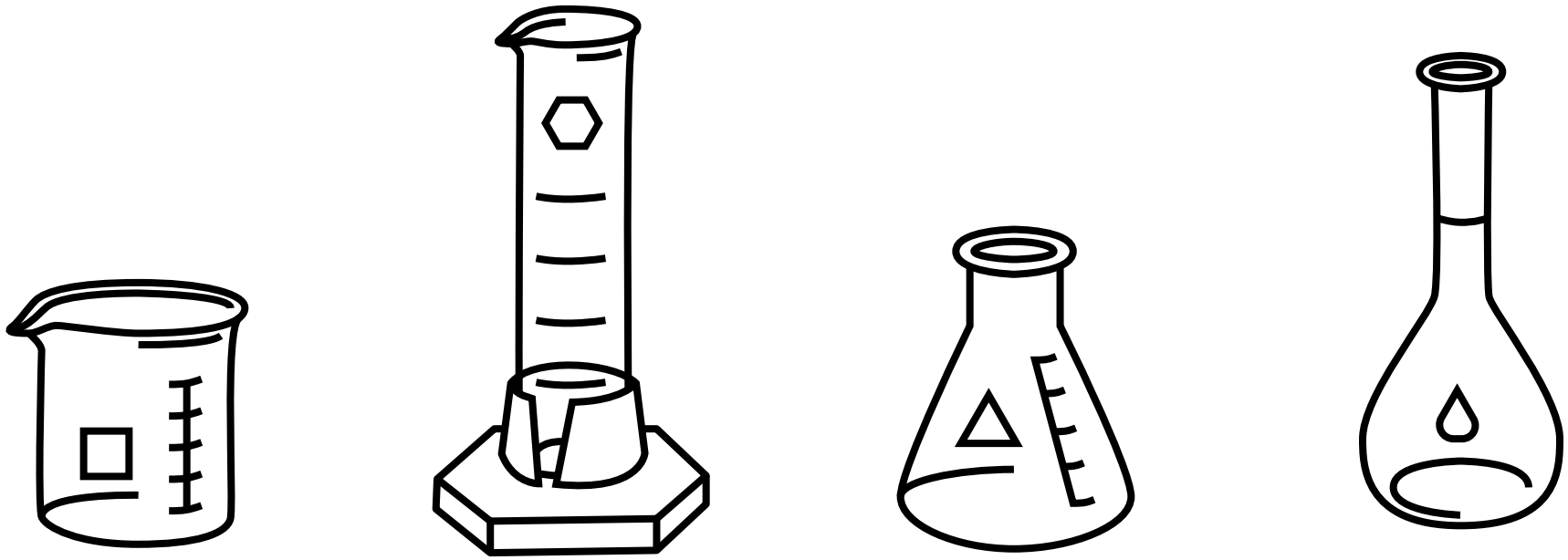
Working Safely in the Lab



Presented by:
Nicolas Meier
April 17th, 2020

Objectives

Review lab safety!

Share some new ideas, concepts, changes, and some of the incidents since last year.

Continue to improve our lab safety culture.

Support and look out for each other.

Prepare as best we can for any situation.

Topics

PART I

Resources on Campus

Fundamentals of Lab Safety

Additional Notes

Break

PART II

Planning for an Emergency

Hazard Communication—GHS

Safety Scenarios

Questions

What are some of the hazards in your lab, chemical or otherwise?

Do you know what resources are available on campus to help prepare for an emergency?

Do you know who to contact in case of a minor spill or an emergency?

Recommended Viewing:

➜ Experimenting with Danger

Resources on Campus

You have a lot of great support on campus!

Chemistry Stockroom

Lab and University-wide Inventory

Environmental Health and Safety

Chemical Hygiene Committee

Resources on Campus

Emergency Management

pdx.edu/emergency-management

Student Health and Counseling

1880 SW 6th Ave (503) 725-2800

Campus Public Safety Office

633 SW Montgomery St (503) 725-4407 non-emergency

Portland Fire

Emergency Response—911

Clean Harbors

Large Spill Response & Clean Up

Proactive and Reactive Resources

Proactive Systems consist of:

Front-end research, education, maintenance of equipment, and documentation of procedures.

