

Developing a Standardized Safety Approach to Instructional Laboratories in a Major Research Institution

Laboratory work is essential to all academic programs, starting with introductory-level undergraduate courses. It is vital that students develop a strong foundation in the basic principles and procedures of laboratory safety and to expand their knowledge throughout their academic career. It is important that both undergraduate and graduate students are able to recognize hazards, assess risks, minimize risks, and prepare for proper execution of potentially hazardous processes. Safety considerations should be woven into every part of the curriculum, from basic familiarity with common hazards for undergraduate students to the ability to predict and prepare for hazards of unknown materials at the graduate and professional level. Safety training should be treated as a critical component of preparing students to be successful as professionals. This document is a guideline to set the minimum standard for managing safety within instructional laboratory courses.

Responsibilities:

College Dean:

- Require all incoming graduate students in the fall to attend Graduate Student Safety Orientation provided by EH&S.
- Assure that the College upholds all health and safety requirements

Department Chair/Vice-Chair:

- Assures that the department upholds all campus health and safety requirements.
- Assure that each course instructor has reviewed and documented all experimental SOPs. Clearly define who is responsible, if it is not the faculty instructor.
- Be familiar with the experiment procedures and risk levels for each course.
- When safety responsibilities are discussed (e.g. safety committee, department meetings, Teaching Assistant (TA) orientation, etc.), partner with EH&S to present safety responsibilities and the safety review process (including but not limited to SOPs, working with Student Disabilities Services on accommodations for students, reproductive health issues, emergency procedures/injuries, PPE enforcement, safety moments at the beginning of each class).
- Share PI Responsibilities video with all faculty. Reinforce message that PIs are responsible for the safety of all in their lab: <https://www.youtube.com/watch?v=6KZawWfDYIQ>

Faculty/Instructors/Academic Coordinators:

- Assures that Teaching Assistants uphold the health and safety requirements and completes the [Primary Safety Responsibilities of TAs acknowledgement form](#).
- Review PI Responsibilities video: <https://www.youtube.com/watch?v=6KZawWfDYIQ>

- When you are assigned a course, obtain a copy of the previous standard operating procedures (SOPs), review and update when there is change in procedures/experiment set up. Document using the [SOP Review/Revision Acknowledgement form](#).
 - Utilize the [Experimental Risk Assessment tool](#) to review experiments and procedures to ensure appropriate safety measure are in place. Reviews should be conducted for existing experiments, new experiments, changes in procedures, or after an incident.
- Contact EH&S at ehslaboratory@ucr.edu to initiate access to the course [Laboratory Hazard Assessment](#) for your instructional lab, which will determine the appropriate personal protective equipment (PPE) and other specific hazard (i.e. biological materials, radiation materials, etc.) approval for the lab. PPE identified must also be used for the students in the lab.
- Complete the [Instructional Lab Checklist for Faculty/Instructor/Academic Coordinator](#) for each course on an annual basis or for every quarter you serve as the instructor.
- Clearly define expectations to TAs when students do not come to lab with the correct PPE.
- Clearly define and demonstrate proper use and safe removal of gloves.
- Incorporate [Student Laboratory Safety Commitment](#) (See Appendix B) in the laboratory course requirements, ensure all students complete, and maintain records of completion.
- Provide and document safety training, including the completion of the [Instructional Laboratory Site Specific Training Checklist](#) with each TA. This should be completed for each room/site where the TA will be working in.

Teaching Assistants:

Teaching Assistants (TAs) typically have responsibilities for operating and overseeing undergraduate students and laboratories. Below is a list of expectations for Teaching Assistants:

- Attend Graduate Student Safety Orientation that is hosted by EH&S prior to serving as a TA*.
- Review and acknowledge the [Primary Safety Responsibilities of TAs](#) (See Appendix A).
- Understand the principles of safety – [RAMP](#) – and how these apply to each experiment.
- With the Faculty/Instructor/Academic Coordinator, complete the [Instructional Lab Site Specific Training Checklist](#) for each room where you will be assigned.
- Read the [Chemical Hygiene Plan](#) and sign the [acknowledgement form](#).
- Know where the Safety Data Sheets (SDS) for each chemical are located and become familiar with each section.
- Ensure all students have reviewed and signed the [Student Laboratory Safety Commitment](#) (See Appendix B).
- Demonstrate proper laboratory techniques for each experiment to the students.
- Maintain good housekeeping in assigned laboratories.

- Do not use cell phones during sessions unless instructed to do so.

For courses that do not have TAs assigned, Faculty/Instructor/Academic Coordinators are responsible to ensure all the above expectations are met.

Environmental Health and Safety (EH&S):

EH&S provides consultation and guidance for all instructional labs.

- Organize the Graduate Student Safety Orientation course and make improvements to the content as appropriate.
- Share attendance records of GSSO to the appropriate College administrators to ensure students receive credit for attending.
- Evaluate all instructional lab on an annual basis and share evaluation reports to the Department Chair and Dean.
- Participate in any department or college level safety meetings.
- Share lessons learned from near misses and other incidents broadly to the College.

