

Laboratory Safety

EMERGENCY NUMBERS:

Emergency Transportation: EMS & Fire: 5911 (If you need off campus 911 help, remember to dial 9 for an outside line.)

Campus Security: 503-5269 or 503-5911

School Nurse: 5191 or 5197

Spartanburg Regional Medical Center Emergency Room: 9/560-6221

Poison Control Center: USC-Columbia 9/1-800-222-1222

Chemical Emergency Hot Line: 9-1-800-424-9300 url for MSDS: <http://faculty.uscupstate.edu/labmanager/>

It is important that you know the following material. You will be asked to sign a form stating that you have read and understood it. You will also be expected to pass a safety quiz given during the second lab period of each semester.

A. Laboratory Layout and Safety Features

During the first laboratory period, locate the safety showers, the fire extinguishers, the eye-wash station, and the gas shut-off valves. Know how to use them. Become familiar with routes for evacuating the building in the event of fire or other hazard. Locate the emergency telephone and the first aid kit. Locate and familiarize yourself with the Material Safety Data Sheets (MSDS's). They contain information about the physical and chemical properties of a substance and identify hazards associated with the chemical. The MSDS's may also list acute and/or chronic effects of a chemical. Acute effects occur after short exposure, and chronic effects occur after long-term exposure. Our lab contains an MSDS for every chemical that you will use. MSDS information can also be found on the world wide web. Web addresses (URL's) that you might investigate are:

<http://msds.ehs.cornell.edu/msdssrch.asp>

<http://hazard.com/msds/>

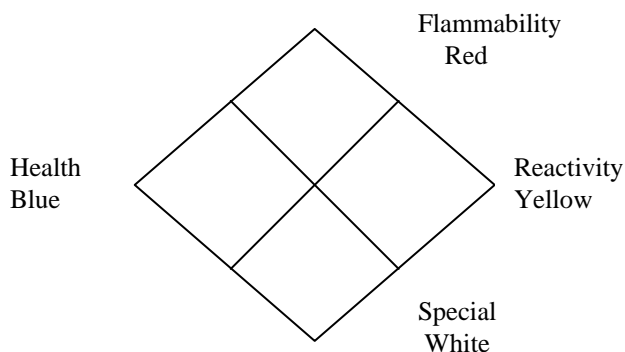
<http://physchem.ox.ac.uk/MSDS/#MSDS>

<http://www.uiowa.edu/~chemsafe/MSDS/>

<http://www.acros.be/>

<http://search.chemexper.com>

Become familiar with the National Fire Protection Association (NFPA) hazardous materials labeling system. Each chemical is labeled according to its health, flammability, and reactivity hazards. The degree of each hazard is indicated in the hazard rating symbol key by a number from 0 (minimal hazard) to 4 (extreme hazard). The symbol key is color coded such that the blue diamond indicates the health hazard, the red diamond is the flammability hazard, and the yellow diamond is the reactivity hazard. Special reactivity (such as oxidizing agent (OX) or water reactive (W)) is indicated in the white diamond.)



B. Personal Safety

1. Place coats, books, purses and backpacks in empty lab drawers, on the side bench tops, or in the tall wooden cabinets. Never leave these items on the lab bench where you are working or on the floor.
2. Bare feet and open sandals are not permitted in the laboratory. If you come to lab in shorts you must wear a lab apron. Long hair should be tied back.
3. Food and drink are not permitted in the laboratory. Smoking is not allowed in the Smith Building; it is especially hazardous due to the presence of flammable solvent. Unauthorized experiments and horseplay are strictly forbidden.
4. Because the eyes may be permanently damaged by spilled or splashed chemicals and flying broken equipment, be sure to wear safety goggles at all times in the laboratory. Contact lenses should not be worn in the laboratory; chemicals may infuse under the lenses and cause irreparable eye damage. Glasses should be substituted for the contact lenses and worn during the laboratory period. Safety goggles must be stamped with "Z87.1" and are available in the bookstore. (Note: The acceptable goggles sold in the bookstore have an elastic strap to keep them secure. Do not buy *safety glasses*. You need **safety goggles**.)

