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Safe Science: Be Protected!

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FOR A SAFER SCIENCE EXPERIENCE: BE PREPARED!

I. WHAT NEEDS TO BE DONE?

With the increase in hands-on, process and inquiry based science over the past few years, the likelihood for laboratory accidents in schools has also increased. Students using Bunsen burners, working with hazardous chemicals, breaking glass, and more, present special safety challenges which need to be addressed. One way to prepare for a safer science experience is to have the appropriate safety equipment and provide student training. The following items represent basic planning/equipment which are needed in the laboratory for safe operation: Attire, personal protective equipment, MSDS, labeling, fire blanket, fire extinguisher, safety shower, and fume hood.

II. DRESSED FOR THE OCCASION!

Attire or dress is critical to avoid skin exposure to hazards. School science laboratories need to have established and enforced attire standards. Included in the standards should be:

a. Long and loose hair should be avoided – tie back to prevent entanglement and catching on fire.
b. Avoid loose clothing which might get entangled in equipment or catch on fire when using a burner.
c. Wear only closed toed shoes or sneakers. Open toed footwear like sandals and thongs are unacceptable. Footwear containing woven material should also be avoided.

III. PPE FOR YOU AND ME!

Personal protective equipment (PPE) is required by all occupants – students, teachers, and others when dealing with materials and/or procedures which could prove to be a danger to the eyes; e.g., Hazardous chemicals, projectiles, particulates, and more. When dealing with hazardous liquids like acids, etc., chemical splash goggles are required. When dealing with solids like projectiles, etc., safety glasses are required. Make sure the lenses have an impact rating like Z-87.1.

Appropriate gloves and aprons should also be used in cases where chemical or liquid splashing is possible, and where hands may be exposed to chemicals, extreme heat and more.

IV. MSDS

Material Safety Date Sheets (MSDS) are the bible with a small "b" when it comes to knowing anything about hazardous chemicals. To be better pre-

pared for safety, it is important to know what dangers are possible and what kind of protection is needed. Basic MSDS guideline information is as follows:

a. Make sure MSDS sheets are secured when chemicals are purchased. Suppliers are required to provide them.
b. Keep all MSDS sheets for chemicals being used on file in the laboratory. The administration should also have copies.
c. Be sure to read the MSDS prior to using chemicals and take proper precaution.
d. Be sure to share pertinent MSDS information with students prior to using chemicals in the laboratory.
e. Make sure the school medical support person knows the location of the MSDS for chemicals being used in the laboratory.

V. LABELING – KNOW WHAT YOU ARE DEALING WITH!

Labeling or signage is critical on several fronts. Signage alerting occupants of dangers and location of safety equipment. Include fire extinguisher, eyewash, shower, exits, master shutoff valves and more. Individual chemical labels are also important in preventing accidents. No container should be in the laboratory or storeroom without an appropriate label. Labels minimally should include name of the contents, dangers, precautions, date and supplier.

Some schools use safety warning National Fire Protection Association diamond labeling systems. This is a quick reference for determining health (blue for health hazards), fire (red for fire danger), reactivity (yellow for reactivity) and hazards (white for specific hazards).

VI. ENGINEERING CONTROLS

Engineering controls include eyewash fountains, acid showers, etc. No laboratory should be operational without these controls for safety.

Eyewash fountains are critical as a response to an eye exposure. Time is critical in this case, so the eyewash fountain should be within a maximum of a 10 second reach. Tepid water should be available and bathing the eyes for a minimum of 15 minutes. The eyelid should be retraced or held open. The medical support person should be contacted immediately.

Safety showers can be used for hazardous chemical exposure and clothing fire. Again, access should be within 10 seconds.

VII. FIRE BLANKET – WRAPPING IT UP!

Fire blankets are one line of defense in helping to protect laboratory occupants from being burned. General procedure includes;

a. Pull the tabs or handles to release the blanket in the storage container or box.
b. Shake open the blanket and hold it at its end.
c. Wrap the victim in the blanket and roll him/her on the floor to smother the fire.

VIII. EXTINGUISHER THE FLAMES!

Fire extinguishers are another line of defense in dealing with safety hazards. Appropriate and annual training by laboratory personnel and students is required in advance of any laboratory work. There are two main

types of fire extinguishers appropriate for the laboratory: i.e., carbon dioxide and dry chemical. The extinguishers are often color coded: i.e., Carbon dioxide extinguishers are red and dry-chemical extinguishers are yellow. Please note that these two types of extinguishers are ineffective when fighting reactive metals such as magnesium, aluminum, etc. Extinguishers should be serviced annually by a qualified technician. Special "D" type extinguishers are required. All expelled extinguishers should be replaced immediately.

The PASS system is used for operating the extinguisher in case of fire:

After breaking the nylon retaining cord -

a. Pull the pin at the top of the extinguisher. This will allow the locking mechanism to be released and be able to discharge the extinguisher.
b. Aim at the base of the fire, not the top of the flames.
c. Squeeze the lever slowly. This action releases the extinguishing agent in the extinguisher.
d. Sweep from side to side. Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out. Be sure to operate the extinguisher from a safe distance, so as not to be overcome by fumes or heat.

The last think to remember is to be sure to have a means of egress at your back. Do not get trapped by having no way to escape, if the fire gets out of control.

IX. FUME HOOD AND VENTILATION

Chemistry laboratories are not supposed to smell, contrary to the belief of many administrators. Adequate ventilation is defined as ventilation that is effective in keeping the concentration of a chemical below the permissible exposure limit (PEL) or threshold limit value (TLV). The MSDS should be consulted for these values.

In the case where the general laboratory ventilation is not adequate, fume hoods are used to prepare solutions or carry out reactions which produce hazardous vapors, gases, etc. Fume hoods should be inspected on a regular basis to insure proper operation. They are not to be used for storage of materials or equipment. Most fume hoods are not be used to ventilate the laboratory.

X. IN THE END!

Doing science is how students best learn science. Being prepared to do science safely is the best learned science.

LIVE LONG AND PROSPER SAFELY!

RESOURCES:

Occupational Safety and Health Administration: http://www.osha.gov
American National Standards Institute: http://www.ansi.org
Canadian Organizations Government Standard Sites: http://www.safetysmart-magazine.com/page-bin/links'canadianorg.htm
European Agency for Safety and health at Work:
http://uk.osha.eu.int/about/list.stm