATA

Molar mass	22.99
Melting point	97.8°C
Boiling point	881°C
Specific gravity	0.968 (20°C)
Flammability	Flammable solid

REGULATORY INFORMATION

ADG Class	4.3
Packing Group	I
UN Number	1428
Poisons Schedule	-
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 CO_2 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

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VERSION
19 Nov 2016

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.

$$2M + 2H_2O \rightarrow 2M^+ + 2OH^- + H_2$$

$$2M + 2CH_3CH_2OH \rightarrow 2M^+ + 2CH_3CH_2O^- + H_2$$

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 SODIUM[1] (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 SODIUM[2]

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.

VERSION
19 Nov 2016

Science ASSIST
Chemical
Summary

sodium acetate, anhydrous

sodium ethanoate; acetic acid, sodium salt

Formula	CH_3CO_2Na
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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium acetate, trihydrate

sodium ethanoate trihydrate; acetic acid, sodium salt, trihydrate

Formula	$CH_3CO_2Na.3H_2O$
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 (-$3H_2O$)
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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium bromide

bromide salt of sodium

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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium carbonate

soda ash; washing soda

WARNING

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.

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VERSION
24 Nov 2016

Science ASSIST Chemical Summary

sodium chloride

rock salt; common salt; halite

Formula	NaCl
CAS No.	7647-14-5
User Group	F-12

DESCRIPTION
Colourless crystals or powder with a characteristic saline taste and odour.

SOLUBILITY
Soluble in water, glycerol and ethylene glycol. Very slightly soluble in alcohol.

Solubility in water 358 g/L (20°C)

PHYSICAL DATA

Molar mass	58.44
Melting point	801°C
Boiling point	1461°C
Specific gravity	2.17 (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 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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium citrate, dihydrate

trisodium citrate dihydrate; sodium citrate tribasic

Formula	$Na_3C_6H_8O_7.2H_2O$
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 (-$2H_2O$) 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.

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.

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.

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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium dichromate dihydrate

bichromate of soda; disodium dichromate dihydrate

DANGER

Formula	$Na_2Cr_2O_7.2H_2O$
CAS No.	7789-12-0
User Group	11-12S (Notes D,K)

DESCRIPTION

Red-orange, odourless, deliquescent crystals.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 732 g/L (20°C)

PHYSICAL DATA

Molar mass	298.00
Melting point	140°C (-$2H_2O$) 357°C (anhydrous salt)
Boiling point	>400°C decomposes
Specific gravity	2.35 (20°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 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 treament 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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium dithionite

sodium hydrosulfite; sodium sulfoxylate

DANGER

Formula	$Na_2S_2O_4$
CAS No.	7775-14-6
User Group	7-12S

DESCRIPTION

White or yellow-grey, crystalline solid with a slight odour of sulfur dioxide.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol.

Solubility in water 250 g/L (20°C)

PHYSICAL DATA

Molar mass	174.11
Melting point	ca 100°C decomposes
Boiling point	-
Specific gravity	2.5 (20°C)
Flammability	Combustible. Can self-ignite in moist air.

REGULATORY INFORMATION

ADG Class	4.2
Packing Group	II
UN Number	1384
Poisons Schedule	-
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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium hydrogen carbonate

sodium bicarbonate; baking soda

Formula	$NaHCO_3$
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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

sodium hydrogen sulfate

sodium bisulfate; sulfuric acid, monosodium salt

DANGER

Formula	$NaHSO_4$
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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium hydroxide

caustic soda; soda lye

DANGER

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

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VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

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 ≤ 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 ≤ 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

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

sodium hypochlorite, 10-12.5% solution

bleach; hypochlorous acid, sodium salt

DANGER

Formula	NaOCl
CAS No.	7681-52-9
User Group	7-12S

DESCRIPTION

Pale yellow liquid with a pungent chlorine-like odour. Commmercial products of this concentration are available as swimming pool ‘chlorine’ or industrial bleach.

SOLUBILITY

Miscible with water. Reacts with organic solvents.

Solubility in water Miscible

PHYSICAL DATA

Molar mass	77.44
Melting point	-25°C (8-12.5%)
Boiling point	decomposes
Specific gravity	1.2 (14%)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	1791
Poisons Schedule	S5
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).

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 ≤ 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 ≤ 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

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.

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

sodium iodide

sodium monoiodide

WARNING

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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium iodate

iodic acid, sodium salt

DANGER

Formula	$NaIO_3$
CAS No.	7681-55-2
User Group	11-12S (Note B)

DESCRIPTION

White, odourless crystals or powder.

SOLUBILITY

Soluble in water, acetone and acetic acid.
Insoluble in methanol.

