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NOTES ON CHEMICAL WASTE MANAGEMENT IN THE TEACHING LABS

Public opinion of waste management and federal and provincial legislation are constantly changing as environmental awareness grows. Unfortunately, the public's perception of how we, as chemists, deal with our chemical waste does not seem to change as fast. The Department, and of course the University, revise our practices frequently. The purpose of these notes is to bring you up to date with the current guidelines.

Laboratory waste is divided into five categories:

a) **Landfill Waste**. This would typically be paper towels used for hand drying or wiping up minor spills (dry off solvents in the hood first), non-recyclable paper, bagged loose powders such as column packing or vermiculite (and other shipping material), used gloves etc. No glass (including Pasteur pipettes) is allowed. Many used containers may be recycled once they have been cleaned (see below). The few that cannot be recycled must be cleaned and put in either the landfill waste or the glass waste.

b) **Glass**. Non-recyclable glass (essentially any glass other than clean empty bottles) should be collected in the separate container in each lab. It must be cleaned, as it will also be taken to the landfill.

c) **Glass or Plastic Bottles and Containers**. Most bottles and other containers in which liquid or solid chemicals were obtained can be recycled, but they must first be cleaned. Drain the residual chemicals into a suitable waste container. Bottles that have held acutely hazardous or reactive waste must be rinsed with a suitable solvent. When residual volatile liquid is present after draining, place in a fume hood to allow evaporation to dryness. Do a final rinse with water, then take to the designated collection area. Do not dispose of pop or juice bottles in these bins, as there are more appropriate places to recycle these on campus. Bottle caps go into the landfill waste bin. Regarding plastics, types #1 - 7 can be recycled, as can un-numbered bottles. Plastic types #8 or higher may be dealt with separately - contact Science Stores for advice.

d) **Organic Liquids**. These are separated as to whether they contain halogens or not. Any solvent combination including a halogenated solvent must be placed in the BLUE halogenated waste container. Non-halogenated solvents go into the RED container. Both are sent off the island for burning. It is important that the separation be correct, so that the appropriate fuel proportions can be adjusted to maintain complete combustion. Some water is an allowable component of a mixture, but obviously undesirable in large quantities. Remember that any solute that is included will also be combusted. This is particularly dangerous where heavy metals are concerned, as vaporised metal will spread deposits over a large area of ground.

   The small blue and red containers have two caps. The larger is intended as the pouring hole, the smaller is an air leak. Since the typical fill-line is above the level of the air leak, make sure that the small yellow cap is tightened as soon as an empty can is received.

e) **Solid Chemicals**. These will be collected by the person responsible for the laboratory. In many cases, separation is required, but it would be inappropriate to list them all in this document. Lead, thallium and mercury and their salts are the common items to separate. All solids are appropriately packaged, recycled if feasible, or shipped to a commercial chemical waste company (off the island!). So that they can be dealt with in the best fashion possible, it is important that the containers be secure and labelled with as much information as to the contents as possible. For example, both cations and anions must be defined, even if the list has to have an "*any of the above*" category. The charges for disposal are related to the contents and of course the most expensive ingredient sets the price. This is currently why lead, mercury and thallium are separated. Remember that recycling is a much cheaper alternative in the long run. It is cheaper to send larger and fuller containers, since volume is a component of price (the containers are shipped in drums).

f) **Waste Solutions**. Any solutions generated in the lab should ideally be dealt with by the user. To some extent, this is not practical in a teaching lab environment, and so there are containers in which to collect these solutions. However, you will appreciate that huge volumes can quickly make this an unworkable situation. Each student must reduce the volume of waste generated by either precipitation of the metal, extraction or concentrating the volume of solution on a rotovap. The collected solutions will then be further concentrated into a viscous mass and packaged for disposal as solid waste. This task is made a lot easier if large volumes of solutions are avoided. Each student is encouraged to process all the chemical waste into a manageable solid form for collection.

If you are unsure what to do about disposal of a chemical, talk to a lab instructor first. **DO NOT POUR IT DOWN THE SINK!** There are special methods and equipment for dealing with chemical spills (both small and large). Again consult your instructor.

Occupational Health, Safety & Environment

Conventional Fume Hood Guidelines

1) Before using a fume hood, ensure you will be provided with an appropriate level of protection and that the fume hood is appropriate for your work. Refer to the conditions of use, including any restrictions, noted on the fume hood label.

   a) All operations, which generate airborne chemical contaminants, must be performed in a fume hood. Radioisotopes must be used in a fume hood designated exclusively for such use.

   b) Perchloric acid must be used in a fume hood designated exclusively for its use, having appropriate wash down capabilities.

   c) Biohazardous materials must be used in a certified biological safety cabinet.

Fume Hood #0043023…	Conditions Of Use
Permitted ☑ Carcinogenic Substances	Not Permitted ☒ Perchloric Acid ☒ Chemical Storage
Annual fume hood test completed ☑ ☐ 2008 ☐ 2009 ☐ 2010 ☐ 2011 ☐ 2012	
Fume hood Emergency Procedures Check the air flow indicator to make sure air is flowing into the hood (check air flow monitor display and lights) **If you suspect a reduction or loss of air flow:**	
1. Close the fume hood sash completely 2. Call Facilities Management at 7616 3. Call Campus Security at 7599 (after hours) 4. Await further instructions in safe area	

2) Keep all apparatus at least 15cm (6 in) from the front face of the fume hood and the back damper to ensure air is adequately drawn into the hood. Items stored at the back of the fume hood and larger items should be elevated on a shelf.

3) Do not use a conventional fume hood that does not have the maximum working sash height clearly labeled. Always keep the sash at or below this level, since increasing the sash height reduces the air flow at the face of the hood.

4) All fume hoods should have an "Air Flow Indicator" attached to the sash. Prior to starting work in a fume hood, check the ribbon to make sure air is flowing into the hood (ribbon should be angled towards the hood).

5) To prevent a reduction in airflow at the face of the hood, limit the number of individuals standing close to the fume hood and ensure that open doors and windows are not creating a cross draft.

6) Clearly WHMIS-label all chemicals and long-term experiments including the user's name and date.

7) Do not use a fume hood for storing chemicals unless it has been designated for storage.

8) If a power outage occurs, fume hood function will likely be compromised. In this situation, take precautions to ensure adequate protection. For example, prevent the build-up of vapour and fumes by covering all chemicals, turn off natural gas, secure your experiment and close the sash.

9) Ensure that you are aware of the nearest emergency eyewash and shower. A lab coat, gloves, eye protection and appropriate footwear must be worn.

10) Fume hoods with an on/off switch have been labeled. Ensure the hood is turned on before starting your work and allow time for the flow to stabilize. Before turning the hood off, ensure that any vented chemical storage will not be affected.

11) Do not place electrical apparatus or other ignition sources inside the fume hood when flammable liquids or gases are present in the hood.

For further information contact Occupational Health, Safety & Environment at 250-721-8971 or through their website at http://ohs.uvic.ca/