Safety is the top priority in the chemistry laboratory. Although every attempt has been made to minimize hazards, anything can become dangerous when used improperly. Therefore, it is important that you do your part to ensure the laboratory remains a safe place for you, for your classmates, and your instructor. Please be familiar with the following rules and regulations. You should understand how to operate laboratory equipment safely and properly.
Section I. Chemicals

I.a. Safety Data Sheets (SDS) or Material Safety Data Sheets (MSDS)

1. The SDS or MSDS contains important information about the chemicals with which you will be working.
2. Safety Data Sheets (SDS) or Material Safety Data Sheets (MSDS) are provided in the SDS/MSDS notebooks kept in the laboratory stock rooms (i.e., Magnolia Hall 182, Lakeview Science Center 244A, Laboratory Annex Building 202). Ask the instructor for access to these documents, if needed.
3. SDS’s and MSDS’s are also available on the internet at http://msds.com and various other websites.
4. The SDS or MSDS informs you of the safety hazards associated with the chemical, how to properly handle the chemical, and what to do in case of accidental exposure.
5. The SDS or MSDS instructs you about the proper personal protective equipment to use when handling a chemical (e.g., eye protection, gloves, lab coat, etc.).

I.b. Chemical Safety Diamonds

Chemical safety diamonds are usually displayed on all chemicals in the laboratory. A chemical safety diamond is a quick reference for hazardous material classification. Always read the safety diamond on a chemical prior to using it. Classification guidelines are posted throughout the lab classrooms and described below.

![NFPA704 Color Diamond Reference](image)

The diamond is simple, with 4 color-coded regions that designate these various hazard levels:

- **Blue**: Health hazard (0-4)
- **Red**: Flammability hazard (0-4)
- **Yellow**: Instability hazard (0-4)
- **White**: Special (-W-, OX, COR)

The diamond identifies the hazards of a material and the degree of severity of the health, flammability, and instability hazards. Hazard severity is indicated by a numerical rating that ranges from zero (0) indicating a minimal hazard, to four (4) indicating a severe hazard. The hazards are arranged spatially as follows: health at nine o'clock position, flammability at twelve o'clock position, and instability at three o'clock position. In addition to the spatial orientation that can be used to distinguish the hazards, they are also color-coded as follows: blue for health, red for flammability, and yellow for instability.

The six o'clock position on the symbol represents special hazards and has a white background. The special hazards in use are W, which indicates unusual reactivity with water and is a caution about the use of water in either firefighting or spill control response, OX, which indicates that the material is an oxidizer, or COR, which indicates the chemical is corrosive.
I.c. The GHS Labeling System

Recently, the Occupational Health and Safety Administration (OSHA) adopted the GHS labeling system for laboratory chemicals. Many of the chemicals you use will now have GHS labels instead of the chemical diamonds. GHS is an acronym for The Globally Harmonized System of Classification and Labeling of Chemicals. The GHS is a system for standardizing the classification and labeling of chemicals and is intended to communicate hazard information, as well as protective measures, on labels and Safety Data Sheets.

Figure 2. GHS Pictograms and Hazard Classes

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<tr>
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<th>Oxidizers</th>
<th>Flammables</th>
<th>Explosives</th>
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<td></td>
<td>Oxidizers</td>
<td>Flammables</td>
<td>Explosives</td>
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<td>Self Reactives</td>
<td>Pyrophorics</td>
<td>Self Reactives</td>
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<td></td>
<td>Self-Heating</td>
<td>Emits Flammable Gas</td>
<td>Organic Peroxides</td>
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<tr>
<td></td>
<td>Emits Flammable Gas</td>
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<tr>
<td></td>
<td>Organic Peroxides</td>
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<tr>
<td></td>
<td>Acute toxicity (severe)</td>
<td>Corrosives</td>
<td>Gases Under Pressure</td>
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<td></td>
<td>Carcinogen</td>
<td>Environmental Toxicity</td>
<td>Irritant</td>
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<td></td>
<td>Respiratory Sensitizer</td>
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<td>Dermal Sensitizer</td>
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<td></td>
<td>Reproductive Toxicity</td>
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<td>Acute toxicity (harmful)</td>
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<td>Target Organ Toxicity</td>
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<td>Narcotic Effects</td>
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<td>Mutagenicity</td>
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<td>Respiratory Tract</td>
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<td>Aspiration Toxicity</td>
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<td>Irritation</td>
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I.d. Wear Proper Clothing
   1. Safety glasses or goggles must be worn at all times while in the laboratory. Prescription glasses are not an acceptable substitute for safety glasses or goggles. Sunglasses or tinted safety glasses are not acceptable.
   2. Appropriate laboratory attire includes clothing that covers the stomach or mid-section, legs, and feet. Shorts and short skirts above the knee and open-toed/open-heeled shoes are not permitted. Leggings and tights are not permitted. Loose sleeves should be tied up to prevent them from dropping into a solution or flame. For the same reason, long hair should be tied back.
   3. Consult the SDS or MSDS for instructions on proper laboratory attire with specific chemicals.