C. Safe Laboratory Procedures

1. There are four exposure routes by which harmful chemicals can enter the body:
 - Inhalation
 - Ingestion
 - Injection
 - Absorption
2. Cuts and burns are the most common injuries occurring in freshman chemistry laboratories. These can be prevented by following a few simple rules:
 - a. When inserting glass tubing or thermometers into rubber stoppers, always use glycerin (available on the shelf) or soapy water as a lubricant on both the glass tubing and the hole. Always protect your hand by wrapping the glass tubing with a towel.
 - b. Fire polish all sharp edges of broken glass.
 - c. Discard cracked or broken glassware immediately.
 - d. Never heat a graduated cylinder with a burner flame.
3. When heating a test tube or carrying out a reaction in one, never point the test tube toward your laboratory neighbor or yourself.
4. **NEVER POUR WATER INTO CONCENTRATED ACID.** Concentrated acids and bases may be diluted by pouring the reagent into water while stirring carefully and constantly. **ALSO, NEVER ADD CONCENTRATED ACID TO CONCENTRATED BASE OR VICE VERSA**
5. The Bunsen burner can be a major fire hazard in the hands of a careless student. The burner should be burning only for the period of time in which it is actually utilized. Carefully position it on the desk away from flammable material. Before lighting, make sure that flammable reagents (such as acetone, benzene, ether, and alcohol) are well separated from your burner. Be careful not to extend your arm over a burner while reaching for something. Long hair should be tied back while using a burner.
6. Always use a rubber bulb to fill pipet. **NEVER FILL A PIPET BY USING YOUR MOUTH.**
7. Many chemicals used in the laboratory are toxic. Therefore, never taste a chemical. If you are instructed to smell a chemical, do so by pointing the vessel away from your face and carefully fanning the vapors toward your face with your hand and sniffing gently. If a substance has an odor, unless you know it to be safe, it should be treated as a toxic substance and should not be inhaled or spilled on the skin. Many solvents are toxic both when their vapors are inhaled and when they are absorbed through the skin.

8. Any experiment involving the use of or production of objectionable (i.e., poisonous or irritating) gases must be performed in the hoods. Concentrated hydrochloric acid and concentrated ammonia should be opened only under a hood.

9. **READ THE LABEL CAREFULLY** before taking anything from a bottle. Many chemicals have similar names, such as sodium sulfate and sodium sulfite; it is obvious that use of the wrong reagent can spoil an experiment or, in some cases, cause a serious accident. (Potassium chloride is relatively inert; potassium chlorate is used in explosives.)

10. Do not carry reagent bottles to your desk. This is a matter of courtesy to the other students in the class, and it minimizes the possibility of contamination of the reagent. Obtain the required quantities of chemicals from the reagent shelf or hood by taking clean test tubes or beakers to the reagent area.

11. **NEVER RETURN EXCESS MATERIALS TO REAGENT BOTTLES.** Make it a practice not to take much more material than is required for the experiment, because many chemicals are quite expensive.

12. Do not insert spatulas or pipets into reagent bottles. Remove a solid reagent from the stock bottle by pouring it onto a clean watch glass or filter paper by gentle rotation of the bottle. To transfer a solid material to a test tube, first place the solid on a creased narrow strip of paper. Then insert the paper into the test tube and shake the solid down the crease by gently tapping with a finger. Pour a liquid into a clean, dry beaker before pipetting.

13. To remove a glass stopper with a flat head from a reagent bottle, grasp the stopper between the two middle fingers, with the palm of your hand facing upward. Hold the stopper in this position until you return it to the bottle. Never place it on the table or working surface. Such technique insures that the stopper will not be contaminated with dirt or another chemical.

14. Do not use chipped, cracked, or broken glassware. Glassware with cracks may break when heated. Make certain that all your glassware is clean, dry and free of chips and cracks. Before heating glassware, verify that it is heat resistant by looking for the Pyrex or Kimax trademark.

15. Use baking soda (sodium bicarbonate) to neutralize all acid spills immediately.

16. If a mercury thermometer is broken the first thing you must do is **clear the area; move away from the area and tell the other students to do the same.** Then tell the lab instructor, who will clean up the mercury with a special mercury spill kit. Do not attempt to clean up the mercury yourself!

17. When unplugging hot plates in the lab, hold onto the plug rather than just pulling the cord!

18. Do not place beakers of flammable liquids beside a hot plate where vapors can come in contact with the hot plate's heating elements and catch fire.

D. Fires

Minor fires in test tubes, beakers, flasks, etc., are easily extinguished by smothering with a watch glass or a damp towel. Make sure the contents have cooled below the ignition temperature and no source of ignition is present before the cover is removed. Sand is available for smothering small fires on the bench top. Large fires due to flammable solvents are extinguished most effectively with the carbon dioxide or powder fire extinguishers. Should your clothing catch fire, do not run because running fans the flames. If you are close to a safety shower the best solution to burning clothing or hair is to step under the shower and pull the lever.

E. First Aid

1. Report any injury to the instructor immediately, no matter how small. Report spills of chemicals to the instructor so that they can be safely removed.

