

# COLLEGE of CHARLESTON

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DEPARTMENT OF  
CHEMISTRY  
AND BIOCHEMISTRY

## Laboratory Safety



# **THE CHEMISTRY LABORATORY INCLUDES HAZARDS AND RISKS.**

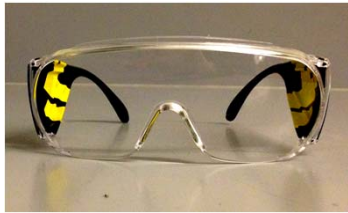
Scientists understand the risks involved in the laboratory and have established a set of laboratory safety practices. This presentation summarizes some of the safety rules that scientists follow in the laboratory.



**1.**

**Personal Protective Equipment:**  
What is required for you to wear  
when you work in the laboratory.

# PPE – Personal Protective Equipment



# Eye Protection

[Splash zone video](#)

- Contact lenses are OK as long as glasses/goggles are worn
- Prescription glasses – you must wear goggles over them
- [Wish I'd Worn My Safety Glasses Video](#)

- Eye wash station





# UV Goggles Cabinet – in most labs



Tie back long hair before entering the laboratory, don't wear dangling jewelry.



Yale physics student Michele Dufault was killed in a shop accident in April 2011 that would have been prevented had she tied her hair back

# Foot Protection

- Sandals, flip-flops, Crocs, open-toe and open-top (i.e. ballet flat) shoes and canvas shoes (i.e. Toms) are not appropriate. These are not going to protect your feet if you drop a piece of glass with a liquid chemical reagent in it.





# Result of Improper Footwear in a Laboratory



Northwestern University, Evanston, IL July 2003

Your instructor will send you home to change if you do not have appropriate shoes or other required PPE.

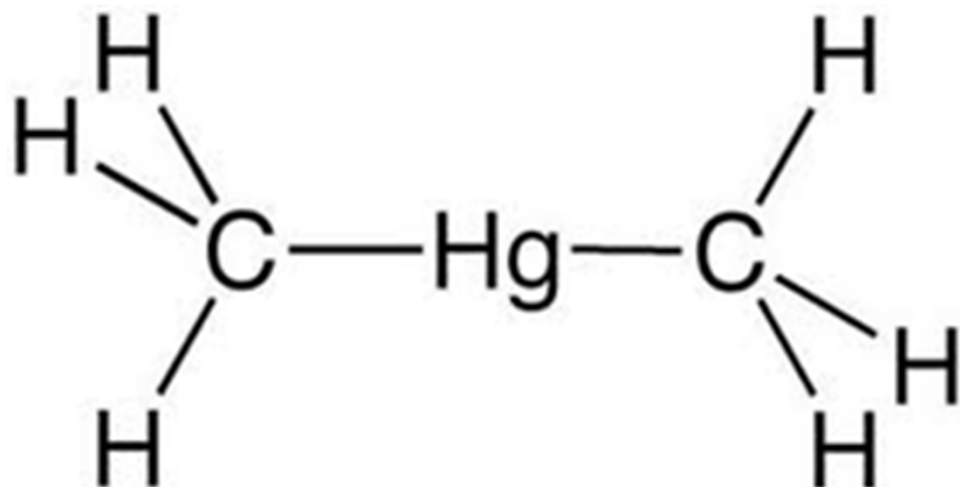
# Hand Protection: Chemically resistant Lab Gloves



- Wear gloves of a material known to be resistant to permeation by the substances in use – nitrile is good for most of our laboratory classes.
- Inspect each glove for small holes or tears before use.
- When you spill on your glove or tear it, change it immediately.  
**Throw gloves away any time you take them off.**

# Karen Wetterhahn

(October 16, 1948 – June 8, 1997)



The **latex gloves** she was wearing were **not resistant** to methyl mercury – it passed through the glove, through her skin, entered her blood system and resulted in her death weeks after the exposure.

Dartmouth College



# Use of Gloves

Remove gloves before handling objects such as doorknobs, telephones, pens, computer keyboards, pH meter or other electronic buttons, or phones while in lab. It might be convenient to have one gloved hand and one ungloved hand to do procedures where these kinds of things are used.