I.e. Avoid Chemical Exposure
   1. No eating, drinking, or chewing gum in the laboratory.
   2. Avoid direct contact with chemicals. Although some reagents are fairly innocuous, it is always good practice to avoid direct exposure. If you do spill something on you, wash it off immediately.
   3. ALWAYS wash your hands before leaving the laboratory.
   4. Avoid touching your face with your hands while in the laboratory. If you accidentally get chemicals on your hands, you won’t make the mistake of transferring them to your face or eyes.
   5. Avoid touching your cell phone, notebook, computer, etc. with your hands while in the laboratory.
   6. Do not sit on the laboratory bench. Do not climb on the bench or stools.
   7. Do NOT smell the vapors given off by a chemical substance unless specifically directed to do so by the instructor. Some vapors, such as ammonia, can irritate and even damage the lungs if inhaled too strongly. If detecting the smell of a chemical is indicated, gently waft the chemical vapors towards your nose and carefully inhale.
   8. Use fume hoods when carrying out a vigorous reaction or when generating a hazardous gas. Always use the hood when directed to do so.
   9. Do not pipette by mouth.
   10. Never taste a chemical.
   11. Never remove chemicals from the laboratory.
I.f. Handle Chemicals Properly

1. Place chemicals and equipment as far back on the laboratory bench as possible to prevent them from falling off the edge of the bench. Also be careful with rolling equipment, such as stirring rods and thermometers.
2. Do not heat or cool a closed container.
3. When heating the contents of a test tube or flask, be sure to point the opening away from yourself and others.
4. When diluting an acid or base, add the acid (or base) to water and not the other way around.
5. Follow the procedures given below if you come in direct contact with an acid or base.
   a. Face (eyes not involved): Using an eyewash fountain, flush the face for approximately 15 minutes with water. Leave safety glasses or goggles on to prevent flushing the acid (or base) into the eyes.
   b. Face (eyes involved): Immediately remove your safety glasses or goggles and begin flushing in an eyewash fountain. Your eyes must be open for the flushing to be effective; therefore, use your fingers to prop your eyelids open. Flush for approximately 20 minutes. If only one eye is contaminated with chemicals, keep the contaminated eye lower than the good eye. This will prevent flushing chemicals into the good eye.
   c. Body: Remove any contaminated clothing and flush the skin for approximately 10 minutes with water. The safety shower should be used if the chemical covers a larger amount skin. Do not be shy about removing clothing. The more time a chemical is in contact with the skin the more damage it will do.
6. Carefully read the labels on all dispensing bottles. Some reagents may differ only in concentration (e.g. 0.1 M NaOH vs. 1.0 M NaOH); therefore, make sure you obtain the exact reagent called for in the laboratory experiment. Likewise, label any reagents stored in beakers, flasks, or test tubes at your bench. Mixing of incompatible reagents could pose a safety hazard.

I.g. Clean-up and Waste

1. Never return unused chemicals (including distilled water) to their original containers. Doing so will contaminate the contents in the container. Properly dispose of all unused chemicals. If necessary, consult the instructor.
2. Deposit all liquid and solid waste from your experimental procedures in a container labeled “Hazardous Waste”. This container will usually be a glass jug found in one of the fume hoods. The label will also indicate from what experiment the waste was generated. Add your waste to the appropriately labeled container. Mixing waste from different experiments can be dangerous to you, your classmates, and the people who are responsible for disposing of the waste. Do not overfill the waste container. Keep the waste container in its secondary container (usually a plastic tray). Recap the waste bottle after you are finished adding your waste. Ask your instructor if you are unsure of how to dispose of your waste.
3. Put all broken or chipped glass in the Broken Glass Container. Put only broken glass in the broken glass containers.
4. Wash all used glassware with soap, rinse with water, and return glassware to the storage shelves. Do not leave glassware by the sink.
5. Return all glassware and equipment to the appropriate place.
Section II. Laboratory Equipment

II.a. Fume Hoods
1. The fume hood sash should be as far down as possible. You should raise it up just enough to work comfortably. A fume hood sash that is raised up all the way does not provide any protection from vapors and chemical splash.
2. Always make sure that the hood is turned on.
3. Keep all items at least four inches away from the front of the fume hood.
4. Keep all lightweight items (e.g., paper products) away from the back of the hoods to prevent loss to the ventilation system.
5. Do NOT place your computer in the hood. Find an appropriate place close to your workspace, but away from any chemicals.

