Hazardous waste disposal

Posted by Anonymous on Fri, 2016-06-24 08:56

Hazardous Waste Disposal: Can you please advise on how to deal with hazardous waste, including chemical waste, which type of chemicals go into what type of container, e.g., acids into a corrosives container, ethanol into a flammable waste container. In particular, could you please advise how to treat the waste of Cobalt Chloride, Copper Chloride, Strontium Chloride, Lithium Carbonate; can you please advise what chemicals they can be mixed and disposed of with.

Voting:
Average: 5 (1 vote)

Year Level:
7
8
9
10
Senior Secondary
Laboratory Technicians:
Laboratory Technicians

Showing 1-1 of 1 Responses

Laboratory Chemicals and Waste Management/Setup

Submitted by sat on 01 August 2016

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Schools have a responsibility to identify, segregate and dispose of hazardous waste in a safe and environmentally conscious manner. Hazardous waste in schools can include equipment that contains hazardous chemicals such as batteries and radioactive sources, contaminated items such as sharps and broken glass, biological materials such as microorganisms, as well as chemicals used and produced in the school laboratories.

We provide some general information here for the management of your laboratory waste. For more detailed guidance information please refer to our Microbiology Guidelines[1] and Chemical Management Handbook.[2]

Hazardous and regulated material

Battery disposal: check with local waste management companies.

Radioactive sources: check with the EPA. See the Science ASSIST SOP.[3]

Glassware/sharps

Glassware contaminated with hazardous materials should be decontaminated before being reused or disposed of. Glassware which cannot be decontaminated, should be disposed of as hazardous waste. See our Information Sheet on lab glass and porcelain disposal.[4]

Biological Hazardous Wastes

Any microbiological equipment, for example agar plates, with microbial growth, or contaminated items such as gloves, test tubes etc., should be placed into an autoclave or oven bag and sterilised in a pressure cooker or autoclave at 121 °C, 15 psi for 15–30 minutes before being disposed of in the normal waste bin, or, in the case of equipment, being detergent washed and reused. See our Information Sheet on sterilising agar.[5]

Hazardous Chemical Waste

General considerations

Careful consideration is required for the disposal of any hazardous chemical.

- **Consult the Safety Data Sheet:** The safety data sheet (SDS) for a chemical should be checked for the correct Personal Protective Equipment (PPE) to be worn and for any specific advice on disposal procedures.
- **Chemical incompatibility:** If storing waste as mixed waste, incompatible chemicals should not be placed in the same bottle. Information about the incompatibilities of a chemical can be found in the safety data sheet, Section 10: Stability and Reactivity. See the References for other sources of this information.
- **Container type:** A bottle or container of the same material as that in which the chemical is supplied is suitable for the storage of waste. Old chemical containers which are in good condition and have been thoroughly cleaned can be used for storing waste. Metal containers are generally not recommended for the storage of waste due to their reactivity and potential to corrode. Containers which have previously contained highly toxic waste should not be re-used, but should be disposed of via a licenced waste contractor.
- **Local policies and guidelines:** Disposal guidelines from your school jurisdiction, organisations such as your local council, water authority or the Environment Protection Authority (EPA) in your state/territory should also be considered.

Disposal methods

The following options can be considered for disposing of laboratory chemical waste.

- **Store as solid or liquid waste and arrange for collection** by a licenced waste disposal contractor. This method of disposal applies to many organic liquids, heavy metal salts, and mercury waste as well as larger volumes of chemicals and any unknown chemicals.
- **Recycle** if safe and manageable. For example, copper sulfate or alum can be recovered by recrystallisation or evaporation of the solution. Crystals from class crystal-growing activities can be reused in the preparation of solutions.
- **Landfill**. Small quantities of non-hazardous solid chemicals such as sugars, or salts in which both the anion and cation are non-hazardous can be disposed of as general waste
- **Wash to waste**. Dilute solutions of small quantities of water-soluble, non-hazardous chemicals are accepted by most water authorities. These chemicals must be non-toxic to aquatic organisms. Unknown chemicals should never be put down the sink.
- **Treat the waste** to minimise the volume or reduce/eliminate the hazard, and dispose of the products accordingly. Consideration should be given as to whether this is economical in terms of the time and chemical resources required. Waste treatment methods include (i) neutralisation of acids or bases, (ii) evaporation of water from aqueous salt solutions, (iii) precipitation or displacement of metal ions from solution (iv) reduction of oxidising agents.

