

RAMPING UP LAB SAFETY

In any laboratory setting, there are numerous hazards and risks that can impact the health and safety of those who are working. Safety is a priority in this course, and it is the responsibility of all persons in the laboratory to consider, mitigate, and be prepared for any potential hazards. A simple and effective approach to laboratory safety is known as RAMP:

- **R**ecognize hazards
- **A**ssess the risks of hazards
- **M**inimize the risks of hazards
- **P**repare for emergencies

Recognize Hazards: A hazard is any source of potential damage or harm to an individual's health or life under certain conditions.¹ In the chemistry laboratory, hazards can come from the chemicals, equipment, or procedures used. It is important to be able to recognize [common laboratory hazards](#) and explain why they are hazards. The best source for chemical hazard information are [Safety Data Sheets](#), which are standardized documents that list the physical, health, and environmental hazards, along with recommended safe handling, storage, and personal protective measures. The Globally Harmonized System (GHS) is a standardized way that chemical hazards are classified and labeled using signal words and pictograms. Signal words and pictograms should be visible on all commercial and secondary chemical containers and provide a quick method to identify hazards.

Assess the Risks of Hazards: Risk is the probability that a person will be harmed or experience an adverse health effect if exposed to a hazard.¹ To assess risk, you want to consider how you might be exposed to the hazard and what would be the potential effects of that exposure. The magnitude of risk will depend on both the probability of occurrence and the severity of the hazard. Additional important factors to consider are the quantities or concentrations of reagents and the length of exposure.

Minimize the Risks of Hazards: Although it is not possible to remove risk from laboratory activities, careful planning and attention to detail can minimize risk. Good laboratory practices to minimize risk include always wearing personal protective equipment (PPE) appropriate for the hazards, ensuring glassware and equipment are in good working order prior to use, being trained in and familiar with the laboratory procedures, keeping workspaces clean and free of clutter, using the lowest concentrations and smallest volumes possible for all chemicals, disposing of waste properly, and never working alone.

Prepare for Emergencies: Accidents, such as chemical spills, fires, cuts, burns, and exposures are all possible even if efforts have been taken to mitigate risk. It is important to consider what could go wrong, even if it is a low probability, and how to respond. One key step is to be familiar with the location and proper use of emergency equipment such as first aid kits, fire extinguishers and alarms, safety showers, eyewashes, and chemical spill kits.

EXAMPLE RISK ASSESSMENT

Recognize Hazard	Concentrated HCl	Puddle of water on the floor
Assess Risk	<ul style="list-style-type: none"> • Skin burns and eye damage upon contact • Respiratory irritation • Damage to organs through prolonged or repeated exposure 	Possible to slip and fall resulting in: <ul style="list-style-type: none"> • Injury to the person falling • The dropping of chemicals leading to a chemical spill • The dropping of glassware resulting in broken glass
Mitigate Risk	<ul style="list-style-type: none"> • Wear PPE (gloves, long sleeves or lab coat, safety goggles) • Work in the fume hood • Use small quantities • Clean up any drips or spills immediately 	<ul style="list-style-type: none"> • Place warning signs around the spill or block access to the area • Remove the water from the floor as quickly as possible
Prepare for Emergency	<ul style="list-style-type: none"> • Spill or splash: remove any exposed clothing or PPE; flush skin or eyes with water for 15 minutes (sink, eyewash, or safety shower) • Inhalation: Move to well-ventilated area • Large spill: Use acid spill kit located in the stockroom 	<ul style="list-style-type: none"> • Obtain absorbent pads or other method of removing the water from the stockroom or campus safety • Contact campus safety for emergency services if needed

REPORT (20 PTS)

Carefully review the experimental procedure for Weeks 2 and 3 of Experiment 1. Identify three potential hazards that you would consider moderate or high risk: one chemical, one equipment, and one procedural. For each hazard, complete the following risk assessment:

- Describe the potential hazard.
- Explain the potential risks associated with the hazard under the conditions of the experiment. Use SDS/GHS information where appropriate.
- Describe measures that should be taken to minimize the risk of the hazard.
- Describe the “worst case scenario”. What is the worst that could happen regarding the hazard, and what would need to be done in case of that emergency? Would you feel prepared to handle this emergency? Why or why not?

Then answer the following question: Of the three potential hazards that you identified, which is the greatest risk, and why?

Submit your responses as a word document to Canvas by the beginning of the second lab period. Be prepared to share with the class one of the hazards you identified during the pre-lab discussion period.

REFERENCES

1. Chemical & Laboratory Safety <https://www.acs.org/content/acs/en/chemical-safety.html> (accessed Jan 18, 2021).
2. Laboratory Safety for Chemistry Students, 2nd Edition | Wiley <https://www.wiley.com/en-us/Laboratory+Safety+for+Chemistry+Students%2C+2nd+Edition-p-9781119027669> (accessed Jan 18, 2021).