Keeping freshmen safe: A holistic approach to safety in undergraduate general chemistry

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C Davis Chemistry Context

- Approaching 4000 UG Enrolled Per Quarter (Gen. Chem.)
- 80-90 Graduate Student TAs Per Quarter
- UG Students Enter With Minimal Lab Skills
- Some TAs Have Limited Lab Skills
- Size Dictates Reality
Expectations for TAs

- Learn the System & Labs
- Present Relevant Lab & Safety Info to Student
- Managing 24 Students per Lab
A & Staffing Structure

- Lab Coordinator (B. Enderle)
- Lab Supervisor (W. Huang)
- Safety TAs
- New Grads & Mid-Quarter Review TAs
- Head TAs
- Lab/Discussion TAs
A Trainings

- New TA Training (2 Days)
  - Practice Discussion
  - Hands-On Training
  - Mid-Quarter Review
- Quarterly TA Training (2 Hours)
- Weekly TA Meetings (45 Min)
A Documentation & Signatures

- Trainings & Meetings
- Standard Operating Procedures
- Chemical Hygiene Plan
- Injury & Illness Prevention Plan
- Videotaped Meetings for Make-ups
- Green Sheets (TA & Student)

SAFETY RULES FOR TEACHING LABORATORIES

The following rules are designed for your safety in the laboratory. The Laboratory Instruc- tor (LI = TA), Laboratory Supervisor and/or Chemical Instructor is required to enforce these rules and has the full backing of the Department of Chemistry Staff and Faculty. The LI is also required to enforce all laboratory experiment-specific safety procedures in carrying out the laboratory work. Violations of these rules will result in expulsion from the laboratory.

1. No one is allowed in the laboratory without the supervision of a LI. No laboratory work will be done without supervision. Perform only authorized experiments, and only in the manner instructed. DO NOT alter experimental procedures, except instructed.

2. Approved safety goggles must be worn by all persons at all times. At no time are safety glasses of any kind acceptable in the laboratory. Goggles must be worn by every person in the lab until everyone has finished with the experimental procedure and has put away all glassware. Safety goggles may not be modified in any manner.

3. Closed-toe, closed-heel shoes must be worn at all times.

4. Clothing (long sleeves and pant legs are NOT allowed) that completely covers your arms and legs must be worn at all times in the laboratory. Leggings, tights, or leggings do NOT qualify. Inadequate protection often leads to injury. Avoid wearing expensive clothing to lab as it may get damaged.

5. Absolutely no food or drinks are allowed in the laboratory. This prohibition applies to the storage of food and the consumption of food, beverages, medicines, tobacco, and chewing gum. Contact lenses and cosmetics are not to be applied while in the laboratory. Infections will result in expulsion from the laboratory. Because cell phones or other personal electronic media can easily be damaged in the laboratory, use of such devices is at the student’s own risk.

6. Learn the location and how to operate the nearest eyewash fountain, safety shower, fire extinguisher, and fire alarm box. Fire and flood in the遵义 is to wash with copious amounts of water using the eyewash fountain for 15 minutes, then immediately to the Student Health Center for further treatment. First aid for head or hand should not be performed in the laboratory. In the case of unrecognized contamination, clothing should be washed thoroughly as thorough washing. In the case of the shower or eyewash in activated, the exposed person must be accompanied by the Student Health Center for further evaluation.

7. All operations in which noxious or poisonous gases or vapors are used or produced must be carried out in the fume hood.

8. Contain long hair while in the laboratory. Hair can catch on fire while using open flames.

9. Mouth suction must never be used to fill pipets. Always use a bulb to fill pipets.

10. All accidents, injuries, explosions, or fires must be reported at once to the LI. In case of serious injury, the LI or Lab Supervisor must call 911 for an ambulance. In cases where the LI and Lab Supervisor decide the extent of an injury warrants evaluation/treatment, the student must be accompanied to the Student Health Center. Students are also encouraged to seek medical attention if the student then feels necessary. The student must always be accompanied by the Student Health Center.

11. Horseplay and carelessness are not permitted and are cause for expulsion from the laboratory. You are responsible for everyone’s safety.

12. Keep your working area clean – immediately clean up all spills or broken glassware. Exercise appropriate care to protect yourself from skin contact with all substances in the laboratory. Clean off your lab workbench before leaving the laboratory. Skateboards, rollerblades, and other such personal equipment must be stored outside of the laboratory. Personal electronics are not permitted when needed for the laboratory.

13. Put all toxic or flammable waste into the appropriate waste container(s) provided in your laboratory.

14. Containers of chemicals may not be taken out of the laboratory except in the dispensary for refill/replacement or to exchange full waste jars for empty ones. All containers must be covered before you take them into the hallway to the dispensary. Never to unseal glassware containing chemicals into the hallways or other public areas.

15. Laboratory doors must remain closed except when individuals are actively entering or exiting the lab. Do not prop the door open.
Personal Protective Equipment for TAs, Students, & Lab Personnel

- Goggles
- Lab Coats
  - Students = White Color
  - TAs & Lab Personnel = Blue Color
- Close-Toe, Close-Heel Shoes
- Pants & Shirt
- Nitrile Gloves
Resources

- Student Lab Manual
- TA Lab Manual
- TA Online “Share” Folder
- Email Copy of All Notes
Student Expectations for Understanding

- Lab Procedures
- Equipment & Glassware Techniques
- Safety Procedures
- Waste Disposal
Student Pre-Lab Work

- Watch Experiment Video Online
- Online Pre-Lab Quiz
- Read Student Lab Manual
- Pre-Lab Notebook Preparation
- Don Personal Protective Equipment

EVERY LAB!
Chemistry is the study of composition and properties of matter. In order to investigate these properties, one must learn the proper techniques used in the laboratory. You will begin by measuring the simple quantities of mass and volume of water. You will then use these quantities to calculate the density of...
Pre-Lab Discussion by TAs

- PowerPoint Presentation
- Lab Overview
- Safety Procedures
- MSDS Overview
- Lab Equipment Use
- Electrical Safety
- Waste Disposal
- Sample Calculations

EVERY LAB!

Spectrophotometry Part II

- Part I: Analysis of 1 substance
- Part II: Analysis of an unknown mixture
  - Use Beer’s law to determine concentration of TB
  - Scan: 2 peaks will be observed
- Why do we need to measure both sets of solutions at 618 and 434 nm?
During Lab

- TA Circulates & Listens
- Safety TAs & Lab Supervisor Circulates
- Lab Stops for Corrections/Observations
Safety From Every Angle

- Extensive Documentation
- Pre-Lab Preparation
  - Students & TAs
  - Visual, Videos, Reading, Quiz, Training, Reasoning, etc.
- Personal Protective Equipment
- Reviews During Lab