You Have Safety Questions? We Have Safety Answers!

QUESTION # 2

We frequently do the sodium in water demonstration as a teacher demonstration. What is the STAO Safety Committee's suggested precautions for this demonstration? We have a parent who has expressed a concern.

RESPONSE

The following precautions should be taken, whether it be sodium or potassium:

- TEACHER DEMONSTRATION only!
- Use only a rice-grain sized sample of the metal, removing as much liquid paraffin as possible with a paper tissue.
- Use a wide glass trough filled with cold water. Ensure the water is cold!
- Teacher and students should protect their eyes with safety goggles and a safety shield should be used. (Pieces of molten metal and concentrated base are sometimes ejected from the trough during the reaction).
- No attempt should be made to constrain the metal. It must be allowed to roam freely over the surface of the water.
- When the demonstration is over ensure that the knife used for cutting the metal, and the paper tissue on which the metal was cut, have no unreacted metal pieces adhering to them. They should both be put in the trough of water to allow for any surplus alkali metal to react.

The STAO Safety Committee believes that, if teachers follow the advice given above, then this demonstration can be performed safely and important educational outcomes achieved. With appropriate safeguards, teachers can continue to ensure they are delivering safe but exciting science.

« « « By the STAO Safety Committee

The STAO Safety Committee welcomes enquiries, with respect to safety issues, from STAO members. Please send your questions to the Safety Committee Chair (refer to page 4 'Committee Chairs'). Your questions and the STAO Safety Committee responses may be published in Crucible, particularly if the information is deemed of general interest to other STAO members. Anonymity, however, will be guaranteed.

QUESTION # 3

What exactly is an MSDS?

RESPONSE

MSDS is the acronym for 'Material Safety Data Sheets' which are an integral part of the ***Workplace Hazardous Materials Information System*** (WHMIS). Under WHMIS , there are three ways in which information on hazardous materials must be provided:

1. **Labels** on the containers of hazardous materials;
2. **Material Safety Data Sheets (MSDS)** to supplement the information on the label; and
3. **Worker Training**.

The WHMIS label provides immediate vital warning information to those using the hazardous material. The MSDS, however, contains additional detailed hazard and precautionary information important in handling emergencies (e.g. spills; accidental ingestion) or in designing controls for the safe use of the hazardous material. Ontario law requires the employer (e.g. District School Board) to have an MSDS available for every hazardous material in the workplace (e.g. school). The MSDS contents are spelled out by both federal and provincial regulations.

QUESTION # 4

How is science equipment best stored in elementary schools?

RESPONSE

Equipment is an important feature of elementary school science and has a key role to play in developing how students think and work scientifically. Effective science teaching depends on the right equipment being in the right place at the right time, and in working condition. Storage should reflect the needs of both students and staff in allowing for efficient access and movement of materials. Some storage options include:

1. **Central Storage.** In this method all science equipment is stored centrally e.g. all equipment for the whole school is stored in one area such as a designated room. Environmental conditions of the room are important (i.e. humidity).
2. **Topic Boxes**. Equipment is stored in science topic boxes (e.g. Forces and Movement; Pulleys and Gears), perhaps in a District School Board 'Kit Service' facility. Topic boxes are borrowed by classes for a set period of time.
3. **Individual Class Resource**. Each class is provided with a set of equipment which covers the science to be taught that year. Equipment is stored in cupboards and on shelving within the classroom.

4. **Basic Equipment Kit for Each Class.** Each class is given a set of basic science equipment, such as hand lenses and measuring equipment. This equipment kit is to accommodate spontaneous science activities in the classroom and basic measurement in activities. Science equipment related to the main teaching topic (e.g. light) is borrowed from a central store or topic box.
5. **Equipment Carts**. An equipment cart is simply a cart, preferably with shelves and trays, in which equipment is stored. The items are numbered and labeled and the cart either stored in the classroom (one cart per class) or moved from class to class as the need arises or the class is timetabled for science.
6. **Cupboards**. Cupboards commonly form part of the storage provision in classrooms. Cupboards are useful for items which are likely to be pilfered if stored on open shelving.

QUESTION # 5

What safety legislation/regulations applies to chemical storage in schools?

RESPONSE

Science teachers have a legal responsibility to ensure chemicals are stored in a proper manner. *The Occupational Health and Safety Act (1996)* in **Section 37(3)** imposes a general duty of care in respect to the storage of hazardous materials. The storage of some categories of chemicals, in particular highly flammable liquids (*Ontario Fire Code* O.Reg. 388/97 Section 4.2) and compressed gas cylinders (*Ontario Fire Code* **O.Reg. 388/97 Section 5.6**) , are also subject to statutory regulation. WHMIS legislation requires an MSDS to identify storage requirements in one of its 9 sections of information (Preventative Measures). In addition, a local Board of Education may have identified recommended policies and procedures designed to ensure compliance with the law in matters of storage and to promote the health and safety of employees and others who might be affected by the legislation.

QUESTION # 6

I wish to inquire about the disposal of hazardous materials/wastes generated in science programs at secondary schools. Specifically, I am wondering if the STAO Safety Committee is aware of any "standard operating procedures" for handling and disposing of hazardous wastes from science programs (other than the information found on MSDS)?

RESPONSE

The STAO Safety Committee has recently (May 2001) published a safety resource entitled *Disposal of Hazardous Waste from School Science Laboratories*. It can be ordered from the STAO Science Store. (Cost $6.00 ISBN 1-894592-06-9)

QUESTION # 7

I wonder if you could let me know if STAO Safety has a position on having the large hydrogen and oxygen cylinders for use in science classes. Your informed opinion on whether these cylinders are necessary and what risks are involved would be appreciated.

RESPONSE

A cylinder of compressed gas may present a significant hazard if the pressure is suddenly released. (see 'Learning by Accident' article in the June 2001 issue of *Crucible*) In addition, there may be a hazard dependent upon the nature of the gas itself.

As these cylinders contain gas under high pressure (up to 150 atmospheres), they should be stored in a cool place. They must never be left to roll around freely, but should be chained or clamped firmly, in an upright position, or used in the special stands available. For transporting the cylinders, the use of special trolleys is recommended.

The *Ontario Health and Safety Act and Regulations* covers the storage of gas cylinders. In particular O. Reg. 851, s.49 states:

A storage cylinder for compressed gas shall,

a. have a valve connection that prevents an inadvertent connection which would result in a hazardous mixture of gases;
b. be secured in position during transportation, storage or use;
c. have the valve protection cap in position when the cylinder is not in use;
d. when containing acetylene, be in an upright position; and
e. be protected from physical damage.

Care should be taken to ensure that all valves are clean, dry and free from grease.

The ignition of hydrogen/air mixtures is the most common source of serious explosions in school laboratories. While not free from risk, cylinders of compressed hydrogen gas provide a safer source of hydrogen than most school methods of generating the gas; not only is the hydrogen likely to be purer, but the rate of flow can be closely controlled. The relatively high rates of flow available mean that air can be more readily flushed through apparatus. Hydrogen cylinders should, however, be fitted with a needle valve to control the flow of gas as well as a pressure-reducing valve.

While it is usually appreciated that a leak of hydrogen into the atmosphere may cause an explosion, this is not very likely because of the speed at which the gas diffuses. However, the serious fire hazard arising from a leak of oxygen is less well known. In an atmosphere containing as little as 25% oxygen, materials ignite at much lower temperatures than normal and burn furiously.

Gas cylinders will be checked for leaks by the supplier when being refilled. Schools should check gas cylinder regulators at least annually for leaks using detergent solution. We recommend that regulators be checked every five years by a specialist company.