

Name:

Safety Is No Accident!

A chemistry laboratory is an inherently dangerous place. Fire, toxic vapors, explosions, poisonous substances, broken glass, and corrosive materials are among the more common dangers. All of these hazards are aggravated by careless or thoughtless work. The main objective of this reading section is to encourage an attitude that will prevent accidents in the general chemistry laboratory.

The following guidelines must be read and followed at all times to minimize the chances of accidents. You will be asked to leave the laboratory without finishing your experiment if you fail to comply with any of the following rules. These guidelines are derived from simple common sense. Naturally, the sheer complexity of any chemical laboratory will always present potential problems that cannot be anticipated in advance. The guidelines given here are therefore not all-inclusive (nor can they ever be).

1. **Approved eye protection** (shatterproof goggles) must be worn at all times in the laboratory.
There are no exceptions. Contact lenses must be avoided whenever possible because corrosive materials and/or chemical vapors can be trapped between the lens and cornea where the chemicals may not be rinsed away, even during intensive washing.
2. **Lab coats** must be worn at all times in the laboratory. Length should be knee length or longer for effective coverage and protection. Sleeves should not be gaping in order to minimize the likelihood of knocking equipment over or incurring splashes on the arm. Some laboratory coats have cuffs or buttons to minimize the gaping. Fastenings should be easy to undo to facilitate quick removal if necessary
3. **Laboratory aprons.** Aprons provide full coverage at the front, but do not protect the upper most body, shoulders and arms. Aprons are made from different materials such as cotton, vinyl, rubber, nitrile, PVC and neoprene. They offer varying degrees of protection from chemicals, tear resistance and general durability.
4. **Proper gloves should only be worn when handling concentrated or toxic chemicals.** The lab manual will specifically indicate when gloves are necessary. While wearing gloves, touch only the chemicals and glassware needed to perform procedural steps. Do NOT handle objects commonly used without gloves (such as lab manuals or notebooks, pens, sink handles, door knobs, etc). You do not want to contaminate these surfaces, as you will eventually have to touch them once the gloves are removed.

1. Safety in the lab

5. **Shorts, mini-skirts, and open-toed shoes are NOT permitted in the lab.** Other loose articles of attire (e.g., long scarves) are not to be worn in lab because they can become entangled with equipment or prevent prompt emergency evacuation from a dangerous area. Long hair should be pinned back to prevent contact with flames or chemical reagents.
6. **Emergency equipment is located in the lab room and hall areas.** Note the location of eyewash fountains, showers, fire extinguishers, fire blankets, and spill clean-up buckets. If safety equipment is to be used call the instructor and stockroom personnel for help. Note the location of emergency exit routes.
7. **Fume hoods must be used for all reactions using (or evolving) noxious or highly combustible chemicals.** Do NOT inhale deeply.
8. **Spills must be contained and removed immediately.** Spill clean-up buckets containing absorbent materials are located in the front of the lab room near the blackboards. Work areas (including Balances, instruments, desktops, hood areas, etc.) should be cleaned after each use to remove any chemical residues. Do not work with chemicals in the immediate vicinity of instrumentation. Be sure to notify the instructor of any mercury spills. Mercury is extremely toxic and the vapor pressure of mercury at room temperature is approximately one hundred times greater than its threshold toxic limit for humans!
9. Eating, drinking, and smoking are strictly forbidden in the laboratory. This includes chewing gum! When pipetting liquids, always use a pipet bulb; never pipet liquids by mouth! Always wash hands before leaving the lab to avoid absorption or accidental swallowing of trace harmful materials.
10. Be particularly cautious in situations where **special hazards** may occur:
 - a. Cracked or broken glassware should NEVER be heated, pressurized, or subjected to vacuum, regardless of how small the imperfection may appear. Broken glassware should be returned to the stockroom for repair or proper disposal.
 - b. Liquid nitrogen can cause severe frostbite. Do not trap liquid N₂ in common laboratory glassware. Upon warming, liquid nitrogen poses an explosive hazard.
 - c. Use of flammable, volatile liquids (e.g., ether) requires special caution. NO flames or spark sources may be used in the vicinity. Most organic vapors are heavier than air and can flow

1. Safety in the lab

for considerable distances, at explosive concentrations, along a bench top or floor.

- d. Metals can react violently with water (e.g., alkali metals, metal hydrides, reactive metal halides, metal alkyls, etc.). BEFORE using such materials, know how to handle and dispose of them safely. If you are unfamiliar with the chemical properties, safe handling procedures, or disposal requirements of a chemical, consult with your instructor before you attempt to use it.
 - e. Electrical equipment provides a possible cause of electrocution. Sparking from frayed or broken cords also may cause ignition of solvents. Report such hazards to the instructor and stockroom personnel and do NOT use the equipment in this condition.
11. **Unsupervised experimentation** is not permitted under any circumstance. An instructor must be present in the lab at all times when students are working. No horseplay or pranks are allowed. For reasons of safety, radios and tape players operating through loudspeakers or headphones are not permitted in the laboratory.
 12. **No changes in written experimental procedures** are allowed without specific authorization of the instructor. Violation of these rules will lead to immediate disciplinary action.
 13. **Clean up:** collection bottles are located in the fumehoods. **READ THE LABELS ON THE COLLECTION BOTTLES** and use the container **ONLY** for the chemicals indicated. **NEVER** put acids, bases, or oxidizing/reducing agents into the organic disposal containers - doing so may catalyze violent reactions. Never dump a chemical down the sink. Your complete cooperation will help maintain the quality of our water system. When in doubt, ask the instructor or stockroom personnel.
 14. **Read the labels on the reagent bottle.** Verify that the formula of the chemical is the one you need for your experiment. Note the concentration, if a liquid. Check bottles for warnings specific to the particular chemicals in use. **NOTE CAREFULLY!** The absence of a warning label should never be misconstrued as an identification of the absence of dangerous properties. Safety and toxicity information about chemicals used in your experiments is available at the stockroom window. Ask to see the "Material Safety Data Sheet" (MSDS) for all chemicals that will be in use for the particular experiment.

