

Laboratory Storage: Lab Safety

Student Activity Suggestions

- Create a safety video for your school's chemistry lab. Show what safety equipment is available and demonstrate how to properly use it
- Create a series of safety posters for your school laboratory, illustrating "Do's" and "Don'ts" of lab safety
- Create a PowerPoint presentation of lab safety. An example can be found at Chem Info Net (<http://www.cheminfonet.org/slide.htm>)
- Research lab accidents that have occurred in school laboratories. How could these accidents have been avoided? Follow this link for an example.
- Locate MSDS (Material Safety Data Sheets) for chemicals used during the course and compile them in a binder.

General Safety Guidelines

- Be prepared for the lab before coming to class. Read over the lab before starting any experiments. Pay special attention to any safety precautions.
- Always behave appropriately in the lab. No horseplay is allowed.
- Report any accidents immediately to your teacher
- Accidents can happen - report any problems immediately so the situation doesn't get worse
- Clean up all spills immediately. Be sure to inform the teacher about the spill in case special methods are needed for clean up.
- Avoid touching anything hot Test any object that might be hot by placing the back of your hand about 5 cm from the object. If you feel any warmth, then the object is hot.
- Know the location of all safety equipment in your lab as well as emergency exits. Learn how to properly use all safety equipment.
- Avoid cutting yourself Never use glassware that is chipped or cracked. Dispose of broken glassware in an approved container.
- Wear sensible clothing and proper protection when heating substances. Avoid loose clothing that may get too close to a flame or caught in equipment. If you have long hair tie it back.
- Always wear safety goggles when doing experiments
- Carefully read labels on bottles Often you will be working with chemicals that have similar names or differ only in their concentration (e.g. 0.1M HCl vs 1.0M HCl). Always double check to make sure you are using the correct chemical at the correct time.
- Never smell chemicals directly Waft the fumes to your nose

- Never taste chemicals. No eating or chewing gum in the laboratory
- Always clean up after yourself
- Never attempt unauthorized experiments
- Wash your hands with soap and water after each laboratory exercise
- Learn proper handling techniques for all chemicals Acids - acids are highly corrosive, causing burns to skin and clothing.
- When diluting an acid, always slowly add the acid to the water, stirring to dissipate the heat to avoid splattering. CAUTION: NEVER pour water into a concentrated acid. Any acid spills should be dealt with promptly by neutralizing with a base.
- Bases - Strong bases can also cause severe burns to the skin. Bases are very dangerous if splashed into the eyes.
- Mercury - mercury is highly toxic and spills are difficult to clean up. If special mercury recovery equipment is not available (sprays, wipes, etc. - available from chemistry lab suppliers) zinc dust should be used. Zinc dust reacts with mercury to form a safe mixture that is easy to handle and dispose of.
- Dispose of all chemicals properly at the end of each laboratory exercise

Basic First Aid

Bleeding

Minor cuts - wash the cut with soap and water and pat dry. Apply sterile bandage or dressing.

Severe - Apply pressure. Elevate. Apply dressing or bandage. Prepare to treat for shock. Seek medical assistance.

Burns, Chemical

Flood the affected area of the body with water for 20 minutes. Remove contaminated clothing. Seek medical attention.

Burns, Fire

Minor burns - cool the burned skin in cool water for at least 10 min until the pain is relieved.

Severe burns - immediately start cooling the burn with cool water for at least 10 minutes. Have the victim lie down. Prepare to treat for shock. Cover the burn with clean, non-fluffy material to protect from infection; bandage loosely. Seek medical attention

Clothing on fire - STOP, DROP, and ROLL. If available wrap the victim tightly in a fire blanket or other heavy-duty fabric (wool is the best) to smother the flames. The victim should be lying down if wrapped in a blanket to avoid a "chimney effect" which would increase the severity of the fire.

Smoke and/or Fire in the Lab - Be sure to know the location of all fire exits

Minor fires - know the location of the fire extinguisher and how to use it.

Major fires - All individuals should immediately leave the laboratory. The last person leaving the lab should close the door to the laboratory. If smoke has filled the room, stay low while evacuating the room. The school fire alarm should be rung after exiting the lab.