Solubility in water 81 g/L (20°C)

PHYSICAL DATA

Molar mass	197.89
Melting point	ca.560°C(decomposes)
Boiling point	-
Specific gravity	4.28 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	II
UN Number	1479
Poisons Schedule	-
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, CO_2 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

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

sodium metabisulfite

sodium disulfite; disodium pyrosulfite

DANGER

Formula	$Na_2S_2O_5$
CAS No.	7681-57-4
User Group	7-12

DESCRIPTION

White to yellowish crystals, granules or powder with a slight odour of sulfur dioxide.

SOLUBILITY

Soluble in water and glycerol. Slightly soluble in alcohol.

Solubility in water 650 g/L (20°C)

PHYSICAL DATA

Molar mass	190.11
Melting point	> 150°C decomposes
Boiling point	-
Specific gravity	1.4 (25°C)
Flammability	Non-combustible

REGULATORY INFORMATION

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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium metasilicate, pentahydrate

disodium metasilicate pentahydrate; water glass

DANGER

Formula	$Na_2SiO_3.5H_2O$
CAS No.	10213-79-3
User Group	7-12

DESCRIPTION
Colourless, odourless granules.

SOLUBILITY
Soluble in water. Insoluble in alcohol.

Solubility in water 840 g/L (20°C)

PHYSICAL DATA

Molar mass	212.14
Melting point	72°C (-5H_2O) 1090°C (anhydrous)
Boiling point	-
Specific gravity	1.75
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	3253
Poisons Schedule	S5
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

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VERSION
28 June 2018

sodium molybdate dihydrate

disodium molybdate dihydrate; molybdic acid, disodium salt

Formula	$Na_2MoO_4.2H_2O$
CAS No.	10102-40-6
User Group	11-12

DESCRIPTION

Colourless, odourless crystals.

SOLUBILITY

Soluble in water.

Solubility in water 840 g/L (20°C)

PHYSICAL DATA

Molar mass	241.95
Melting point	130°C (-$2H_2O$) 687°C (anhydrous)
Boiling point	-
Specific gravity	3.78 (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, 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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium nitrate

chile saltpetre; nitric acid, sodium salt

WARNING

Formula $NaNO_3$
CAS No. 7631-99-4
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 acetone.

Solubility in water 874 g/L (20°C)

PHYSICAL DATA

Molar mass	84.99
Melting point	308°C
Boiling point	380°C
Specific gravity	2.26 (20°C)
Flammability	Non-combustible oxidising solid

REGULATORY INFORMATION

ADG Class	5.1
Packing Group	III
UN Number	1498
Poisons Schedule	-
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium oxalate

disodium ethanedioate; oxalic acid, disodium salt

WARNING

Formula $Na_2C_2O_4$
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

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 quanitities 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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium phosphate, monobasic, dihydrate

monosodium dihydrogen orthophosphate dihydrate;
phosphoric acid, monosodium salt

Formula	$NaH_2PO_4.2H_2O$
CAS No.	13472-35-0
User Group	7-12

DESCRIPTION
Colourless, odourless crystals or powder.

SOLUBILITY
Soluble in water. Practically insoluble in alcohol.

Solubility in water 850 g/L (20°C)

PHYSICAL DATA

Molar mass	156.02
Melting point	>170°C decomposes
Boiling point	-
Specific gravity	1.915 (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. 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 quanitities 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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium phosphate, tribasic, dodecahydrate

trisodium orthophosphate dodecahydrate

WARNING

Formula	$Na_3PO_4.12H_2O$
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 (-11H_2O)
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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium silicate solution

water glass; liquid glass

WARNING

Formula	$Na_2O.(SiO_2)_x(aq)$
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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium sulfate

sodium sulphate; sulfate of soda; sulfuric acid, disodium salt

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.

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.

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.

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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium sulfide, hydrate

disodium monosulfide hydrate; sodium sulphide

DANGER

Formula	$Na_2S.xH_2O$
CAS No.	27610-45-3
User Group	Staff

DESCRIPTION

Colourless to yellow to brick-red flakes or crystalline solid with an odour of hydrogen sulfide.

SOLUBILITY

Soluble in water. Slightly soluble in alcohol. Insoluble in ether and *n*-octanol.

Solubility in water 450 g/L (20°C)

PHYSICAL DATA

Molar mass	78.04 (anhydrous) 240.18 (nonahydrate)
Melting point	50°C (nonahydrate) 1176°C (anhydrous)
Boiling point	-
Specific gravity	1.43 (nonahydrate)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	II
UN Number	1849
Poisons Schedule	S5
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

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium sulfite

disodium sulphite; sulfurous acid, sodium salt

DANGER

Formula	Na_2SO_3
CAS No.	7757-83-7
User Group	11-12

DESCRIPTION

Colourless, odourless crystals or powder with a saline, sulfurous taste.

