Safety Precautions for the Laboratory

Before you begin your work, it is necessary for you to know safe practices for the laboratory that must be observed at all times, for your protection and the protection of others. You are expected to read these rules thoroughly and to pass an exam with 100% accuracy before you may continue your lab work in this course. Keep in mind that these rules were written with someone else’s blood.

I. Eye Protection

Approved safety eye glasses or goggles must be worn at all times. There is usually not an increased risk of chemical exposure if you choose to wear contact lenses. The most common exceptions to this are isopropyl alcohol vapors, ethyl alcohol vapors, methylene chloride, and ethylene oxide. In some cases, contact lenses actually provide a barrier that adds additional eye protection.

If anything gets in your eye, the eyelids should be held open while flushing the eye with water from the eyewash for 15 minutes. Immediately go to the nearest eye wash station (at sinks or in the front safety station) and begin flushing the eye. Have someone notify the instructor! The first 10 seconds are crucial!

II. In Case of an Accident or Fire

If there is an accident or injury in the lab, take the appropriate safety measures immediately and then notify the instructor. If there is a large chemical spill on the clothing, the safety shower should be used immediately. Clothing should be removed promptly in the case of a large chemical spill. Wash any chemical off on the skin with water. Notify the instructor! If your clothing catches on fire, lie down and roll. Someone will bring the fire blanket to you. **DO NOT RUN** to the blanket or safety shower!

Simply smothering it with a sufficiently large watch glass or inverted beaker can put out a small, contained fire. In the case of a multi-neck flask, loosely insert rubber stoppers or corks. Never use a towel - it may overturn the container and spread the fire as well as catch fire itself.

To extinguish an open fire in the laboratory, discharge the small fire extinguishers in the lab. Discharge at the base or source of the flames, slowly moving from one side to the other to avoid flashback, while calling for assistance and for the sounding of local alarms, if necessary. If the fire is not brought under control and begins to spread, have the fire department called while using the larger extinguisher in the hall. Evacuate everyone from the lab except those involved in extinguishing the fire.

III. Safe Handling of Chemicals and Equipment

A. Flammable Solvents

Some solvents used in the laboratory are flammable and require precautions concerning there use. Three common extremely flammable solvents are diethyl ether, petroleum ether, and carbon disulfide. All flames and spark sources (motors and heaters) must be turned off in the area that is used for the solvent. A hood must be used for transferring or working with any amount of flammable solvent.
Five common less dangerous, but still highly flammable solvents, are acetone, benzene, cyclohexane, ethanol, and methanol. All flame and spark sources in their immediate area should be turned off and a hood should be used for everything except washing glassware. The vapors of all of the above solvents are harmful and should not be inhaled.

B. Respiratory Hazards

The following chemicals should be used in the hood only; ammonium hydroxide, concentrated acids (such as nitric, acetic, sulfuric, and hydrochloric acids), ammonium sulfide, acetaldehyde, acetic anhydride, and aniline.

C. Cumulative Poisons

These are substances that can accumulate in the body and cause health problems. Avoid breathing the dust of these substances. Never dispose of these substances or solutions containing these substances in the drain. Special waste containers will be provided. Cumulative poisons include, but are not limited to, compounds containing one of these elements or ions:

- silver
- lead
- antimony
- arsenic
- beryllium
- mercury
- cadmium
- chromate
- dichromate
- fluoride

In the case of liquid mercury, the most likely source is a broken thermometer. It is important that you notify the instructor of any broken thermometers so that special equipment can be used to clean up the spill. Students will not be charged for broken thermometers.

D. Chemical Burn Hazards - Especially Hazardous to the Eye

- concentrated acids and bases
- bromine
- aluminum chloride
- ammonium sulfide

E. Explosive Hazards

Although we will not attempt to work with explosive hazards in this lab, you should be aware of their existence and potential danger.

Organic compounds may react violently with the following substances:

- ammonium nitrate
- potassium chloride
- dichromate ion
- permanganate ion
- sulfur
- perchlorate ion

Solid compounds of silver or mercury as well as oxalates of heavy metals are explosive.

Iodine combined with ammonia or aluminum is an explosive reaction.
F. Other Toxic Chemicals

Many substances are skin absorption hazards. These will be identified when they are used. Wear gloves if instructed to do so.

G. Use of Hood

A hood is used to draw toxic or flammable vapors from the laboratory. The airflow at the face of the hood should be 80-100 ft/min for adequate protection. If you have doubts about the efficiency of the hood, ask the instructor for the velometer to test the airflow.

Use the hood if you have any doubts about the reaction or toxicity of the compound in use or being produced.

H. Other Safety Rules - Mainly Common Sense

1. Never taste chemicals.

2. Do not breathe vapors directly. Waft the odor toward your nose instead.

3. Treat a test tube with contents that you are heating like a loaded gun. Never point it in anyone’s direction. Heat gently along the side and never fill more than half full.

4. When pouring liquid chemicals, use a stirring rod to direct the flow.

5. Flush sink drains with water after disposing of chemicals there.

6. Never return unused solutions of chemicals to the container reagent bottle.

7. Add one reagent to another cautiously and slowly. Do not add any solid to a liquid near its boiling point.

8. Do not use mouth suction to fill pipettes.

9. Do not use glassware with broken or chipped edges. When using glass tubing, all ends should be fire polished. To insert glass tubing or rods or thermometers into rubber stoppers, be sure you have the proper size, lubricate the glass with water or glycerin, wrap a towel around the glass, hold the glass near to (less than 5 cm) the rubber stopper, and insert using pressure on the stopper.

10. Discard broken glassware in the special glassware collection container. Do not discard paper waste with chemical waste.

11. Do not store reagents or chemicals in lockers unless you are specifically directed by the instructor to do so.

12. Do not use ice from the laboratory ice machine for beverages.
IV. Dress Precautions

A. Long hair, beards, and neckties can be dangerous in the lab because they can catch fire, get into chemicals, or get caught in apparatus. Secure hair and beard out of the way and remove any neckties or scarves.

B. A lab coat or apron is recommended. It should have a snap closure for fast removal in case of spills.

C. Do not wear flared or loose hanging sleeves or scarves.

D. Sandals are not acceptable shoes for lab work.

E. Cotton clothing (e.g.; jeans) is safer than polyester.

V. General Behavior

A. Horseplay or other acts of carelessness are prohibited. Keeping your work space neat and clean is a matter of survival.

B. Never work alone in the laboratory.

C. Reagents and equipment items should be returned to their proper place after use.

D. Reagents, solutions, glassware shall not be stored long-term in hoods.

E. All containers must be labeled with the identify of the contents.

F. Unauthorized experiments are not permissible because students can not be certain that an experiment is safe to perform. Infractions of this rule will result in severe academic penalties. Chemicals may not be removed from the laboratory because most chemicals are dangerous, particularly under non-laboratory conditions. In any event, unauthorized removal is illegal.

G. Because of the risk of getting toxic chemicals into your mouth, you are not permitted to smoke, chew, eat, or drink while in the laboratory.

H. Please inform the instructor if you have any physical condition that might present a problem (for example, allergies, epilepsy, breathing disorders, pregnancy).

I. Do not perform any experiment while under the influence of drugs or alcohol. Besides the obvious danger of this, the vapors of some chemicals are toxic when combined with alcohol in the blood (especially carbon tetrachloride).