- **Throw away gloves anytime you take them off.**
- You should expect to use several pairs of gloves in any given lab period.
- [Glove video](#)



# Wash your hands!

- Always, even after wearing gloves, wash your hands with soap and water before leaving the lab.
- [Hand washing video](#)



# UCLA Lab Fire: December 29, 2008

Sheri Sangji was using this plastic syringe to transfer *tert*-butyllithium. This was not the correct procedure, because this compound is well-known to ignite if it is in contact with air. The syringe plunger dropped out of the syringe and the reagent ignited. Sheri died January 16, 2009 of severe burns. She was wearing nitrile gloves but no lab coat. The students assisting her did not remember to put her under the safety shower.



# Lessons from UCLA accident

Lessons: Know the proper procedures for transferring dangerous reagents. Wear your lab coat at all times in the lab. Know where safety shower and other emergency equipment is – **you may need to be the one who needs to be ready to act when your lab mate is unable to help himself/herself.**

**2.**

**Eyewash and Safety Shower:**  
Know where these are in your lab.



# Eyewash / Safety Shower

The **eyewash** is on the left. Pull the handle and a fountain of water will appear that you can use to bathe your eyes.



The **safety shower** is on the right. Pull the handle and water will start spraying from the shower head on the ceiling. There's no drain in the floor – we only do this in emergencies, because a flood of water will have to be cleaned up.

# Eye Wash



# Safety Shower



### 3.

**Chemical Fume Hoods:** You must do your experiment in the hood if any of your reagents are flammable, have harmful fumes or present a splash or explosion hazard.



# Using the Fume Hoods properly



This window/bar is called the sash.



If this is not saying NORMAL, then the hood is not protecting you. Keeping the sash and sliding panels in proper position keeps this NORMAL, otherwise the alarm goes off. If the alarm goes off, you need to reposition things to the correct positions, then press the “mute” button to reset the controller.

The sash should never be raised above the green “operation” level when you are working in the hood.

**Closed, not in use**



**In use, side-to-side panel used as shield**



**In use, sash (window) raised to less than 18 inches**



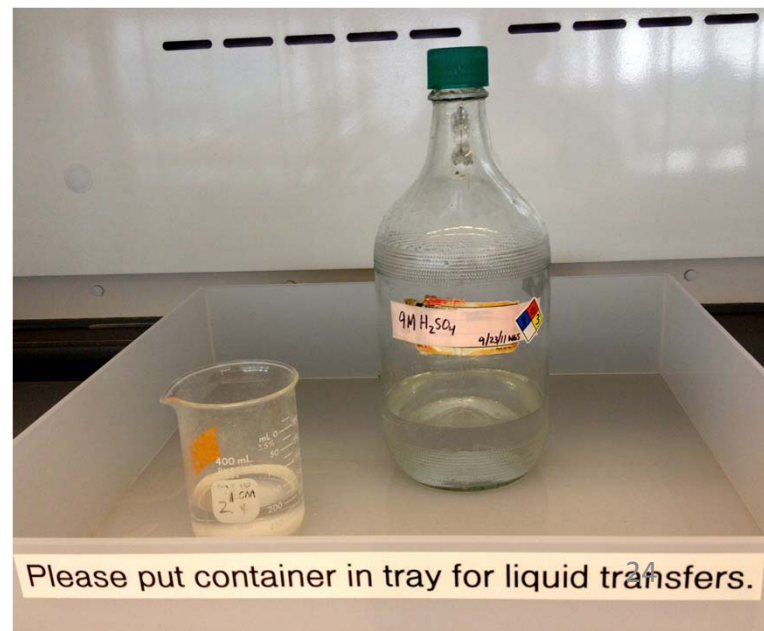
**Don't open side shields to make one big window.**



# Fume Hood Use

- [Video on use of Fume Hood](#)

- When using a laboratory hood, set the equipment and chemicals back at least 6 inches.
- **Never lean in and/or put your head in the hood when you are working.** This is worse than doing the experiment with no hood at all.
- It's a good idea to put liquid reagent containers in trays to catch all spills and drips





