



## Guide to Basic Laboratory Safety Chemistry Department Saint Louis University



This guide has been prepared by the Department of Chemistry Safety Committee to ensure the responsibility of all individuals in laboratories to observe safe practices and to know what to do in the event of an accident. While it is not possible to address all the possible dangers involved with all procedures or chemicals, there are some basic rules and procedures that should be remembered and followed.

### **Rules to be followed without exception:**

1. Eye protection is required at all times where chemicals are handled or stored. This is not only good safety, but is also a Missouri State Law, Federal Law as well Saint Louis University policy.
2. Teaching labs require goggles to be worn at all times unless otherwise specified by the instructor.
3. Unauthorized experiments and unapproved variations in experiments, including changes in quantities of reagents, are prohibited as they may be dangerous.
4. When working with chemicals in the laboratory, another person needs to be within easy calling distance, preferably in the same room unless otherwise specified by your instructor/principal investigator. Lab doors must remain opened when lab is occupied unless otherwise required by export control.
5. Never leave an experiment unattended while it is reacting rapidly or being heated. Long-term reactions may be left once you are sure it is safe, but only with faculty approval.
6. Sitting on the hallway floor or blocking the hallway poses a hazard and is therefore not allowed.
7. Clothing must cover from your shoulders to your ankles.

When choosing what to wear in a laboratory setting, always keep in mind that the main priority is safety. In the case of an accident, the clothes provide a barrier between the skin and the hazardous chemical. Examples of what NOT to wear: shorts, mid-length pants, short skirts, sleeveless/backless shirts, clothes that have holes in them or are see-through.

- i. Anyone in a laboratory must wear shoes that entirely cover the feet (no skin or socks showing). Shoes should be made out of a durable material in order to provide a protective barrier.
  - ii. Shirts must cover the upper torso entirely and have sleeves (billowing sleeves are not allowed). No midriff should be showing. *Note: If you raise your arms and your midriff shows, wear something else.*
  - iii. Pants or skirts must cover down to your shoes.
  - iv. Hair past the shoulder line should be tied back while working in the laboratory.
8. Lab coats shall be worn whenever there is a possibility of splashes, spills, or other clothing contamination to personnel in research laboratories. Students in teaching laboratories must follow the requirements for the specified course.
  9. No food or drink is allowed in any laboratories in Monsanto Hall. No exceptions.
  10. Pyrophoric materials must only be handled by trained personnel with a trained coworker present.

*There are also other rules that apply in various laboratories and situations, especially when concerning research laboratories. Your research director will provide additional instructions specific to their respective laboratories.*

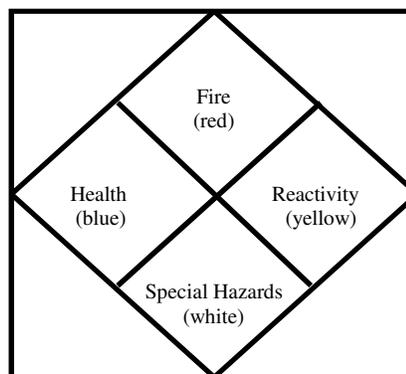
## CHEMICAL HAZARD INFORMATION

Before performing any experiments, you should ask yourself, "What would happen if...?". Answers to this question require some understanding of the hazards associated with the chemicals and equipment involved. Thus, knowledge of stability, reactivity, flammability and toxicity of chemicals used will dictate precautions to be taken. Information concerning the properties of chemicals may be found in a number of sources; some major sources of information are:

1. The Merck Index and the Condensed Chemical Dictionary
  - i. provide information on the physical and chemical properties, toxicity and uses of chemicals
  - ii. available in the Pius XII library and in the Department of Chemistry/RM115
2. Material Safety Data (MSD) Sheets
  - i. provide information on physical properties, toxicity, health effects, first-aid, fire and explosion data, reactivity, spill or leak procedures, precautions to be taken in the handling and storage, and conditions to avoid
  - ii. easily accessible online through website such as Sigma-Aldrich, Fischer Scientific, etc.
3. NFPA (National Fire Protection Association) symbols:

The NFPA system identifies the hazards of a material in terms of four categories: health, fire (flammability), reactivity (instability), and special hazards. The order of severity is indicated by a number ranging from 4 (extreme hazard) to 0 (minimal hazard). The numbers are placed in the figure shown to the right. When no classification is given, handle the chemical as if it poses an extreme hazard in all four categories. In general, the numbering system coincides with the following system rating:

- |   |                 |
|---|-----------------|
| 4 | extreme hazard  |
| 3 | serious hazard  |
| 2 | moderate hazard |
| 1 | slight hazard   |
| 0 | minimal hazard  |



A more detailed description of each numerical rating is as follows:

### *Health*

- 4 Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment was given.
- 3 Materials which on short exposure could cause serious temporary injury even though prompt medical treatment was given.
- 2 Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
- 1 Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
- 0 Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.