This is the hard part and where the most work needs to be done.

The focus is on the prevention of hazards.

A proactive system includes you.

Proactive Resources

Chemistry Stockroom

Science Research and Teaching Center, Room 280
chemstrm@pdx.edu
(503)725-4273

Environmental Health and Safety

Research EHS Staff
Science Research and Teaching Center Room 144
EHS-group@pdx.edu
(503) 725-5269

Fire Prevention

University Services Building
go.pdx.edu/firesafety
(503)725-4325

Proactive and Reactive Resources

Reactive Systems are:

Systems in place when an incident happens, with specific training to handle incidents.

Generally, this will be outside of the departments and even the University.

The Chemistry Stockroom

Training, Advice, Assistance

Chemical Inventory for Purchases

Campus Inventory Management

Deliveries of chemicals and supplies

Personal Protective Equipment—
Lab coat program,
Gloves and Goggles for Purchase

Borrow equipment

Tools

SRTC 280
(503) 725-4273

RLSB 2N067
(503) 725-7725

chemstrm@pdx.edu

Chemical Inventory

Local (your lab) and campus-wide.

Assists with the reduction of hazards.

It is a resource for research
"Who has a certain chemical I'd like to try?"

Helps to keep your lab organized.

Compliance with regulations—OSHA, DEQ, Fire.

Keep chemicals current—remove old chemicals.

Only useful if your lab's inventory is up to date!

Environmental Health and Safety

Research Safety
Lindsay Henderson

Office: 144 SRTC
(503) 725-5269
lindsah@pdx.edu

Waste Lab
Tim O'Brien

Office: 181 SRTC
(503) 725-3403
obrient@pdx.edu

Environmental Health and Safety

Assistant Director
Radiation Safety Officer
Scott Jaqua

Office: 144 SRTC
(503) 725-5269
sjaqua@pdx.edu

Why might you need EHS?

Radiation Safety and Training

Chemical Safety

General Lab Safety

Biosafety

IACUC (Animal Care)

Laser Safety

Fieldwork Safety

Lab Waste

Near-Miss and Incident Reporting

Lab Hazard Assessment

Personal Protective Equipment

Safety Data Sheets

Chemical Hygiene Plan

HF Room Access and Training

Formaldehyde Training

Bloodborne Pathogen Training

Fume Hoods

Air Quality

Safety Showers and Eyewash

Lost and Found

got waste?