**4.**

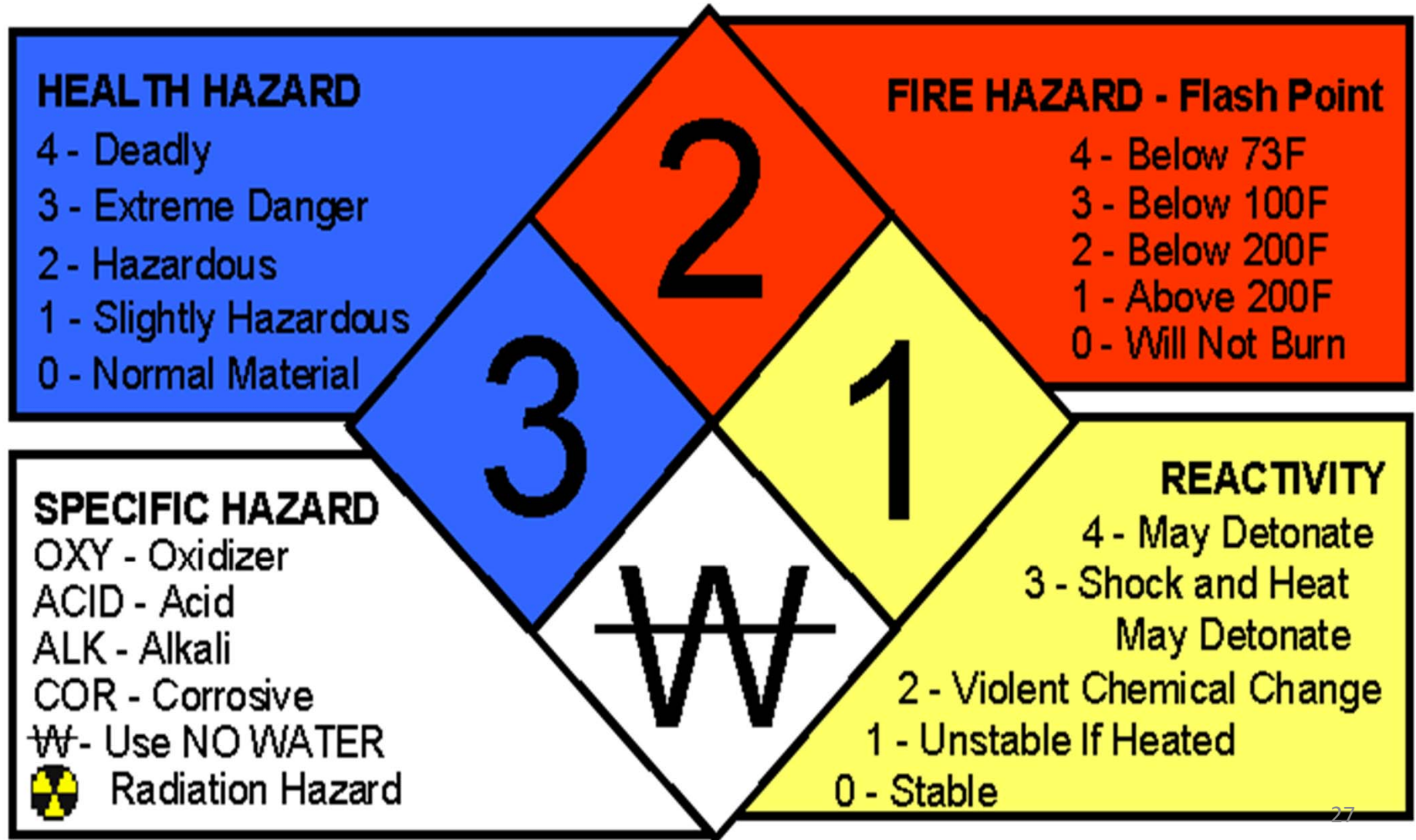
**Know the risks of the chemical reagents you are working with**

# Labels are important



Even if it seems obvious.  
In the chemistry lab, nothing is ever obvious.

# NFPA Diamond



# MSDS (SDS)

- Provides procedures for handling or working with that substance in a safe manner
- Includes physical data  
melting point, boiling point, flash point, etc. toxicity, health effects, first aid, reactivity, storage, disposal protective equipment, & spill-handling procedures.