### *Fire (flammability)*

- 4 Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily

- 3 Liquids and solids that can be ignited under almost all ambient temperature conditions.
- 2 Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
- 1 Materials that must be preheated before ignition can occur.
- 0 Materials that will not burn.

***Reactivity (instability)***

- 4 Materials which, in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
- 3 Materials which, in themselves are capable of detonation or explosive reaction, but require a strong initiating source or which must be heated under confinement before initiator which react explosively with water.
- 2 Materials which, in themselves are normally unstable and readily undergo violent chemical change, but do not detonate. Also, materials that may react violently with water or which may form potentially explosive mixtures with water.
- 1 Materials which, in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy, but not violently.
- 0 Materials which, in themselves are normally stable even under fire exposure conditions and which are not reactive with water.

***Special hazards***

- OX Materials that are strong oxidizers.
- ~~W~~ Materials that have an unusual reactivity with water.
- P Materials that are subject to polymerization under some emergency conditions.
- ☣ Materials that are radiation hazards.

**EMERGENCY RESPONSE INFORMATION**

***In case of an emergency being calm is of the utmost importance.*** Before reacting, step back and assess the situation. If help is needed, there are two simultaneous acts that need to occur: (1) begin treating the person or situation as described below and (2) assign specific persons to contact (a) the main office, (b) responsible faculty, and/or (c) Department of Public Safety and Emergency Preparedness (DPSEP) so that assistance can be provided immediately. Each laboratory has an accessible phone which should be used during an emergency. It is important to realize that if calling from a SLU landline, one must dial 7 before dialing the extension number. If calling from a cell phone, one must dial 314-977-extension number. It is crucial to remember that if previously mentioned responsible parties are not accessible by phone, physically send someone to find assistance. Below are two important phone numbers you should memorize:

- Chemistry Main Office, Monsanto Hall Room 125: 7-2850
- Department of Public Safety and Emergency Preparedness (DPSEP): 7-3000

Know the location of all emergency exits, safety equipment and fire alarms. During an emergency do not use the elevators. If evacuation of the building is required, go directly to a predetermined meeting location so that everyone can be accounted for.

In the case of an accident please remember to respect the privacy of any victims and stand back to provide emergency responders easy access to the victim and accident site.

### ***Chemicals spilled on a person over a large area***

1. Quickly remove all contaminated clothing and take the person to the safety shower. Keep the water running on the injured for 15 minutes to wash off the chemicals. Do not waste any time because of modesty. A person's life could be at risk.
2. Someone should immediately contact the department office/faculty member in charge and call DPSEP at 7-3000.

### ***Fire***

1. The action taken will depend upon the severity of the situation.
  - a. If there is no injury and the fire is small, could be contained in a vessel, it can usually be suffocated by covering the fire with an inverted beaker or a watch glass. Do not use cloths or towels. Remove any nearby flammable materials to avoid possible spread of fire.
  - b. If a spilled or sprayed liquid is burning over an area too large for the fire to be suffocated quickly and simply, all persons should leave except those designated to help. If you have been trained to use a fire extinguisher, you may do so by discharging it at the base of the flame. If this does not bring the fire under control, evacuate the building.
    - i. When evacuating the building activate the fire alarm. Remember do not use elevators.
2. Someone should immediately contact the department office/faculty member in charge and in a situation described in "1b" call DPSEP at 7-3000.

### ***Burning Clothing***

1. The victim needs to stop, drop, and roll.
  - a. The fire needs to be smothered with a fire blanket or a lab coat. Do not use a fire extinguisher on a person whose clothing is burning.
  - b. If there is chemical spillage involved in addition to burning clothing, the injured person should be taken to a safety shower and their contaminated clothing removed. Keep the water running on the injured for 15 minutes to wash off the chemicals. Place clean, soaking wet, ice-packed cloths on burned areas and wrap the injured in a fire blanket to avoid shock and exposure.
2. Someone should immediately contact the department office/faculty member in charge and call DPSEP at 7-3000.

