

# Safe Practices in Chemical Laboratories

Accidents in the laboratory usually result from carelessness or ignorance on the part of the victims or their neighbors. The purpose of the handout is to improve the safety of our laboratories by showing you how to protect yourself against laboratory hazards. Each of you must take a test covering this handout. You must pass the test with a score of 93% or better before you will be permitted to do lab work. The test may be repeated as many times as necessary.

## A. General Considerations

1. As soon as possible, and before taking the test, familiarize yourself with the location of safety equipment in the laboratory, including fire extinguisher, fire blanket, safety shower, eyewash bottles or fountains, sodium bicarbonate, and first aid kit.
2. Report any accident or injury, even an apparently minor one, to the lab instructor or lab assistant on duty, or to the stockroom personnel. If you're asked to go to the Health Center for medical attention, you must go. Refusal to do so is grounds for being dropped from the course.
3. Always follow directions carefully and completely. Assemble apparatus as outlined in your directions, and never modify apparatus or directions unless specifically told to do so. You do not have sufficient experience to know if such modifications are safe. Carefully observe precautions mentioned in the experiment, and never perform any unauthorized experiments.
4. Conduct yourself properly in the laboratory. Horseplay and other careless acts cannot be permitted.
5. Be aware of your neighbor's activities; many accident victims are innocent bystanders. If you see safety violations by others, advise them. If they continue, advise the instructor.
6. Before doing any lab work, make sure an instructor or lab assistant is in the lab or close at hand.
7. Do not remove chemicals or equipment from the lab.
8. Keep your work space neat and clean. Never put coats and backpacks on the lab bench; they may interfere with the experiment and can easily be damaged. Place tall items toward the back of the bench where they won't be overturned. Keep drawers closed and aisles free of obstruction.
9. Clean up for the next student. Wash and wipe off the benchtop. Clean up paper, chemical spills, and broken glassware on the bench and floor. Make sure all equipment is in its proper place. Sloppy lab practices may affect your grade!
10. Use distilled water sparingly. Use it only when specified in the experiment and only as a final rinse when washing glassware.

## B. Eye Safety

1. State law requires that you wear goggles in the laboratory. Prescription glasses, even if they have side shields, do not offer sufficient protection against chemical splashes. You must wear approved safety goggles whenever you are near the lab benches (even if you aren't doing laboratory work.)
2. Wearing contact lenses in the lab is discouraged. Harmful vapors can be trapped under them and damage your eyes. And, if a chemical gets splashed in your eyes, it may be difficult to remove the contacts rapidly enough to prevent eye damage. If you normally wear contacts,

switch to regular glasses during the lab if possible. If you must wear them in the lab, wash them off as soon as you can after leaving the lab.

3. If a chemical does get in your eye (even if you think it only might be in your eye), wash it out immediately, then report the accident. Use the eyewash fountain, an eyewash bottle, or cup your hand under a faucet. Wash with plenty of water for several minutes. (Some safety manuals recommend 15 minutes.) Never use a chemical to wash another chemical from the eye. You may find it necessary to force your eyelids open with one hand. Have someone contact the instructor while you are washing your eye. Strong bases such as sodium hydroxide cause the most rapid damage, but acids and salts are also very harmful. Time is critical; you must wash your eyes as quickly as possible when any chemical is splashed in them. Remember, with proper eye protection, the chances of an accident are reduced greatly.

## **C. Fire Safety**

1. Know where to locate and how to use the fire extinguisher.

There are fire extinguishers in the labs and in the hallways. The extinguishers are operated as follows:

- . Lift up to remove it from its wall support.
  - . Pull the pin.
  - . Squeeze the handle.
- Aim at the base of the flame, being careful not to spread the fire.

2. Large chemical fires will usually involve flammable liquids. Since water would probably spread the fire, the CO<sub>2</sub> extinguisher is preferable. Small, contained blazes in a flask or beaker can simply be covered by a book or a watch glass to cut off the oxygen supply.

3. Fires on clothing should be extinguished with the fire blanket, the safety shower, or a fire extinguisher, whichever is closer. DO NOT RUN.