# **5. Fire Safety**



# Fire Alarms – know the location of one close to your lab



# Fire Extinguishers – we have several in the labs and in the hallways.



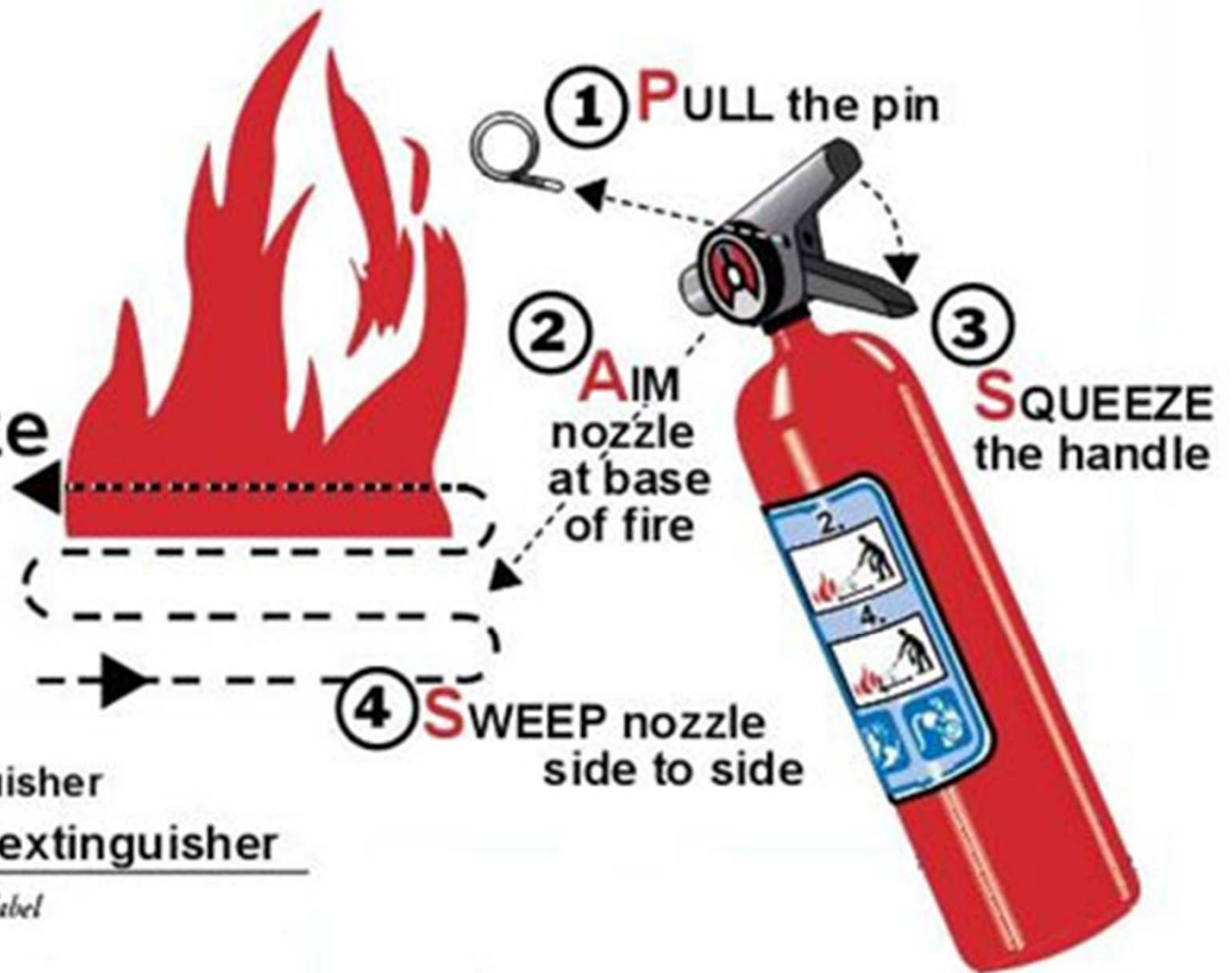
## To operate an extinguisher:

