

Safety in the Chemical Laboratory

A. Emergency Equipment

1. FIRE EXTINGUISHERS

- When to use*
- Uncontrolled fires.
 - **IF THE FIRE IS TOO LARGE TO PUT OUT WITH A FIRE EXTINGUISHER**, evacuate the room.
 - Turn off the main gas supply for the room if that can be done safely, close the door behind you, pull the fire alarm, and evacuate the building.

- Comments*
- Remember to pull out the safety pin from the side of the handle with a sharp pull.
 - Aim at the **BASE** of the flames and pull the trigger sweeping back and forth over the area in flames.
 - Large extinguishers will spray for about 20 s, smaller ones for about 10 s.
 - You must be within 4–5 m (12–15 ft) for the spray to be effective.
 - **DO NOT** spray the contents of an extinguisher on a person. Some types of extinguishers can freeze flesh or drive powder into the eyes or lungs.
 - School extinguishers are usually “general purpose” and can be used on chemical, electrical, and general fires which might occur.

2. FIRE BLANKET

- When to use*
- Used when a student's clothing or hair catches on fire.
 - Used to smother burning material on the floor or bench.

- Comments*
- If your clothing catches on fire, “stop, drop, and roll”. Blanket can be used to smother flames. Once the fire is out, remove any burned clothing (unless it has melted onto the skin). It is very important to get burned skin cooled as soon as possible.

3. EYEWASH FOUNTAIN

- When to use*
- Used any time a chemical or solution gets into eyes.

- Comment*
- Push lever to turn on eyewash. Stream of water must strike your eyes **DIRECTLY**.
 - Blinking rapidly helps wash underneath the lids. Keep washing the eyes for at least 15 minutes.
 - People wearing contact lenses are at greater risk of having eye damage. The lenses may absorb chemicals and trap them against the eyes.
 - Do not use the eye wash if you suspect that there is glass in you eyes as well as chemicals.

4. EMERGENCY SHOWER

When to use • Used when hazardous chemicals spray over large areas of the body or clothing.

Comments • Use hand-held shower to spray water liberally over the affected area.

- If a hazardous liquid chemical or solution soaks into you clothing, the affected clothing **must** be removed after the washing.

5. NEUTRALIZING SOLUTION

When to use • Use this solution whenever an acidic or basic (“caustic”) solution has come into contact with your skin.

- **DO NOT USE IN YOUR EYES** – use the eyewash if something gets in you eyes.

Comments • Consists of a dilute solution of sodium acetate and acetic acid (“vinegar”) and is more or less harmless to the skin for short periods of exposure.

- If skin feels slippery before applying neutralizing solution, the chemical which contacted the skin was a base and prolonged washing of skin must take place.
- After washing with neutralizing solution, continue to wash with warm soapy water.

6. Some final notes on emergencies:

a) **Priorities**

If more than one piece of equipment is needed or more than one problem has arisen, tend to the most serious problem first.

- a person on fire (immediately life threatening), then
- a person with chemicals or glass in eyes (threatens permanent blindness), then
- a person soaked with chemicals (harm to skin; generally slower reaction due to natural protective oils on skin).

b) **Sources of First-Aid Assistance**

- Mr. Rempel, Mr. Johnson

B. Protective Equipment

1. **SAFETY GLASSES**

When to use • Safety glasses **MUST** be worn whenever chemicals are being used or glass work is being performed.

- **Putting on safety glasses at the start of a lab period MUST become an automatic reflex.**

Comments • Safety glasses must be worn for the entire lab period whether you are handling chemicals or not.

- Only putting on the safety glasses when you are handling chemicals will not prevent chemicals from getting in you eyes from someone else.

2. LABCOATS

When to use • Labcoats **MUST** be worn whenever chemicals are being used.

- **Putting on labcoats at the start of a lab period MUST become an automatic reflex.**

Comments • Completely button up to prevent chemicals from being spilled on the front of clothing.

- Long sleeves must be rolled up.

3. FUME HOODS

When to use • The fume hood is used whenever poisonous or offensive odours are produced.

- Normally the instructions for an experiment will specify the use of a fume hood as part of the procedure.

Comments • Learn where the On/Off buttons for the fume hood are located.

- It is **NOT** necessary to pull down the glass partition during usage; the hood has sufficient draft to keep fumes out of the room even when the glass is fully up.
- The only time it should be necessary to pull down the glass is when the reaction may splatter out of its container.

C. In Case of Fire

1. The first and most important thing to do is to back out of harm's way and evacuate the situation.
2. Next, warn the teacher and other students with a shout.
3. **CONTROLLED FIRES:** If a fire is controlled, in the sense that it is in a beaker, flask, or test tube, the fire can often be put out by placing a watch glass or inverted beaker over the top of the container and smothering the fire.

DO NOT PANIC, in most cases the fire will burn out on its own.

4. **UNCONTROLLED FIRES:** If the fire is not minor and will possibly continue to spread, everyone must immediately evacuate the room except those who may be using a fire extinguisher.

If possible someone should turn off the main gas supply in the room. Also, someone should pull the fire alarm to evacuate the building. The door must be closed after the **LAST** person is out.

Important: Students **MUST** quickly go to the designated assembly point so that a roll call can be made to check that everyone is out of the building safely.