2. **HEAT BURNS:** Quick immersion in cold running water or ice water relieves pain and decreases damage to the skin. This treatment should be followed by the use of an ice pack for some 20 to 30 minutes. For the more serious burn where blistering or loss of skin results, the area should be covered with an ice pack and the patient transported (ice

pack in place) immediately to the hospital for further treatment. No other preliminary first aid treatment or ointment should be applied.

3. **CHEMICAL BURNS:** When a corrosive chemical (such as strong acids or strong bases) comes in contact with the skin, immediately flush the area with large volumes of water in order to remove the chemical. Do not attempt to neutralize the chemical with a mild reagent, since this may make the burn more severe. All parts of the clothing which came in contact with corrosive chemicals should be promptly removed and the skin flushed with water. Do not put ointment on a chemical burn since small amounts of the chemical might be trapped underneath and cause greater damage. Otherwise, treat in the same way as in section 2. above.

4. **EYE INJURIES:** A few seconds delay in removing a chemical from the eye may be sufficient to cause serious injury. The eye should be washed by directing a stream of water onto the bridge of the nose (not directly into the eye) allowing the water to flow over the eyeball, which is kept exposed by holding the eyelid open. If the victim cannot use an eye fountain effectively since they lack control over the eyelid, the person administering the first aid must hold open the eyelid. A large clean beaker may be used to pour copious amounts of water on the bridge of the nose. After flushing the eye with water, the patient should be taken to the hospital for further treatment by a physician. Remember that most eye injuries may be prevented by wearing safety goggles.

5. Fainting is the result of lack of oxygen to the brain. Lower the head. Do not place an unconscious person on his back; there can be asphyxiation from the tongue.

6. In case of poisoning, phone the poison control center for advice. Find out and have available the phone number of the poison control center.

F. Proper Waste Disposal

1. Place used matches, paper, glass, and similar items in the proper waste cans, not in the sinks.
2. All solid chemical waste material must be deposited in a waste can. Do not put solids in the sinks.
3. Aqueous acids such as hydrochloric, nitric, and sulfuric acids may be poured down the sink. Flush the drain with plenty of water before and after disposing of acids.
4. Aqueous bases such as sodium hydroxide and ammonium hydroxide may also be poured down the sink with plenty of water.
5. Non-aqueous organic solvents are usually toxic and many are immiscible with water. **DO NOT POUR THESE DOWN THE SINK!** Special waste containers will be provided in the hoods.
6. Aqueous solutions containing ions of heavy metals (Ba, Cu, Cr, Ni, Zn, Pb, Cd, Hg) must not be poured down the sink. Special waste containers will be provided.
7. Do not put unused chemicals back into the reagent bottle. Chemicals are costly and the risk of contamination is too great when unused portions are returned to original containers.

G. Clean-up

1. Maintain a clean working area at all times. As soon as you have finished your experiment, disassemble the apparatus and clean all equipment and your bench top. Return special equipment to its designated area. To clean glassware, use detergent and a brush, then rinse with tap water. A thorough final rinsing with distilled water will remove traces of minerals that may be dissolved in tap water. Check to be sure your glassware is clean by observing it while it is wet. Water beads on dirty glass but forms smooth films on clean glass. Before leaving the laboratory, all glassware should be left clean and draining in your drawer so that it will be ready for use in the following laboratory period. Lock your drawer.
2. Wash your hands with soap before leaving the laboratory.

Important: To continue in SCHM 109L, you will be required (at the 2nd lab meeting) to sign a form indicating that you have read, understand, and agree to abide by the safety instructions presented above. (Do not sign this form until you have READ the safety guidelines on pages 1-4.) You will also be required to pass a safety quiz with a grade of 70% or higher.

Equipment List

We will not be using lab drawers this semester. Equipment will be put on benches or carts for your use for each lab. The list shown below is to help you identify some of the equipment you will use this semester.

SCHM 109L Locker # _____ Combination _____

<u>Number Missing</u>	<u>Number</u>	<u>Item</u>
_____	10	medium test tubes
_____	2	large test tubes
_____	1	test tube holder
_____	1	watch glass
_____	1	glass stirring rod
_____	1	flat spatula
_____	1	scoopula
_____	4	plastic droppers
_____	2	250 mL Erlenmeyer flasks
_____	1	10 mL graduated cylinder
_____	1	100 mL graduated cylinder
_____	1	1000 mL beaker
_____	1	400 mL beaker
_____	1	250 mL beaker
_____	2	150 mL beakers
_____	1	50 mL beaker