1. Safety in the lab

15. Hot objects should be handled with extreme care. Allow to cool and handle with tongs or lined, heat-resistant gloves.
16. Glass tubing should be inserted into rubber stoppers with extreme care. Make sure the hole is the correct size for the tubing and protect both hands with towels before inserting the tubing. Lubricate the hole with a drop of water and insert the tube with a twisting motion.
17. When heating liquids in test tubes, use a clamp to hold the tube. Heat the liquid gently on the side of the tube near the liquid level, pointing the tube away from you and your fellow lab workers. Never heat the bottom of the tube, and constantly move the tube in and out of the flame to avoid hot spots and violent boiling.
18. Never add water to a concentrated acid! The reaction is very exothermic and spattering can occur. The ejected liquid may consist mostly of concentrated acid. When dilution of an acid is called for, ALWAYS add the acid SLOWLY to water and stir. Cool the container in an ice bath, if necessary.
19. All chemicals must be stored in LABELLED CONTAINERS. The label should contain the compound name, amount or concentration, the students' name, your name (as the TA), and date.
20. Extraneous materials in the laboratory (e.g., books, coats, etc.) clutter the working areas and create unsafe conditions. They should be stored in a locker or placed on a shelf, out of harm's

However complicated these guidelines may seem, YOU are a major controlling factor. If you take the time to familiarize yourself with the experiments and proper laboratory procedures BEFORE you enter the lab, most of the potential for accidents will be eliminated.

IF AN ACCIDENT SHOULD OCCUR...

If an accident should happen, take immediate action, with the involvement of other workers or stockroom personnel, if necessary.

FIRE

If someone's clothing should catch fire, the standard technique to extinguish flames is "STOP-DROPROLL". NEVER run to a fire blanket or shower - you must immediately drop and roll to smother the flames. Running increases the flow of oxygen and increases the burn rate.

If a fire should occur in the laboratory, there are fire extinguishers in each corner of the lab room, to know their locations.

1. Safety in the lab

If the building fire alarm should sound, extinguish all Bunsen burners, hot plates, etc. Ensure that the equipment is in a safe and secure mode. Direct the students to leave the building by the nearest stairwell exit. Do not use the elevators. Remain with your students outside the building and do not reenter the building or lab without the proper authorization.

FIRST AID KIT

A small box containing items to mitigate the damage caused by exposure to chemicals or injury, before expert medical help can be provided, must be available in the laboratory. All those in the laboratory should be familiar with first-aid practices as these save valuable time and reduce the extent of damage in case of laboratory accidents.

CHEMICAL SPILLS

If a chemical splashes in your eyes, immediately flush your eyes with cold, clear water for at least 15 minutes. An eye wash fountain is near the door in each one of the labs. Push the lever forward to deliver a steady, gentle stream of water into the eyes. Be sure to pull back the eyelid and roll back the eye to flush the affected area completely.

If the chemical splash occurs while you are wearing goggles and the eyes are unaffected, flush your face without removing the goggles. The eyes can become contaminated as one tries to remove unrinsed goggles. After the goggles are cleaned, rinse the eyes as instructed above. If the eyes are already affected, immediately remove goggles and begin flushing the eyes as described above.

If harmful chemicals are spilled on clothes, remove the clothes and use the safety shower in the hall to rinse affected skin areas. The threads in cloth can act as small capillary tubes and quickly spread the chemical over a large portion of your body. Some chemicals may need to be neutralized or may be absorbed through the skin. Seek further treatment if necessary.

Acids and bases are particularly hazardous materials because they are so corrosive. They can cause serious burns to skin and eyes. If splashed on skin or eyes, flush the affected area for at least 15 – 20 minutes with cold water. If diluting a concentrated acid, always add the acid slowly to a large amount of water with stirring, to avoid splattering.

BURNS

Small burns from touching hot objects should be flushed with cold water for 20 minutes. Do not apply ointment to burns. Major burns need immediate medical attention. Use the emergency telephone by the elevator to call the UCI police.

CUTS

Small cuts should be rinsed thoroughly and examined for traces of foreign materials such as glass, chemicals, etc. Bandages are available in the stockroom. Severe cuts and bleeding must be treated by applying direct pressure on the wound to control the rate of bleeding. Seek medical assistance immediately. Use the emergency telephone by the elevator to contact UCI



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1. Safety in the lab

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