

SAFETY IN THE CHEMISTRY LABORATORY

The experiments presented in this manual have been designed with your safety in mind. Nevertheless, **whenever you work in a chemistry laboratory, potential hazards exist. However, a knowledge of the most common sources of hazard, as well as the safety precautions routinely observed in the laboratory, will help to avoid any serious accidents.**

Safety Equipment

The safety equipment listed below are found in our chemistry laboratories. You should know the location of each piece of safety equipment and how to use it.

1. Eye Protection and Safety Glasses/Goggles

“Safety glasses are impact resistant lenses that protect the eyes from blows or other injury” (<http://medical-dictionary.thefreedictionary.com/safety+glasses>). Since our eyes and eyesight are precious, wearing safety glasses or safety goggles will protect your eyes from lab hazards when you are in the laboratory, even if you are not doing any experimental work. Hazards include chemicals splashing out of containers, glassware shattering upon heating, and test tubes flying out of a centrifuge. Safety glasses/goggles should be worn at all times when you are in the laboratory.

Note: (i) you are responsible for bringing your own pair of safety goggles/glasses to lab.

(ii) In 1998, the American Chemical Society (ACS) made the following recommendation regarding contact lenses (<http://pubs.acs.org/cen/safety/19980601.html>): “contact lenses can be worn in most work environments provided the same approved eye protection is worn as required of other workers in the area.”

See also <http://www.snopes.com/horrors/techno/cornea.asp>

2. Eyewash Fountain

An eyewash fountain is a water fountain with two faucets directed at one another. When the eyewash fountain is turned on with your head an appropriate distance from the fountain, the two faucets flush water into both eyes. It is unlikely that chemicals will get in your eyes if you are wearing safety glasses. However, if chemicals should get in your eyes, go immediately to the eyewash fountain and flush them for 15 minutes to wash the chemicals out of the eyes. Always report such an accident to your instructor, who may wish to have you see a doctor.

3. Fire Extinguisher

Fire extinguishers are classified and chosen based on the type of fire (<http://www.fire-extinguisher101.com/>). For example, a water extinguisher is suitable for Class A fires that involve ordinary combustible materials, such as paper and wood, but not for Class B fires that involve flammable or combustible liquids, like gasoline. Carbon dioxide and dry chemical extinguishers containing sodium bicarbonate or potassium bicarbonate are used for Class B and C fires (Class C fires involve electrical equipment). Class D fire extinguishers contain a dry powder such as sodium chloride or graphite (http://en.wikipedia.org/wiki/Fire_extinguisher#Class_D) and are used on combustible metals.

4. Fire Blanket

A fire blanket is a sheet of fire retardant material that is used to extinguish small fires. A fire blanket can be used to wrap a victim who has caught fire. Use the Stop, Drop, and Roll technique to smother the fire.

5. Safety Shower

A safety shower is an emergency shower that is designed to deluge continuously at 30-60 gallons per minute for at least 15 minutes (<http://www.answers.com/topic/shower>). The safety shower is found next to the eyewash fountain. If a large quantity of a hazardous chemical has spilled on a person, use the safety shower to flush large quantities of water on the victim. Usually, clothing needs to be removed for the water to reach the victim's skin. Stay under the shower for at least 15 minutes to wash off the chemical

6. Fume Hood

A fume hood is a laboratory bench having a fan that will carry fumes out of the laboratory into the open air above the building. The fume hood is used to perform experiments that produce toxic fumes. Your

laboratory instructor will direct you to carry out experiments in the fume hood. However, if you are doing an experiment that is producing an obnoxious or choking odor in the open lab, do not wait for your instructor and take your work under the hood. If you know you have a sensitivity to a chemical that is being used in lab that day, inform your instructor so you can work in the hood.

7. First-Aid Kit

A first-aid kit is located either in the lab or the prep room. This kit contains bandages, burn spray, antiseptic spray, cold spray, and other items. Always report any injury to your instructor that requires the first-aid kit, since follow-up measures may be needed.

