

# Clayton State University

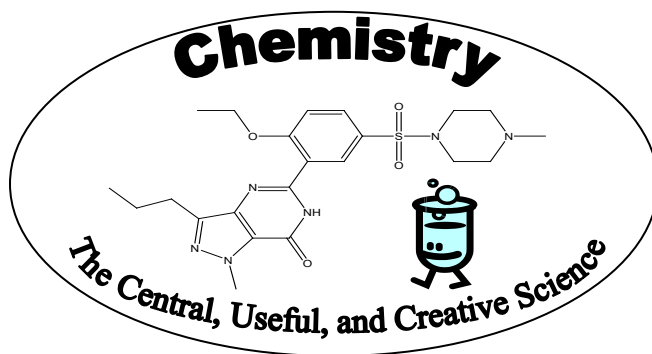
## Chemistry and Physics Laboratory Safety

### Rules and Regulations

#### Important Phone Numbers

Public Safety .....	678-466-4050
Police, Fire, and Ambulance (Emergency) .....	911
Dr. Dmitriy Beznosko .....	678-466-4867
Dr. Drew Brandon.....	678-466-4780
Dr. Emily Harbert-Surber .....	678-466-4795
Dr. Tatiana Krivosheev .....	678-466-4783
Dr. Paul Melvin (Director) .....	678-466-4789
Dr. John Meyers.....	678-466-4773
Dr. Rosann O’Neill .....	678-466-4733
Dr. Cass Parker .....	678-466-4788
Dr. Caroline Sheppard .....	678-466-4777
Dr. Connor Wright .....	678-466-4786
Lashaundra Fambro (Lab Manager) .....	678-466-4868
Cheryl Rainey (Admin. Specialist).....	678-466-4794

Safety is the top priority in the chemistry and physics laboratories. 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 yourself and others. Please be familiar with the following rules and regulations. You should understand how to operate laboratory equipment safely and properly.



## I. Chemicals

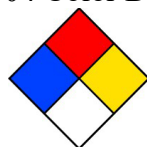
### A. Safety Data Sheets (SDS)

- The SDS contains important information about the chemicals with which you will be working.
- Safety Data Sheets (SDS) are provided in the SDS 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.
- SDS are also available on the internet at <http://msds.com> and various other websites.
- The SDS 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.
- The SDS instructs you about the proper personal protective equipment to use when handling a chemical (e.g., eye protection, gloves, lab coat, etc.).

### B. Chemical Safety Diamonds

Chemical safety diamonds, like the one shown below in Figure 1, may be displayed on some 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.

Figure 1. NFPA704 Color Diamond Reference



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)

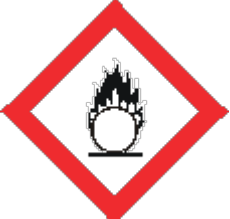








The diamond identifies the hazards of a material and the degree of severity of the health, flammability, and instability hazards. Hazard severity is indicated by a numerical rating that ranges from zero (0), indicating a minimal hazard, to four (4), indicating a severe hazard. The hazards are arranged spatially as follows: health at the nine o'clock position, flammability at the twelve o'clock position, and instability at the 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.

### C. Globally Harmonized Labeling

The Globally Harmonized System of Classification and Labeling of Chemicals (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. 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, as shown below in Figure 2, instead of the chemical diamonds.

**Figure 2.** GHS Pictograms and Hazard Classes

		
<ul style="list-style-type: none"> <li>▪ Oxidizers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Flammables</li> <li>▪ Self-Reactive</li> <li>▪ Pyrophoric</li> <li>▪ Self-Heating</li> <li>▪ Emits Flammable Gas</li> <li>▪ Organic Peroxides</li> </ul>	<ul style="list-style-type: none"> <li>▪ Explosives</li> <li>▪ Self-Reactive</li> <li>▪ Organic Peroxides</li> </ul>
		
<ul style="list-style-type: none"> <li>▪ Acute toxicity (severe)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Corrosives</li> </ul>	<ul style="list-style-type: none"> <li>▪ Gases Under Pressure</li> </ul>
		
<ul style="list-style-type: none"> <li>▪ Carcinogen</li> <li>▪ Respiratory Sensitizer</li> <li>▪ Reproductive Toxicity</li> <li>▪ Target Organ Toxicity</li> <li>▪ Mutagenicity</li> <li>▪ Aspiration Toxicity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Environmental Toxicity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Irritant</li> <li>▪ Dermal Sensitizer</li> <li>▪ Acute toxicity (harmful)</li> <li>▪ Narcotic Effects</li> <li>▪ Respiratory Tract</li> <li>▪ Irritation</li> </ul>

#### D. Wear Proper Clothing

- 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.
- 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.
- Consult the SDS for instructions on proper laboratory attire with specific chemicals.

#### E. Gloves

- Gloves of material suitable for the chemicals being used must be worn. Consult the SDS for the recommended gloves. Latex-free, nitrile gloves are provided in all of the laboratories.
- Gloves should be checked for tears, rips, or deterioration prior to use.
- Gloves should **NOT** be worn in the hallways, lecture rooms, or office areas.
  - Only authorized personnel are permitted to transport chemicals between storage areas. In this case, authorized transporters should observe the “One Glove Rule”—use the ungloved hand to touch common surfaces and the gloved hand to carry the container.
- Certain conditions require hazard-specific gloves. Thermal gloves are available near the ovens in each lab room. Please contact the Lab Manager to obtain cryogenic or cut-resistant gloves.