**P**ull

**A**im

**S**queeze

**S**weep



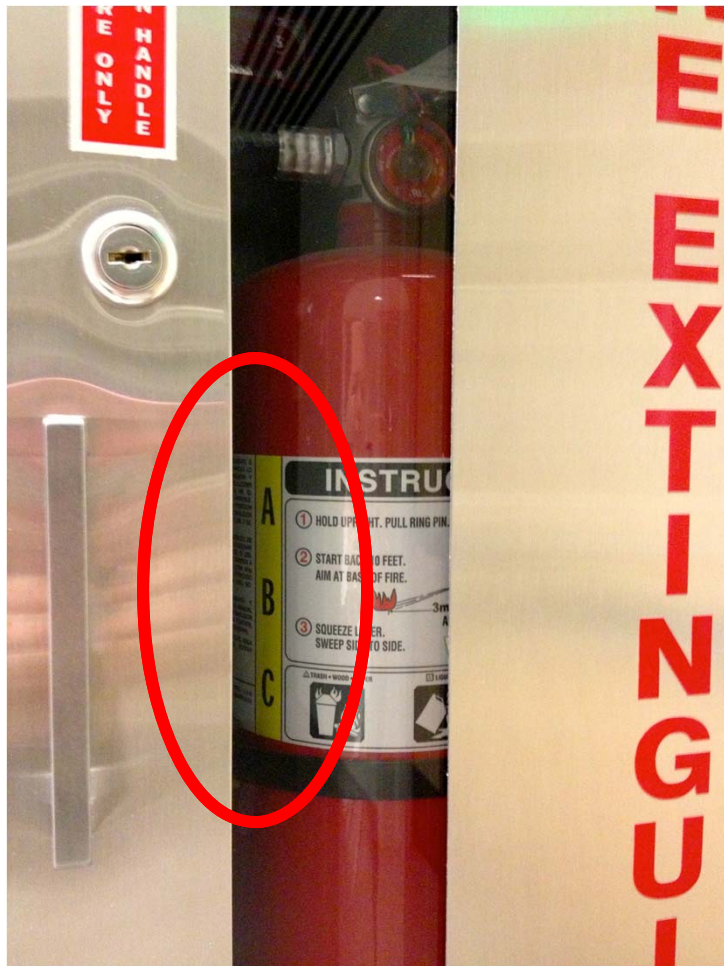
Know your extinguisher

Use the correct extinguisher

*(Check your own extinguisher's label for detailed instructions.)*



# Types of Fire Extinguishers



Most of our fire extinguishers are **ABC**. It contains a dry powder to put out the kinds of fires we might encounter in the chemistry labs where we have class.



This is a special fire extinguisher for combustible metal fires. It is a type **D** fire extinguisher. You won't need to use this unless you work in a research lab with combustible metals.

- <http://www.youtube.com/watch?v=HCVRZuupcFw>

# Student Reaction in a Fire

Although we want you to be informed on the operation of a fire extinguisher, we do not expect you to use it. If a fire is ignited in your area, the proper STUDENT response is to:

- 1) Notify everyone in the room
- 2) Proceed to the nearest exit and pull the nearest fire alarm
- 3) Evacuate the building
- 4) Assemble in front of the library or in the YWCA parking lot

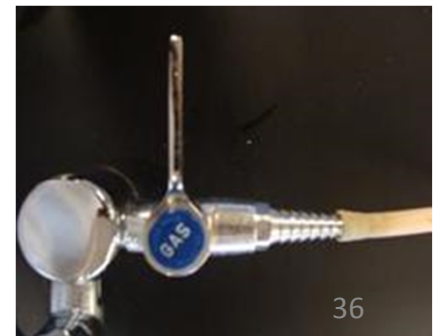


# Working with flames

- Never leave experiments unattended unless you take special precautions to avoid accidents and you notify the responsible individuals.
- Flames are **never allowed** when flammable gases or liquids are in use.
- Always alert others before lighting a flame.
- Never leave a flame unattended under any circumstances.
- Turn off the natural gas at the valve when you are finished with your work



Closed valve is  
Perpendicular to hose



# **6.**

# **Gas Cylinder Safety**

# Gas Cylinders

- <http://www.youtube.com/watch?v=mReuQCuJNQQ>
- A gas cylinder will become a missile if the valve is broken or cracked.
- For this reason, gas cylinders must always be securely chained to a wall or a permanent bench in the lab. The chain should not be loose.
- If a cylinder is not in use or is going to be moved, it must be capped to protect you and everyone else in the building.
- Do not attempt to move a gas cylinder until you have been trained on this important procedure.