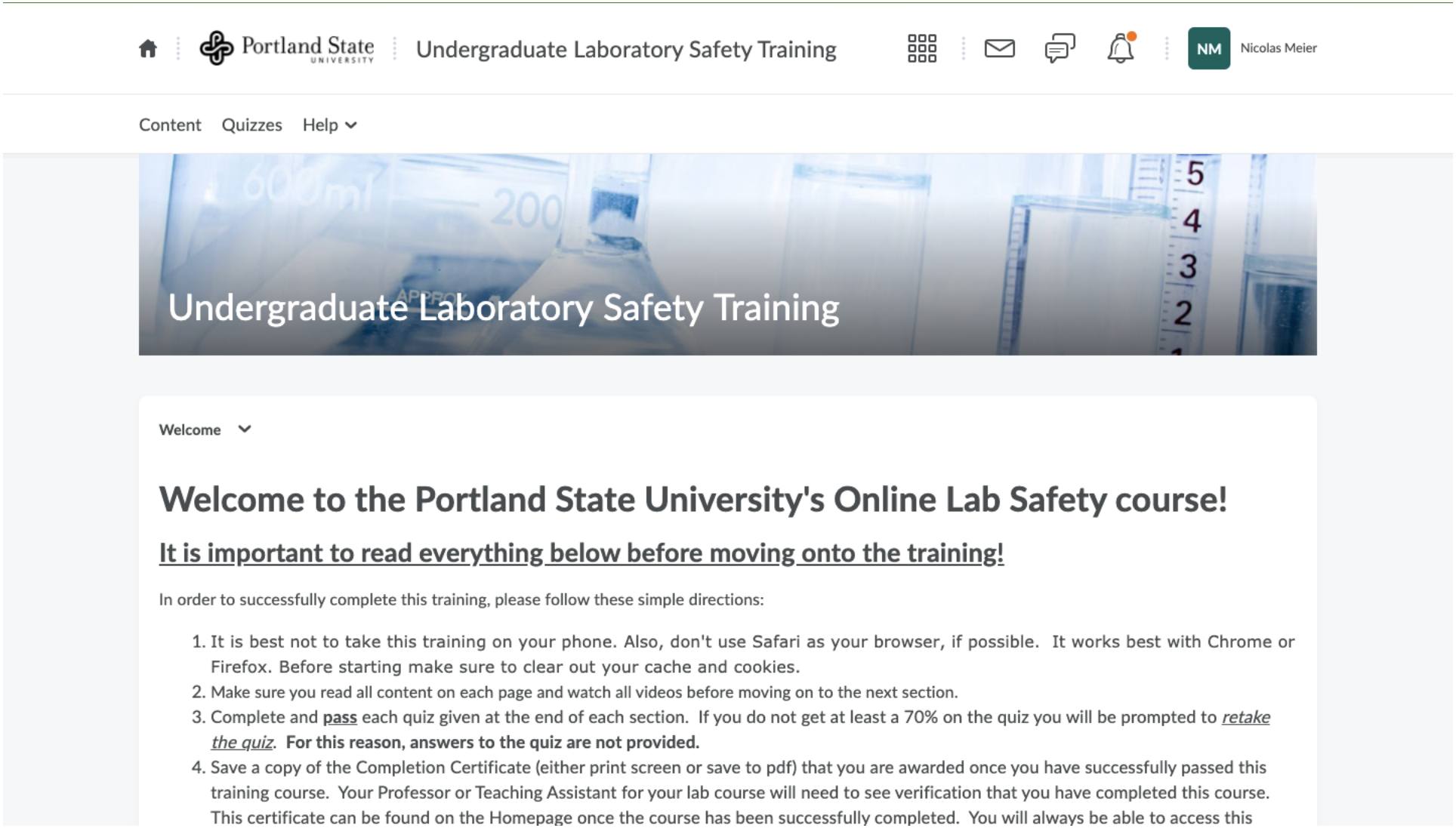
If you have waste, contact EHS through:

Work Order (503-725-2fix) http://pdx.edu/facilities

DO NOT carry waste in hallways, stockpile in lab, or bring directly to EHS or Chemistry Stockroom.

Waste includes:

Used or unwanted chemicals
Items contaminated with biological or radioactive materials
Sharps
Discarded laboratory glassware
Batteries, light tubes/bulbs
Used Oil