On ALL burns **DO NOT**

- Use lotions, ointments and creams
- Use adhesive dressings
- Break blisters

Eye Injuries

Chemicals in the eye - Immediately flush the eye with fresh water for 15 - 30 minutes. Loosely bandage around the eyes. Seek medical attention

Foreign object in the eye - NEVER remove any object embedded in the eye! Floating objects in the eye which can be seen may be flushed from the eye with water. If flushing does not remove the object, the victim should seek medical attention.

Shock

- Lay the casualty down, raise and support their legs.
- Cover with a coat or blanket to keep them warm
- Do not give them anything to eat or drink.
- Check breathing and pulse frequently.
- Give lots of comfort and reassurance

Lab Safety Equipment

Common safety equipment in the high school lab:

- **Fire extinguisher** Fire extinguishers are categorized by the type of fire(s) they will extinguish; most will put out more than one type of fire. Know where your classrooms fire extinguisher is located and how to use it.

Type A	Combustibles	Wood, paper, rubber, plastics
Type B	Flammable liquids	oil, grease, paint thinners
Type C	Electrical equipment	
Type D	Flammable metals	
Type K	Kitchen fires	

- Fire blanket
- Eye wash station
- First Aid kit

Chemical Storage

Safety in the science classroom includes the storage of chemicals. WHMIS regulations under the Hazardous Products Act govern storage and handling practices of chemicals in school laboratories.

Key items to remember:

- Chemicals should be stored in a safe location according to Chemical Class, not just alphabetically.
- Appropriate cautionary labels should be placed on all chemical containers
- All school division employees using hazardous substances should have access to appropriate Materials Safety Data Sheets.
- Check expiration dates of chemicals
- Keep only appropriate quantities of each substance on hand
- Consider safer alternatives to experiments and chemicals - safer for students and for the environment

Safe Disposal of Chemicals

Most of the chemicals used in the standard high school chemistry lab will be nonhazardous waste and may be safely disposed of by washing down the sink with water.

Items that are safe for drain disposal include:

organic materials
inorganic materials
acetamide
acetic acid
acetone

ethanol
ethylene glycol
formaldehyde
methanol
propanol

Solutions of inorganic salts where both the cation and anion are listed. Compounds containing the following that are highly acidic or basic should be neutralized first.

Some items should receive special attention; guidelines are given below for common wastes:

Acids and Bases

Save these solutions in a large container and use one to neutralize the other. The neutralized solution (pH of approximately 7) may then be washed down the sink with water.

Wastes Containing Toxic Heavy Metals

Copper and zinc should not be disposed of down the sink. Municipalities may have specific discharge limits for these metals.

Cations	Anions
Al ³⁺	BO ₃ ³⁻
Ca ²⁺	B ₄ O ₇ ²⁻
Fe ²⁺ , Fe ³⁺	Br ⁻
H ⁺	CO ₃ ²⁻
K ⁺	Cl ⁻
Li ⁺	HSO ₃ ⁻
Mg ²⁺	OCN ⁻
Na ⁺	OH ⁻
NH ₄ ⁺	I ⁻
Sn ²⁺	NO ₃ ⁻
Sr ²⁺	PO ₄ ³⁻
Ti ³⁺ , Ti ⁴⁺	SO ₄ ²⁻
Zr ²⁺	SCN ⁻

References & Internet Resources

The following documents provide additional relevant information related to chemical safety, storage, and disposal in schools.

- Safety in the Science Classroom. (2005). Alberta Education
http://www.education.gov.ab.ca/k_12/curriculum/bySubject/science/screport.pdf
- Science Safety Resource Manual. (2003). British Columbia Ministry of Education
<http://www.bced.gov.bc.ca/irp/resdocs/scisafety.htm>
- *Laboratory Science Position Statement*. (1990). National Science Teachers Association
<http://www.nsta.org/positionstatement&psid=16>
- Flinn Scientific Safety
<http://www.flinnsci.com/Sections/Safety/safety.asp>
- *Exploring Safely: A Guide for Elementary Teachers*. (2002). NSTA Press
- *Inquiring Safely: A Guide for Middle School Teachers*. (2003). NSTA Press
- *Investigating Safely: A Guide for High School Teachers*. (2004). NSTA Press
- *NSTA Guide to School Science Facilities*. (1999). NSTA Press

Organizations

- Occupational Safety and Health Administration
- Health Canada
- Canadian Centre for Occupational Health and Safety
- National Institute for Occupational Safety and Health - Chemical Safety
- NIOSH Pocket Guide to Chemical Hazards (NPG)
- US Chemical Safety and Hazard Investigation Board