Assessing the risk and minimising waste

A risk assessment should be conducted prior to any activity using chemicals to identify all hazards and wastes produced. Our one page risk assessment template can be used for assessing tasks relating to managing hazardous waste.[6]

It is good practice to minimise the chemical waste that is produced wherever possible. It can be instructive for students to assess the chemical waste produced as part of their laboratory activity. Suggestions for minimising chemical waste:

- purchase small quantities so as not to stockpile, and use chemicals only as required
- consider the use of microscale reactions and techniques in the classroom
- regularly dispose of old or out of date chemicals via licenced waste contractors; do not allow them to accumulate

Segregation of chemical waste

All chemical waste requiring disposal by a licenced waste disposal contractor, should be collected into waste bottles which are correctly labelled, segregated from incompatible chemicals and stored securely.

Surplus, old or out of date chemicals are best kept in their original containers. Where chemical containers are degraded, these are best placed into secondary containment, which could be as simple as a strong zip lock plastic bag, if suitable.

Mixed waste: Ensure that only compatible chemicals are contained together. It is good practice to record what and how much of it you have put in the bottle, such as by attaching a label to the outside of the bottle on which to record each addition, or by keeping an electronic record (e.g. an Excel spreadsheet) which can be printed when compiling a waste manifest in preparation for waste collection.

Halogenated and non-halogenated solvents: These two categories of solvent are stored separately to avoid any chemical incompatibilities and hence, dangerous reactions. Also, depending on the waste contractor, the treatment methods they use may be less expensive for solvent in which there is no halogen component.

The following categories of waste can be stored as mixed waste:

- Organic liquid waste, non-halogenated
- Organic liquid waste, halogenated
- Aqueous waste; toxic inorganic substances, heavy metal mixtures
- Solid waste; toxic inorganic residues, heavy metal mixtures
- Aqueous waste, dilute acids
- Aqueous waste, dilute alkalis

The following waste can be stored separately:

- Lead residues
- Copper residues
- Nickel residues
- Chromium residues
- Zinc residues
- Silver residues
- Mercury residues
- Concentrated acid (a separate container for each acid)
- Note: **Do not** mix a concentrated acid with any other chemical.

Regarding the specific chemicals that you have mentioned:

- **Acids**
- **Small quantities** can be diluted, neutralised and washed to waste.

Common reagents for the neutralisation of acids include dilute sodium hydroxide solution, or solutions of sodium bicarbonate or sodium carbonate or solid calcium carbonate. Carbonates have the advantage that neutralisation is indicated by the cessation of effervescence of carbon dioxide. The pH can be monitored with pH paper or indicator solution or a pH probe. Waste should be neutralised to within pH 6-8. The neutral solution can then be flushed down the sink with dilution.

- **Large quantities** should be stored in a suitably labelled container in secondary containment, or bunding, which is able contain the entire contents in the event of the container breaking.
- As noted above, concentrated acids should not be mixed with other chemicals
- **Ethanol**
- **Small quantities** can be diluted to below 24% and washed to waste, as the alcohol is miscible with water.
- **Large quantities** should be stored as non-halogenated organic waste.
- **Cobalt chloride, copper chloride, strontium chloride and lithium carbonate**
- These chemicals are all toxic to either people and/or the environment and should therefore be disposed of by a licenced chemical waste disposal contractor.
- They can either be stored separately or with waste toxic inorganic substances.
- For pure chemicals, keep in their original containers if possible.
- Solutions can be evaporated in the fume cupboard and the salts stored as solids. If heating a solution to evaporate, in order to avoid decomposing the salt, heat only at low temperature in a fume cupboard and do not evaporate to dryness.

References

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3 Science ASSIST, 2014, *Safe Operating Procedure: Handling Radioactive Sources,* Science ASSIST website, Radioactive source | ASSIST (asta.edu.au)

4 Science ASSIST, 2014, *ASSIST Information Sheet: Lab glass and porcelain disposal,* Science ASSIST website, AIS: Lab glass and porcelain disposal | ASSIST (asta.edu.au)

5 Science ASSIST, 2014, *ASSIST Information Sheet: Sterilising Agar,* Science ASSIST website, https://assist.asta.edu.au/sites/assist.asta.edu.au/files/AIS%20Sterilis...

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Further information

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