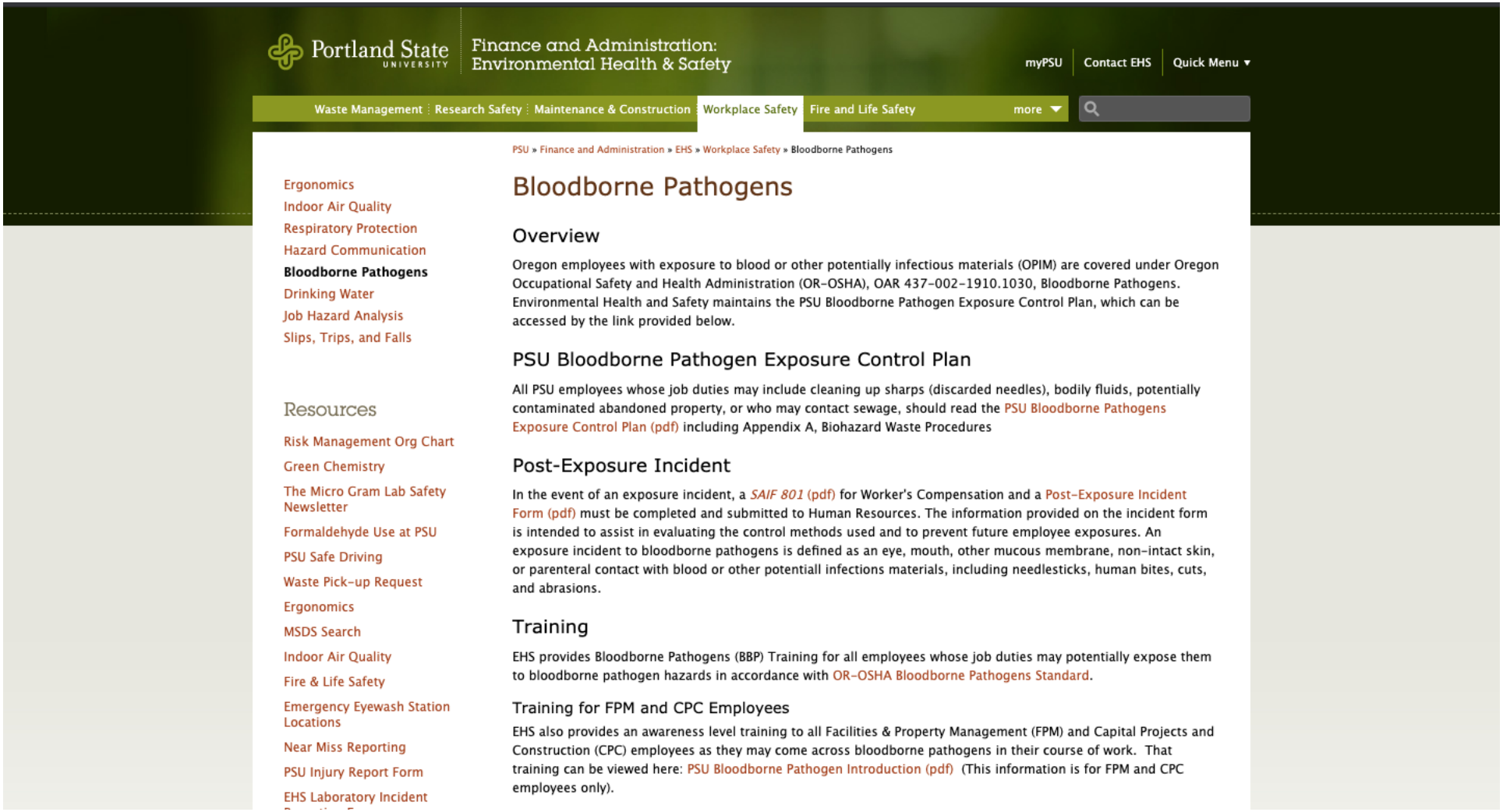

Portland State UNIVERSITY
Undergraduate Laboratory Safety Training
NM
Nicolas Meier
Content
Quizzes
Help
Undergraduate Laboratory Safety Training
Welcome
Welcome to the Portland State University's Online Lab Safety course!
It is important to read everything below before moving onto the training!
In order to successfully complete this training, please follow these simple directions:
1. It is best not to take this training on your phone. Also, don't use Safari as your browser, if possible. It works best with Chrome or Firefox. Before starting make sure to clear out your cache and cookies.
2. Make sure you read all content on each page and watch all videos before moving on to the next section.
3. Complete and pass each quiz given at the end of each section. If you do not get at least a 70% on the quiz you will be prompted to retake the quiz. For this reason, answers to the quiz are not provided.
4. Save a copy of the Completion Certificate (either print screen or save to pdf) that you are awarded once you have successfully passed this training course. Your Professor or Teaching Assistant for your lab course will need to see verification that you have completed this course. This certificate can be found on the Homepage once the course has been successfully completed. You will always be able to access this

Resources

Annual training required by OSHA, through D2L.

Required for all Anatomy and Physiology TAs and all research labs formaldehyde, paraformaldehyde, and/or formalin.