4. Know how to light and operate a Bunsen burner properly. The burner should remain lit only as long as necessary. Matches should be extinguished completely before being thrown away. (Never throw a match into a sink. It will clog the drain, and could ignite a flammable liquid improperly disposed of there.) Long hair should be tied back in the lab, especially when you use a burner. Hair spray is a thin plastic film with a large surface area and can burn rapidly when ignited. Bulky sleeves can also be a hazard.

5. Virtually all flammable liquids have vapors that are heavier than air. The vapors can flow along a bench and be ignited by a burner at some distance. The use of flammable liquids and burners in the same lab at the time is an invitation for serious trouble. Ether vapor, in particular, is the cause of many fires.

## **D. Prevention of Cuts and Burns**

1. When inserting glass tubing (or thermometers) into rubber stoppers:

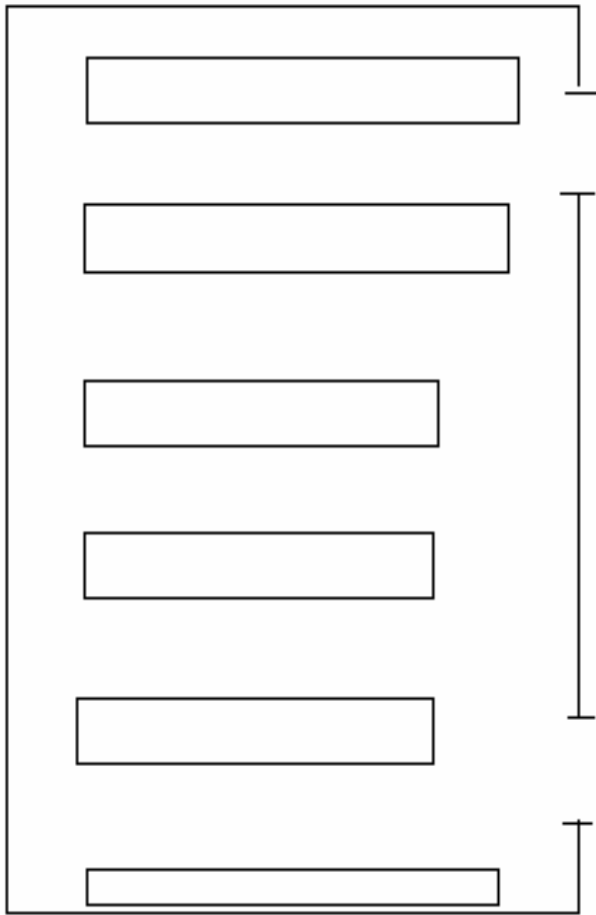
- . Make sure the ends of the tubing are fire polished.
- . Always use glycerin or soapy water as a lubricant on the tubing and in the hole.
- . Wrap the tubing with a towel to protect your hand.
- . Hold the glass near the end to be inserted, and push in with a twisting motion. Never hold the glass at a bend or a funnel at the mouth, and never push with the glass cradled in the palm of your hand.

2. Inspect glassware carefully and replace items that are cracked or chipped.
3. Discard broken glassware in the designated containers. Use the broom and dustpan available in the stockroom to clean up broken glassware.
4. Don't heat heavy non-pyrex glassware such as graduated cylinders or reagent bottles; they might shatter.
5. Use tongs or forceps to handle hot objects. Remember, hot glassware does not appear hot.
6. When heating a test tube, or when carrying out a reaction in one, never point the mouth of the tube at yourself or at anyone else.