SOLUBILITY

Soluble in water and glycerol. Practically insoluble in alcohol.

Solubility in water 220 g/L (20°C)

PHYSICAL DATA

Molar mass	126.04
Melting point	> 500°C decomposes
Boiling point	-
Specific gravity	2.63 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	-
Packing Group	-
UN Number	None
Poisons Schedule	-
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 quanitiies 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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium tartrate, dihydrate

disodium tartrate dihydrate; tartaric acid, disodium salt

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 (-$2H_2O$)
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.

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.

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.

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.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium tetraborate, decahydrate

borax decahydrate; sodium borate; disodium tetraborate decahydrate

DANGER

Formula	$Na_2B_4O_7.10H_2O$
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_2O) 320°C (-5H_2O) 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.

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.

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.

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.

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VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium thiocyanate

sodium rhodanate; sodium rhodanide; sodium sulfocyanate

WARNING

Formula	NaSCN
CAS No.	540-72-7
User Group	11-12

DESCRIPTION

Colourless, odourless crystals or powder.

SOLUBILITY

Soluble in water and alcohol.

Solubility in water 1250 g/L (20°C)

PHYSICAL DATA

Molar mass	81.07
Melting point	310°C
Boiling point	> 368°C decomposes
Specific gravity	1.74 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

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

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sodium thiosulfate, pentahydrate

sodium hyposulfite pentahydrate; ‘hypo’

Formula	$Na_2S_2O_3.5H_2O$
CAS No.	10102-17-7
User Group	7-12

DESCRIPTION

White, translucent, odourless crystals or powder.

SOLUBILITY

Soluble in water. Insoluble in alcohol.

Solubility in water 701 g/L (20°C)

PHYSICAL DATA

Molar mass	248.18
Melting point	48°C
Boiling point	100°C (-5H_2O)
Specific gravity	1.67
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 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.

DISCLAIMER This chemical summary is not a safety data sheet (SDS). It is intended to provide generic information for this chemical. The manufacturer’s SDS should be consulted for information specific to the chemical used.

VERSION
28 June 2018

Science ASSIST
Chemical
Summary

sulfamic acid

sulfamidic acid; aminosulfonic acid

WARNING

Formula	H_3NSO_3
CAS No.	5329-14-6
User Group	11-12S

DESCRIPTION
Colourless, odourless crystals or powder.

SOLUBILITY
Soluble in water. Slightly soluble in acetone. Sparingly soluble in ethanol, methanol. Insoluble in diethyl ether.

Solubility in water 213 g/L (20°C)

PHYSICAL DATA

Molar mass	97.09
Melting point	205°C (decomposes)
Boiling point	-
Specific gravity	2.13 (20°C)
Flammability	Non-combustible

REGULATORY INFORMATION

ADG Class	8
Packing Group	III
UN Number	2967
Poisons Schedule	S6
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 CO_2. 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.

VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

sulfur

flowers of sulfur; sulphur

WARNING

Formula	S
CAS No.	7704-34-9
User Group	7-12

DESCRIPTION

Yellow, odourless powder, granules, flakes or pastilles.

SOLUBILITY

Practically insoluble in water. Soluble in toluene. Slightly soluble in acetone, ethanol and diethyl ether.

Solubility in water Practically insoluble.

PHYSICAL DATA

Molar mass	32.06
Melting point	113-119°C
Boiling point	444-445°C
Specific gravity	1.96-2.07 (20°C)
Flammability	Flammable

REGULATORY INFORMATION

ADG Class	4.1
Packing Group	III
UN Number	1350
Poisons Schedule	-
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.

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VERSION
6 Jan 2016

Science ASSIST
Chemical
Summary

sulfuric acid

oil of vitriol; sulphuric acid

DANGER

Formula H_2SO_4
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 CO_2. 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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

stearic acid

1-heptadecanecarboxylic acid; stearophanic acid

Formula $C_{18}H_{36}O_2$
CAS No. 57-11-4
User Group 11-12

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.

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

tartaric acid

L-(+)-tartaric acid; (2R,3R)-dihydroxysuccinic acid

WARNING

Formula $C_4H_6O_6$
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

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VERSION
9 Dec 2016

Science ASSIST
Chemical
Summary

tris(hydroxymethyl)aminomethane

Tris base; THAM; trometamol

Formula	$C_4H_{11}NO_3$
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 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.

VERSION
24 Nov 2016

Science ASSIST
Chemical
Summary

white spirit

low aromatic white spirit; heavy naphtha

DANGER

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

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VERSION
15 Nov 2016