D. Some Laboratory Hazards

HAZARD	NATURE OF HAZARD	HOW TO DEAL WITH HAZARD
Spilled chemicals	Chemical burns	Notify the teacher for cleanup instructions.
Broken glass	Cuts; chemical in cuts	Notify the teacher for cleanup instructions if chemicals are mixed with the glass. Otherwise, use a broom/dustpan and put broken glass into the BROKEN GLASS container.
Burning chemicals in container	Burns	Smother with watch glass or beaker or leave to burn out.
Chemicals on hands	Chemical burns; skin irritation or allergic reaction	Wash off immediately with large amounts of water. Use a NEUTRALIZING solution if the chemicals are acid, base, or have unknown properties to you.
Smelling chemical vapours	Strong odours may injure nasal passages	Holding container in front of you, gently “waft” odours to your nose with a wave of the hand over the container and towards the nose.
Loose hair or “floppy” clothing / accessories	Burns or chemical spillage; equipment knocked onto floor	Tie long hair back with elastics. Secure loose clothing and accessories.

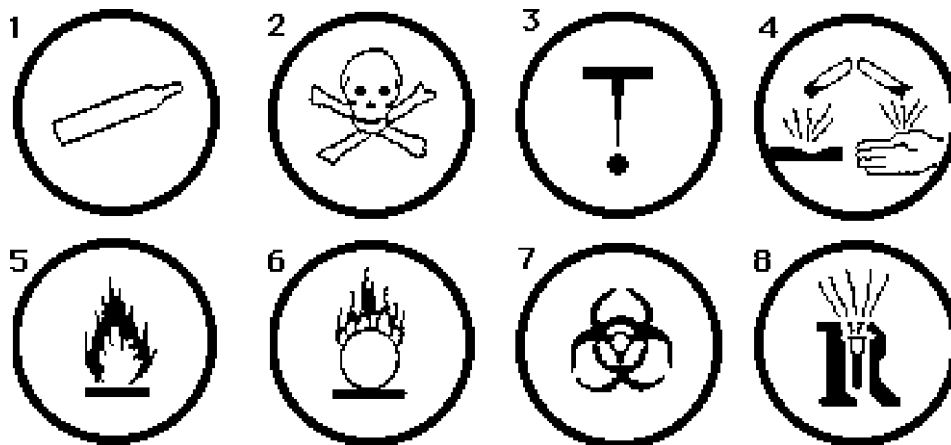
Bunsen burners	Burns; fires	<p>Tie long hair back or use elastics. DON'T keep burner gas on for more than a few seconds if burner won't start.</p> <p>Never point the open end of test tube at anyone when heating materials in a test tube.</p> <p>DO NOT fill test tubes more than $\frac{3}{4}$ full and heat test tube evenly.</p> <p>DO NOT use a bunsen burner near flammable liquids.</p>
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E. General Rules of Safe Laboratory Conduct

1. **NO** horseplay in the lab.
2. **NO** running in the lab.
3. **NO** eating, drinking, or chewing gum in the lab.
4. **DO NOT** carry out unauthorized experiments. **DO NOT** mix chemicals other than in the way you have been instructed.
5. Test for hot object with the back of your hand.
6. **DO NOT** use cracked glassware to heat things.
7. Always prepare for an experiment by reading the procedure carefully.
8. Label **ALL** reagents.
9. **DO NOT** return unused chemicals to their bottles (take only as much as you need).
10. Keep your work area clear.
11. Clean up all spills immediately.
12. Start clean up 10 minutes prior to the end of class.
13. Clean up your work area at the end of the lab.
14. Inform the teacher of **all accidents no matter how minor**.

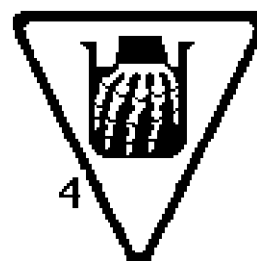
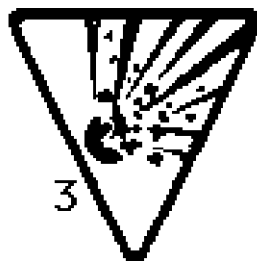
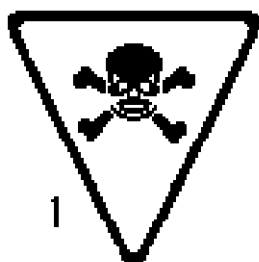
F. Safety Symbols

1. WHMIS SYMBOLS



1. **COMPRESSED GAS** – aerosol containers, gas tanks
2. **IMMEDIATE TOXIC EFFECTS (POISON)** – arsenic, cyanide, methanol
3. **LONG TERM TOXIC EFFECTS (CARCINOGENS)** – benzene, tobacco tar, asbestos
4. **CORROSIVE** – caustic material, acids and bases
5. **FLAMMABLE** – propane, butane, gasoline
6. **OXIDIZER** – nitrates, chlorates
7. **BIOHAZARD** – infectious diseases, viruses, body fluids, bacteria
8. **HIGHLY REACTIVE (UNSTABLE)** – radioactive materials, nitroglycerine, explosives

2. HOUSEHOLD SAFETY SYMBOLS



G. Laboratory Equipment