Safety Resources:

Safety is always an important concern in instructional laboratories.

- University wide resources:
 - [Laboratory Safety Manual](#)
 - [Chemical Hygiene Plan](#)
 - [Lab Site Specific Checklist](#)
 - [12 Months of Research Safety topics](#)
 - [Spotlight on Safety](#)
- ACS Teaching Lab: <https://institute.acs.org/lab-safety/education-and-training/safety-videos/college-lab-safety-videos.html>

Handling biological materials:

- Review [ASM Biosafety Guidelines for Teaching Labs](#).
- Use microincinerators or disposable loops rather than Bunsen burners.

Consult the departmental lab coordinator with questions about departmental safety policies.

APPENDIX A

Primary Safety Responsibilities of Teaching Assistants:

- Read and acknowledge the course LHAT to understand hazards in labs and appropriate PPE for use in the space. Follow appropriate safety and PPE protocols during laboratory preparation activities, such as making solutions and preparing student samples, and throughout the duration of each laboratory course.
 - Eye Protection
 - Wear accepted eye protection and understand that it is your responsibility to make sure that the students do too.
 - Long pants and closed toe/heel shoes
 - Wear long pants and closed toe/heel shoes that cover your ankles and the top of your foot. No shorts, dresses, skirts, or sandals are allowed. It is your responsibility to make sure that the students do the same too.
 - Laboratory Coat
 - Wear the appropriate laboratory coat yourself and understand that it is your responsibility to make sure that the students do too.
 - Gloves
 - Wear the appropriate gloves and understand that it is your responsibility to make sure that the students do too.
 - Understand and demonstrate how to safely remove gloves.
 - Ensure gloves are used when the student's hands have fresh cuts or abrasions, when staining microbes, and when handling microorganisms or hazardous chemicals.
- Accidents and Reporting
 - Attend to injury immediately. Request for help if necessary: [Provide contact information professor in charge of the course].
 - For emergencies, call 9-1-1 or UCPD (951) 827-5222.
 - Notify EH&S at (951) 827-5528 or Report an Incident, Injury or Safety Concern at <https://ehs.ucr.edu/report>. As soon as possible and within 24 hours
 - Report accidents to individual in charge of the course
- Emergencies
 - Familiarize yourself with the [Emergency Poster](#) and [Emergency Flip Chart](#) and review with students on the first day of lab. Including:
 - Calling 9-1-1 or UCPD (951) 827-5222
 - Incidental and major spill
 - Building evacuation
 - Loss of ventilation
 - Loss of electrical power

- Fire and fire alarm
- Natural disaster, such as earthquake
- Active shooter alert
- Safety equipment
 - Make sure that you and your students know the location of nearest: safety shower, eyewash, fire extinguisher, first aid kit, evacuation route, fire alarm and telephone.
- Supervision
 - Make sure there is at least one Teaching Assistant in the laboratory at all times. Never work alone in the laboratory and never leave your students unattended.
- Know, follow and enforce the policies and procedures for the following:
 - Responding to students or staff who have mental health problems. Refer to UCR RED Folder: https://studentdocs.ucr.edu/counseling/uc-riverside_caps_red_folder.pdf
 - Assisting students and staff for injuries, fainting, or other physical health problems.
 - Generation and disposal of hazardous waste.

While **preparing** to conduct a lab, consider the following questions:

- Where is all the safety equipment in my lab space?
- How do I respond if a student had an incident?
- What are the safety considerations?
- Is there a standard operating procedure (SOP) for this experiment?
- Have I reviewed and signed the SOP?
- Chemicals
 - In advance, check the chemicals for your course and make sure they are correct for the current experiment. Follow specific directions for waste disposal that are given at the weekly staff meetings. Log in waste amounts when required to do so. When your lab is over, make sure that all the bottle caps are back on reagent bottles, the bottles are back on the reagent shelf and check that the caps and tops of waste bottles for your section are on and are closed before you leave. All eco-funnel lids must be in the down position (closed).
- Biological materials:
 - Review [ASM Biosafety Guidelines for Teaching Labs](#).
 - Use microincinerators or disposable loops rather than Bunsen burners, when feasible.

During the lab:

- Wear proper personal protective equipment (long pants, closed toe/heels shoes, lab coat, safety glass or goggles, and gloves) and assess that all students are wearing the same level of PPE as you.
- Safety Consciousness

- Give your safety orientation talk to your students before they do any lab work. Warn them of particular hazards before each experiment. Do not allow any unscheduled experiments (these often have unexpected hazards). Be firm on safety from the very first day. Inform the professor in charge if you consider any procedures unsafe. Your feedback is very important.
- Review safety issues for the experiment.
- Conduct safety moments at the beginning of each class. Resources available: <https://ehs.ucr.edu/laboratory/12monthsofresearchsafety>
- Remind students to put cell phones away and not to use during lab session unless instructed to do so.