### ***Explosions***

1. Individuals should immediately turn off burners or heaters and stop the experiment. Prepare to vacate the room as toxic fumes may be present.
  - a. If there is a resulting fire or injured person follow the appropriate previously mentioned instructions.
2. Someone should immediately contact the department office/faculty member in charge and call DPSEP at 7-3000.

### ***Medical***

1. Individuals should provide appropriate, basic assistance to make the victim comfortable and the surrounding environment safe.
2. Someone should immediately contact the department office/faculty member in charge and call DPSEP at 7-3000.

### ***Sounds like a gunshot/active shooter***

1. Turn off lights, stay quiet, barricade/secure door, and hide. Do not huddle together. Be prepared to act.
2. Someone should immediately contact the department office/faculty member in charge and call DPSEP at 7-3000.

### ***Tornado warning/sirens***

- The siren indicates a tornado has been spotted in the area. Immediately move to the lowest level of the building or an interior room or closet. Kneel/sit and cover head with arms to protect against falling debris. Remain there until advised by DPSEP that conditions are safe. In all severe weather situations move inside and avoid glass windows and doors.

### ***Earthquake***

- Move against interior wall, kneel/sit and cover head with arms to protect against falling debris. Use stairwells to evacuate when shaking stops. When outdoors, move into open area away from glass and electrical wires.

### ***Other emergencies***

- For all other emergencies while in the building such as environmental, elevator entrapments, suspicious persons or other safety concerns immediately contact the department office/faculty member and/or call DPSEP at 7-3000 as is appropriate for the situation.

### **Insurance Notice**

The University does not insure students. Students should make sure that they are self-insured, or that they are covered by their parents' insurance. Undergraduate and graduate students employed by the University to teach or research are covered under workers compensation as long as they are performing duties associated with their position as assigned by their PI or Laboratory Coordinator. Injuries sustained to employees outside of assigned duties are covered by the individual's personal insurance policy.

### **Some additional safe laboratory practices**

The following recommendations illustrate some safe practices. These practices are not inclusive. Each experiment and chemical has its own hazards that should be taken into consideration. Be prepared in the laboratory and never assume anything.

1. Keep your hands and body clean of chemicals. Wash thoroughly with soap and warm water whenever a chemical contacts your skin. It is also a good idea to always wash your hands when a laboratory exercise has been completed. Most chemicals are harmful to some degree and those that are not considered dangerous today may be deemed so in the future. It is especially important to keep chemicals off of hands (use gloves if necessary), face, and clothing. Remember that many substances are readily absorbed through the skin.
2. Remove at least one glove before leaving the laboratory as not to contaminate common surfaces (door knobs, etc.)
3. All cylinders of compressed gases must be supported by straps or chains to prevent them from falling over. When moving cylinders, the cylinders should be strapped to a properly designed wheeled cart to insure stability. Cylinder caps should be in place when a cylinder is not connected or is being moved.
4. All spills should be cleaned up immediately. Contact a faculty member for a large spill (>250mL) or for hazardous substances.
5. Carefully read the label before removing a reagent from its container. Read it again as you promptly recap the container and return it to its proper location.
6. Always add reagent(s) slowly. Observe what takes place when a small amount is added and wait a few moments before adding more since some reactions do not proceed as readily as other reactions. If the proper reaction does not initiate, ask your instructor for advice before adding more reagent.
7. To avoid violent reaction and splattering while diluting solutions, always pour concentrated solutions into water or into less concentrated solutions while stirring.
8. Never look down the opening of a vessel unless it is empty.
9. Never pipet by mouth.
10. Check what your neighbors are doing before lighting a burner and turn the burner off when not in frequent use. Flames, operating hot plates, or sparking motors should be kept from the vicinity of flammable solvents.
11. Do not add any solid material to a liquid when it is near its boiling point; this is likely to cause violent boiling over.
12. Make sure glassware is safely and firmly supported.
13. Do not attempt to extract a solution until it is cooler than the boiling point of the extractant.
14. Dichromate, piranha solution, sulfuric acid, and other strong acids or strong oxidizer cleaning solutions should not be used except on specific direction of the instructor.
15. No reagents or chemicals should be stored in your lab drawer, unless you are specifically directed to do so by the instructor or lab manual.

16. A sudden rise in temperature of a liquid being distilled is evidence of decomposition, which may become violent. Immediately remove heat, alert persons nearby, and quickly move away. Do not return until you are certain the temperature has actually dropped.
17. Be aware of what your neighbors are doing, as you may be a victim of their accidents. Do not hesitate to tactfully comment to a neighbor whom you observe engaging in an unsafe practice or operation. If they continue the unsafe practice, tell the instructor.