Miscellaneous Hazards

The chemistry laboratory is a safe place to work as long as you and your co-workers are aware of the various hazards in the laboratory and follow lab safety rules and regulations.

1. People

Our chemistry lab has a capacity of 27 students. With so many people in the lab, it is easy to bump into another person or trip over a chair while moving about the lab. Focus on what you are doing but be aware of your surroundings and what other people are doing. You may be practicing lab safety but if another person standing next to you is not handling a chemical properly, you may be inadvertently involved in an accident.

2. Broken Glass

In the chemistry lab, we will use glassware, such as beakers to prepare hot or cold water baths, graduated cylinders to measure substances, and flasks to carry out chemical reactions. For many experiments, you will have to assemble several pieces of equipment and monitor your experiment from start to finish. Accidents occur when something tips over and glassware breaks. Use a broom and dust pan or wet paper towels to clean up the broken glass. Dispose of the broken glass in the broken glass container.

3. Fires

In the chemistry lab, we will use Bunsen burners, flammable liquids, and perform chemical reactions that generate heat. If something or someone catches on fire, act immediately and use either water, a fire extinguisher, the safety shower, or fire blanket to extinguish the fire. The method you use depends in the type of fire. See the section above on Fire Extinguisher.

4. Chemical Spills: Acids, Bases, and Other Caustic Chemicals

If you spill a small amount of chemical on a small area of your body, like your finger, flush the exposed area for 15 minutes with tap water from a sink. If a burning sensation accompanies the spill, flush the exposed area with water and report it immediately to your instructor. Some chemical burns begin with only a minor burning sensation, but develop into a more serious injury if not treated promptly. Your instructor will be able to recommend further action or send you to a doctor if the burn seems serious. If you spill a large amount of chemical over a large area of your body, use the safety shower. See the section above on Safety Shower.

If an acid is spilled on the floor or lab bench, use the baking soda solution to neutralize the acid. Then, clean up the spill.

If a base is spilled on the floor or lab bench, use the boric acid solution to neutralize the base. Then, clean up the spill.

5. Diluting Concentrated Acids

When preparing a dilute acid solution from a concentrated acid solution, always add the acid to water ("when you're doing what you oughter, add the acid to the water"). If water is added to concentrated acid, the solution will become hot and acid may spatter on you.

6. Spattering from Test Tubes

Spattering may occur when heating liquids in a test tube. To minimize the danger of spattering, heat the test tube near the liquid surface, and agitate the contents to and fro. Never point a test tube being heated toward you or another person. Be aware of your surroundings and what other people are doing.

7. Flame-Drying Glassware

The glass beakers and flasks are designed to withstand the heat of your Bunsen burner. However, certain pieces of glassware, such as graduated cylinders, burets, volumetric flasks, and pipets, should never be heated with a burner, as they are likely to shatter.

Hot glass looks the same as cold glass so be careful touching or approaching glass that someone else is using.

8. Inserting Glass Tubing in Stoppers

The Chemistry Stock Room has an assortment of glass tubing in stoppers that you can use. However, if you need to insert glass tubing into a rubber or cork stopper, make sure the hole is the proper size for the glass tubing and use glycerol (glycerin) or soap as a lubricant. Hold the glass near the end being inserted, and twist the glass into the hole. Never force a piece of glass tubing into a hole. The glass may snap, and the jagged edges on the broken glass can cause a serious cut.

9. Detecting Odors

If your lab instructor directs you to smell a chemical, do not place your nose directly over a container and inhale deeply. Hold the container away from your nose and use your hand to waft the odors gently toward your nose. Partially fill your lungs with air before inhaling the odors to avoid over-inhalation of the fumes. See the Material Safety Data Sheet (MSDS) of the substance for more information.

10. Tasting

Never taste chemicals prepared in a chemistry laboratory unless specifically directed to do so by your instructor. Many chemicals are toxic or hazardous to our health. Your equipment have been cleaned but still may have trace amounts of toxic or hazardous chemicals. See the Material Safety Data Sheet (MSDS) of the substance for more information.