After the lab:

- Maintenance
 - Clean laboratory at the end of each period and make sure all gas and water valves are turned off. Report all utility problems such as gas leaks, hoods off, or plumbing leaks, etc. to [Facilities Services](#).

Teaching Assistant Acknowledgement

I, _____ (TA's name), have read and understand the responsibilities set forth above. I understand that I must obey these rules to ensure my own safety and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe working environment in the laboratory. I am aware that violations could result in disciplinary action.

Signature

Date

APPENDIX B

STUDENT LABORATORY SAFETY COMMITMENT

Laboratory courses include hands-on, inquiry-based investigations. Laboratory activities involve the use of chemicals, biological materials, or equipment that may pose a health and safety risk to students and instructors if not handled properly. To ensure a safe and healthy environment in our laboratories, the following Student Laboratory Safety Commitment has been developed. Students must sign this commitment form and return a signed copy to their instructor on the first day of the laboratory course and before they can participate in any laboratory work or handle hazardous materials. The students should keep a copy in their laboratory notebook as a reminder of appropriate behavior.

GENERAL REQUIREMENTS

1. Students are **not** allowed in the laboratory without their instructor present.
2. Behave in a mature and responsible manner at all times in the laboratory or wherever hazardous materials are stored or handled. All inappropriate behavior is especially prohibited.
3. Follow all verbal and written instructions carefully. If you are unsure of the procedure, ask your instructor for help before proceeding.
4. Do not touch any equipment or hazardous material unless specifically instructed to do so.
5. Do not eat, drink, apply cosmetics, or chew gum in the laboratory. Wash hands thoroughly after participating in any laboratory activities.
6. Tie back long hair.
7. Do not use cell phones during lab session (i.e. phone calls, texting, checking email, etc. is prohibited while in the laboratory) unless authorized by the instructor (e.g., take photos for experiments).
8. Perform only those experiments authorized by the instructor.
9. Students will receive training related to the locations and operating procedures for all applicable laboratory safety equipment and personal protective equipment (PPE).
10. Use class-designated marking pens and writing instruments, if provided by the instructor.
11. Unauthorized personnel are not allowed in the laboratory. Visitors must be authorized by the instructor and the faculty in charge of the course.
12. Never sit or stand on laboratory benches or countertops.
13. Do not handle broken glass with hands; use a dust pan and broom.

HANDLING HAZARDOUS MATERIALS AND EQUIPMENT

1. Wear personal protective equipment (PPE) in the laboratory **at all times**.
 - PPE consists of **long pants (no shorts, dresses, or skirts) and closed toe/heel shoes** that cover the top of the foot and ankles (ballet-style slippers are not permitted), **laboratory coats, safety eyewear** (splash goggles or safety glasses, as

directed), and **gloves**. Safety eyewear must be worn whenever chemicals, hazardous materials, heat, or glassware are used by either the instructor or the students in the laboratory, or as directed. Avoid wearing loose or flammable clothing; long hair should be tied back.

2. Headphones are **not** permitted in the laboratory. Remain alert at all times.
3. Report any incident (including all spills, breakages, or other releases of hazardous materials) to the instructor/TA immediately—no matter how insignificant it may appear. This should include all injuries such as cuts, burns, breathing problems, or other signs of physical harm. It is encouraged that students also report incidents that do not result in physical harm, so that lessons can be learned from these “near misses”.
4. Never remove chemicals, hazardous materials, equipment, or supplies from the laboratory area.
5. Carefully examine all equipment before each use and report any broken or defective equipment to the instructor immediately.
6. Always close chemical containers and return chemicals to their proper location after use.
7. Properly dispose of all hazardous material waste, as directed.
8. Never enter or remain in the science laboratory storage rooms or preparation areas unless accompanied by an instructor or a designated individual.
9. Clean your work area and help clean common areas before leaving the lab.

HANDLING BIOLOGICAL MATERIALS AND EQUIPMENT

1. Disinfect bench before and after the laboratory session with a disinfectant known to kill the organisms handled. Use disinfectants according to manufacturer instructions.
2. Do not mouth pipette.
3. Use proper transport vessels (test tube racks) for moving cultures in the laboratory, and store vessels containing cultures in leak-proof containers when work with them is complete.

HEATING SUBSTANCE

1. Never reach over an exposed flame or hot plate, or leave a flame or hot plate unattended.
2. Never point a test tube or reaction vessel of any type toward another person.

SAFETY COMMITMENT

I, _____ (student's name), have read and understand the Student Laboratory Safety Commitment set forth above. I understand that I must obey these rules to ensure my own safety and that of my fellow students and instructors. I will cooperate to the fullest extent with my instructor and fellow students to maintain a safe working environment in the laboratory. I am aware that violations of this safety code will result in disciplinary action as specified in the Code.

Student Signature

Date