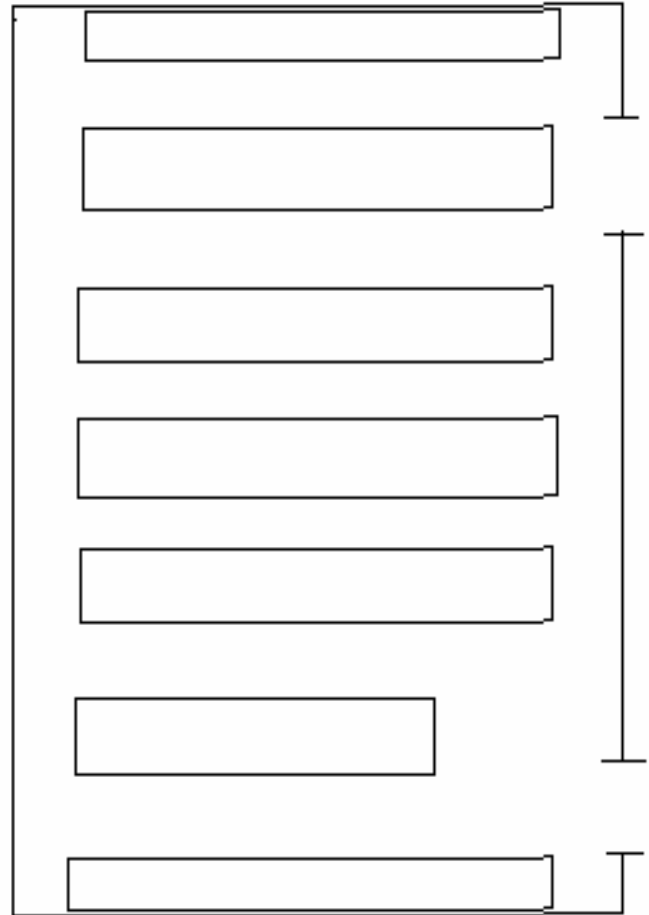
## **E. Chemical Safety**

1. Always consider a chemical to be hazardous until you know for sure it is not.
2. Avoid skin contact with all chemicals. If contact occurs, wash the affected area with large quantities of water. (Soap and water may be needed for substances not readily soluble in water.) If the skin is burned, continue washing with water, and get medical attention. Do not use creams, salves, etc. Chemicals spilled over large areas of the body require immediate action. Remove all contaminated clothing, and flood the affected area with water from the safety shower. For concentrated sulfuric acid spills, wipe off the excess before flooding with water.
3. Protect yourself with proper clothing. Sandals and open-toed shoes may result in chemical burns on your feet. Wear a lab apron to protect your clothing.
4. Avoid breathing harmful vapors. Use the hood whenever directed to do so. When it is necessary to smell a chemical, hold the container away from your face, and carefully fan the vapors toward your face with your hand, sniffing gently.
5. Never taste a chemical unless specifically directed to do so. Never eat or drink in the lab, and wash your hands upon leaving.
6. Read labels carefully. Chemicals may have similar names or formulas but vastly different properties.
7. When obtaining chemicals from reagent bottles, take only what you need. If you take too much, share with a neighbor or dispose of it. Never return anything to the bottle. Be careful not to switch stoppers on bottles or contaminate the stopper by putting it on the bench. Never put a spatula or medicine dropper into a reagent bottle. Pour out what you need into another container. Clean up any spilled chemicals.
8. Discard waste chemicals only in appropriate containers as follows:
  - . Sinks - non-flammable, water-soluble liquids.
  - . Waste baskets - paper products.
  - . Other Specially - Labeled Containers - flammable liquids, non-flammable water-insoluble liquids, heavy-metal compounds, recyclable substances and solid chemicals.
9. Mix chemicals slowly, particularly when mixing concentrated acids or bases with water. Always add acid to water (not the other way around) unless specifically directed to do so.
10. Mercury spills (as in broken thermometers) should be reported to the instructor and will be cleaned up by stockroom personnel. They have special equipment. Do not try to clean it up yourself; you will likely scatter the mercury about and make the hazard worse.

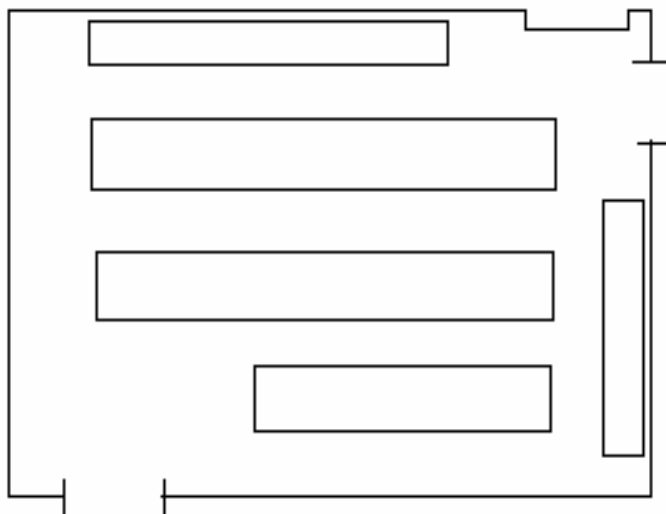
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