II.b. Chemical Balances
1. Keep the balances and work areas clean. In case of a chemical spill, notify the instructor immediately. He/she will provide proper clean-up instructions.
2. Apply caution when opening or closing the glass shields or lids.

II.c. Hot Plates
1. Check the hot plate for frayed cords or other broken pieces prior to use.
2. Do not allow the cord to touch the hot ceramic surface on top or side to avoid burning.
3. Hot plates are hot. Do not let any part of your body come in contact with the hot ceramic surface.
4. Do not place hot plates on a wet surface. This is an electrical hazard.
5. Make sure hot plates have cooled off prior to returning to the original location.
6. Do not heat or cool volumetric glassware. Doing so may damage the calibration.

II.d. Bunsen Burners
1. Ask your instructor if you are unsure how to operate a Bunsen burner.
2. Adjust the gas flow at the Bunsen burner, not the gas valve.
3. When finished, turn off using the gas valve on bench/hood.
4. Open flames (including Bunsen burners) are not permitted when flammable substances are present in the laboratory.
5. Tie back long hair and loose clothing around open flames.
6. In an emergency (e.g., a flame is in the wrong place), turn off the gas valve and notify your instructor immediately.
Section III. Use of Safety Equipment

Your instructor will show you the location and proper operation of the following safety equipment.

- Emergency phone number
  - Public Safety: x4050
- Eye wash stations
- Safety shower
- Fire extinguishers
- Emergency exits
- First-aid kit
- Spill kit
- Fire alarm

Section IV. Common Sense Rules

1. If unsure about a laboratory procedure, ask the instructor for help.
2. Students may not use cell phones, mp3 players, or other distracting devices during laboratories. Headphones of any type are not allowed during lab.
3. Horseplay is not permitted in the laboratory.
4. Bring only a laboratory notebook, pen, and calculator to your laboratory bench. All other items should be safely stored in the designated area for the lab. Never put anything on the floor as this might cause someone to trip or fall or your belongings could be destroyed by spills in the laboratory.
5. Do not conduct any unauthorized experiments in the laboratory.
6. Never pick up hot objects with your bare hands. Always use the test tube holders, tongs, or hot pads for moving hot objects. Do not hand hot objects to the instructor.
7. Never use your thermometer as a stirring rod. Thermometers are fragile and should be used only for their intended purpose.
8. Know the location of all laboratory exits and safety equipment. If unsure, ask.
9. When exiting the lab, turn off all equipment, water, gas valves, and vacuum lines. Ensure that your workspace and glassware are clean.
10. If your clothing catches on fire, do one of the following.
   a. If you are near a safety shower, use the shower.
   b. If the safety shower is not close by, stop, drop and roll on the ground to smother the fire. Do not run. Running fans the flames and will make the situation much worse.
   c. As with all serious accidents, SHOUT to get the attention of others.
11. Report all accidents, no matter how small, to your laboratory instructor.
Section V. Safety Agreements

V.a. Safety Rules and Regulations
   Read all of the above safety rules and save a copy for quick reference. Your instructor may require you to sign and submit the agreement on the next page.

V.b. Laboratory Safety Waiver
   You are required to sign the Laboratory Safety Waiver on the DUCK before you can participate in lab. To complete the waiver, follow these steps:

   1. Login to the SWAN
   2. Click on the DUCK icon in the upper right corner
   3. Click on Student Services
   4. Click on Laboratory Safety
   5. Select the course that you are enrolled in to view and accept the waiver

You must agree to the waiver for EVERY laboratory class that you are enrolled EVERY semester.
Chemistry Laboratory Safety
Rules and Regulations

Name (print) ___________________________________

Date __________________________________________

Instructor_______________________________________

Failure to abide by these regulations may result in your removal from the laboratory or a reduction of your grade.

I have read and understand the rules and regulations governing the chemistry laboratory.

____________________________
Sign your name

Optional declaration of medical conditions

In the case of an emergency, it is important to act quickly and cautiously. In doing so, it is important to be fully aware of any pre-existing conditions or circumstances that may affect treatment.

In addition, other health conditions, such as prescription allergies or seizures, may exist that would make it difficult to administer proper emergency treatment. If such a case were to occur, it is important that the lab instructor be aware of such conditions.

The disclosure of any special circumstances/conditions that you may have is completely voluntary. However, if you would like to make the instructor aware of any of these situations, please indicate those that should be taken into consideration in an emergency.

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