# Gas Cylinder Safety



**Do not attempt to adjust valves on regulators**



regulator

# **7.**

# **Disposal Procedures**

# Broken Glassware

- Always check your glassware and discard any with chips, breaks, or obvious flaws.
- Throw away broken glassware into special glass waste containers





# Waste Disposal

- Waste containers are provided for chemical waste generated in laboratories
- Some things can go down the sink, some can't. **Always check with your instructor.**
- Care must be used to avoid mixing incompatible chemicals such as
  - Acids with Bases
  - Oxidizers and Flammables
  - Water reactive and aqueous solutions
  - Cyanides and acids



# University of Maryland

## September 26, 2011

- Students were conducting an experiment with nitric acid and sulfuric acid was added into a chemical waste container, causing a violent chemical reaction sparked a small fire in and near the laboratory chemical ventilation hood.
- Two female students were injured as a result
- Sustained first- and second-degree chemical burns and superficial cuts.



**8.**

**How to be a good lab citizen**

# Must-have habits for good lab students

- Begin with a clean work surface with your instructions clearly posted and available; have a clear, clean work space and eliminate unnecessary books, book bags, equipment, etc.
- Return all lab materials and equipment to their proper places after use as instructed; clean your lab space as instructed by your teacher or lab instructor/supervisor leaving it in proper order for the next person.

# Keep your lab area clean.



Don't block the floor in front of the eyewash/shower station.

Throw away used paper towels and used gloves, **immediately.**



Don't leave cords dangling because someone will trip over them.

Don't leave things in the floor because someone will trip over it.



# Don't put anything on your face or in your mouth while you're in lab.

- Take care not to ingest anything in the laboratory!
- Food, **gum**, beverages, candy, and tobacco products are never allowed in the laboratory.
- Don't apply makeup, chapstick, lotion, or anything to your face or hands during lab. Wash your hands with soap then leave the lab before touching your face or other exposed skin.





# Stay aware of what's happening around you while you're working in the lab.

- Don't use any distracting electronic devices while in laboratory. If you touch your phone during lab, you're contaminating it with whatever chemicals you've been working with.
- Do not wear earbuds in the lab. You need to be able to hear important announcements, especially in an emergency concern is addressed.



# Chemical Spills

- **Notify your instructor** and your neighbors if you spill chemicals on the floor or bench.
- Don't try to clean it up yourself. Your instructor may need to use a specially designed chemical spill kit.

<http://www.youtube.com/watch?v=Dtp9vT15qI>

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# Texas Tech January 7, 2010

- Conducting research funded by the U.S. Department of Homeland Security on energetic / explosive compounds
- Attempting to produce 100 times more of an explosive compound than the informal lab limit (100mg)

Lesson:  
Follow instructions  
in the lab.



# Students must report any injuries, big or small.

- Report all injuries to the instructor. We will not call emergency services unless the instructor determines it is a serious injury.
- An incident report will be filled out whether it is small or serious.

# Injury procedure, continued

- First Aid kits are available in the lab with band aids and other items for treating small cuts and burns.
- If it is a serious injury, your instructor will call campus emergency services, 843-953-5611. Our campus officers will work with the instructor and/or injured student to determine whether or not 911 EMS should be called in.



Once again, the number to call in an emergency is:

**843-953-5611**

Please take a moment now to program  
this number into your cell phone.



# Report any concerns

- If you have any safety concerns about the lab you are working in or the people working around you, you can contact:
  - Your lab instructor
  - Dr. Wendy Cory – Head of the departmental safety committee
  - Dr. Pamela Riggs-Gelasco – Department Chair for Chemistry and Biochemistry
  - Dr. Jim Deavor, Associate Dean of the School of Science and Mathematics.