#### F. 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, and other personal objects 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.

### **G. 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 of 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 incompatible reagents could pose a safety hazard.

### **H. 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 and benchtops 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.

## **II. Laboratory Equipment**

### **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.
6. Wash all used hoods with soap and water once the experiment is complete.

### **B. Chemical Balances**

- 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.
- Apply caution when opening or closing the glass shields or lids.

### **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.

### **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 the 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.
7. Never leave a lit Bunsen burner unattended.

### **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

### **IV. Common Sense Rules**

1. If you need more clarification on 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, including earbuds, 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 test tube holders, tongs, or hot pads to move 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.

### **V. Safety Agreements**

#### **A. Violations**

Any violations of the safety rules should be corrected immediately. If the violation is not resolved or the violation is consistently repeated, report it to your instructor or the Lab Manager.

#### **B. Safety Rules and Regulations**

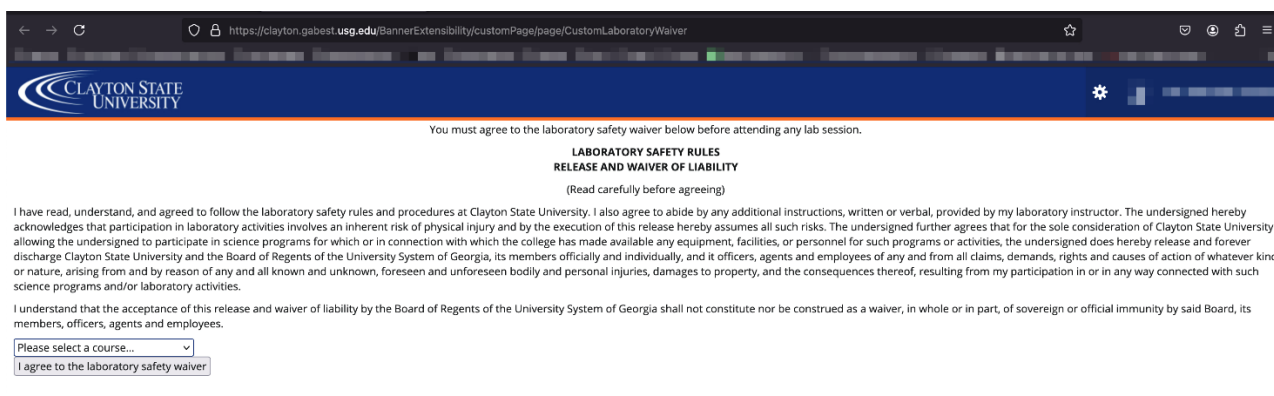
Read all of the above safety rules and save a copy for quick reference. You are required to read, understand, and agree to follow the laboratory safety rules and procedures at Clayton State University. You must also agree to abide by any additional instructions, written or verbal, provided by my laboratory instructor. You will acknowledge this agreement by completing the Laboratory Safety Waiver in the DUCK.

### C. 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. From the [SWAN](#) page, log in to the DUCK.
2. Scroll down and click on the “Laboratory Waiver” tile.
3. Use the “Please select a course…” drop-down menu to select a lab course.
4. Accept the waiver for any lab course that needs attention.

You must agree to the waiver for EVERY laboratory class that you are enrolled in EACH semester.



The screenshot shows a web browser window with the URL <https://clayton.gabest.usg.edu/BannerExtensibility/customPage/page/CustomLaboratoryWaiver>. The page header features the Clayton State University logo and a navigation menu. Below the header, a message states: "You must agree to the laboratory safety waiver below before attending any lab session." The main content area is titled "LABORATORY SAFETY RULES" and "RELEASE AND WAIVER OF LIABILITY", with a sub-note "(Read carefully before agreeing)". The text of the waiver reads: "I have read, understand, and agreed to follow the laboratory safety rules and procedures at Clayton State University. I also agree to abide by any additional instructions, written or verbal, provided by my laboratory instructor. The undersigned hereby acknowledges that participation in laboratory activities involves an inherent risk of physical injury and by the execution of this release hereby assumes all such risks. The undersigned further agrees that for the sole consideration of Clayton State University allowing the undersigned to participate in science programs for which or in connection with which the college has made available any equipment, facilities, or personnel for such programs or activities, the undersigned does hereby release and forever discharge Clayton State University and the Board of Regents of the University System of Georgia, its members officially and individually, and its officers, agents and employees of any and from all claims, demands, rights and causes of action of whatever kind or nature, arising from and by reason of any and all known and unknown, foreseen and unforeseen bodily and personal injuries, damages to property, and the consequences thereof, resulting from my participation in or in any way connected with such science programs and/or laboratory activities." Below this text, a statement reads: "I understand that the acceptance of this release and waiver of liability by the Board of Regents of the University System of Georgia shall not constitute nor be construed as a waiver, in whole or in part, of sovereign or official immunity by said Board, its members, officers, agents and employees." At the bottom of the form, there is a dropdown menu labeled "Please select a course..." and a checkbox labeled "I agree to the laboratory safety waiver".