11. Horseplay

The laboratory is no place for horseplay, since there is always the danger of breaking or spilling something. While a relaxed atmosphere is the most conducive for productive lab work, fooling around in the laboratory is an invitation for a serious accident.

General Laboratory Procedures and Conduct

The following chemistry laboratory safety procedures apply to everyone (instructors, students, and staff) using the chemistry laboratory. Disregard of these procedures will result in disciplinary action.

1. Protective goggles or safety glasses with side shields must be worn at all times in the lab.
2. Learn the locations and the use and operation of the fire extinguishers, safety shower, eyewash fountain, fire blankets, fume hoods, and first aid kit. Learn the location of the fire alarm.
3. Learn the primary, secondary, and handicapped escape routes from the laboratory in case of fire, earthquake, or other disaster. A map of the escape route from the lab is posted next to the hall door.
4. Learn the use and operation of laboratory equipment and instruments. A diagram of laboratory equipment is shown below.
5. Read chemical labels carefully. Be sure you are using the chemical required. Put the cap or lid back on the bottle. Clean up any spills.
6. Never return unused chemical to the stock bottle to avoid contamination.

7. Dispose of chemicals in the appropriate waste container. Never discard solid residues or paper into the sinks.
8. Never perform unauthorized experiments.
9. Eating, drinking, and smoking in the laboratory are forbidden. Do not bring food or drink into the laboratory. You may eat or drink in the hallway outside of the lab.
10. Never taste a chemical.
11. If instructed to smell a chemical, do so by gently wafting the vapors toward your nose.
12. When diluting, ALWAYS add acid to the water.
13. Never point a test tube that is being heated toward you or others.
14. Never pipet by mouth. Use a pipet filler bulb when using a pipet.
15. Long pants are recommended. Footwear should cover the feet completely. No open-toe shoes. Long hair and loose clothing should be secured.
16. At the end of each lab period or when you have finished an experiment, wipe and clean your lab bench area and the balance room, clean and dry equipment; account for and put away the equipment in your locker, and lock your locker. Return all community equipment, e.g., ring stands and hot plates, to their proper places. Dispose of chemicals in the proper waste container.

Accidents

1. Clean up all spills or breakages immediately. Dispose of broken glass in the broken glass container. If a mercury thermometer breaks, do not touch the mercury. Notify lab staff immediately.
2. In case of contact with a chemical, wash the affected area immediately and thoroughly with water. Notify lab staff.
3. In case of an injury, no matter how minor, notify lab staff.

Lab Policies

1. Safety glasses or goggles are required in lab. Prescription glasses are an adequate substitute for safety glasses/goggles. For students who wear contact lenses, you will need to wear safety glasses/goggles over your contact lenses. Try to be aware of your safety as well as the safety of others in lab.
2. FAILURE TO CHECK-IN YOUR LOCKER, whether you drop the course or complete it, results in a \$25 LAB FEE plus a charge for any broken or missing equipment.
3. All labs must be performed to pass this course.
4. Late lab assignments will be penalized 5% per calendar day.
5. The chemistry lab has 12 computers.
 - a. You cannot store your lab data and results on the hard drive of a computer you are using. Please bring a floppy disk or flash/thumb drive to store lab files.
 - b. Each computer is connected to a network printer. You will need to supply your own printer paper. You and your lab partner are asked to donate one ream of paper to lab (you and your lab partner can share the cost of paper) for your use and other student's to use.
 - c. These computers are connected to the internet so you can look up scientific information. Please do not download images, files, or software onto these computers.

Laboratory Safety Agreement

I have carefully read the instructions on good laboratory safety practices and procedures. I understand the importance of good safety practices for my own welfare and of all people in the laboratory and I, therefore, pledge to follow the safety regulations of the college.

Date: _____

Signature: _____

Drawer Number: _____

Print Name: _____