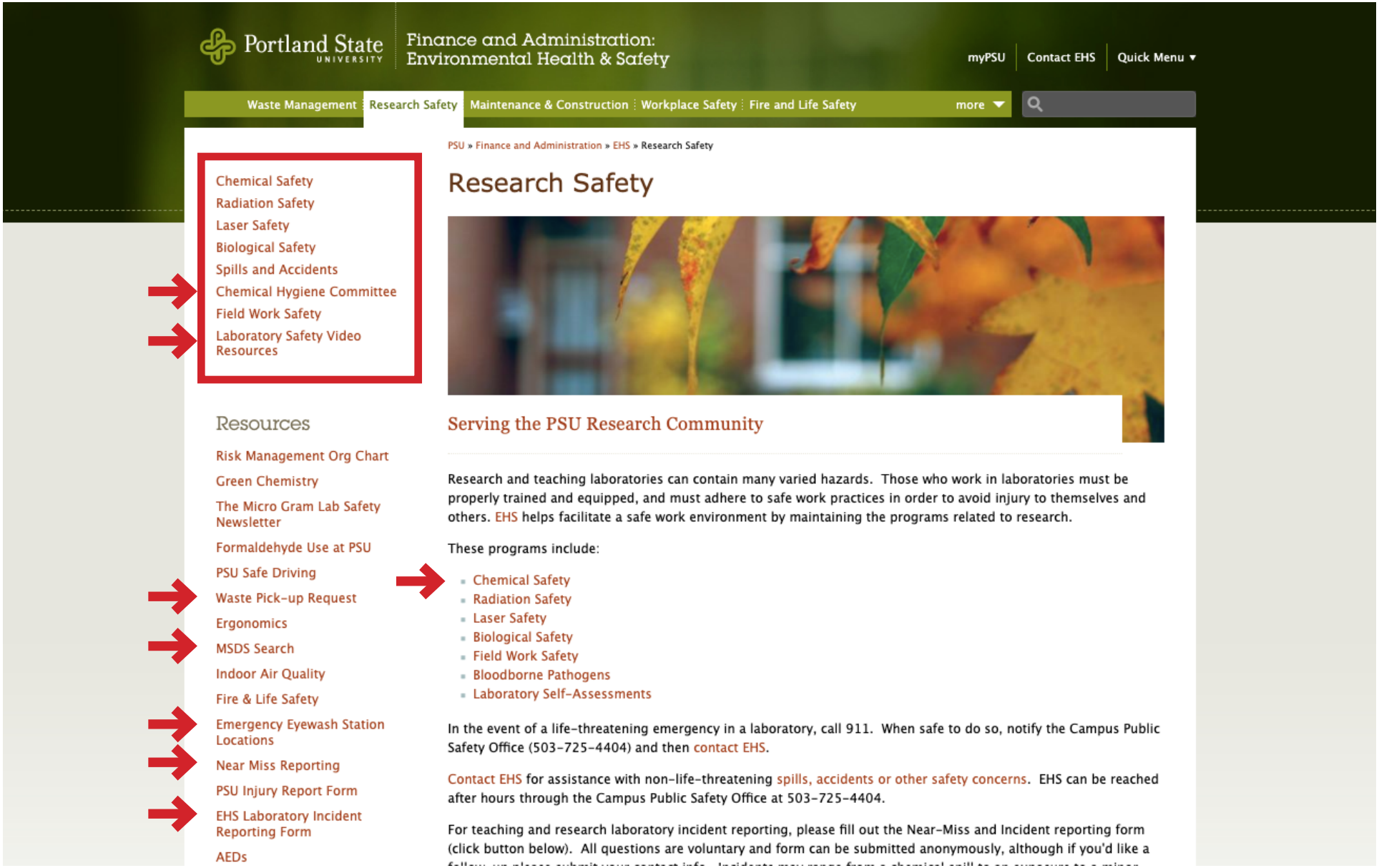
Resources



Annual training required by OSHA, through D2L.

PSU BBP Exposure Control Plan
Work practices, PPE, Exposure Response
Hepatitis B Vaccination Program, IACUC

Resources



Research Safety

Resources

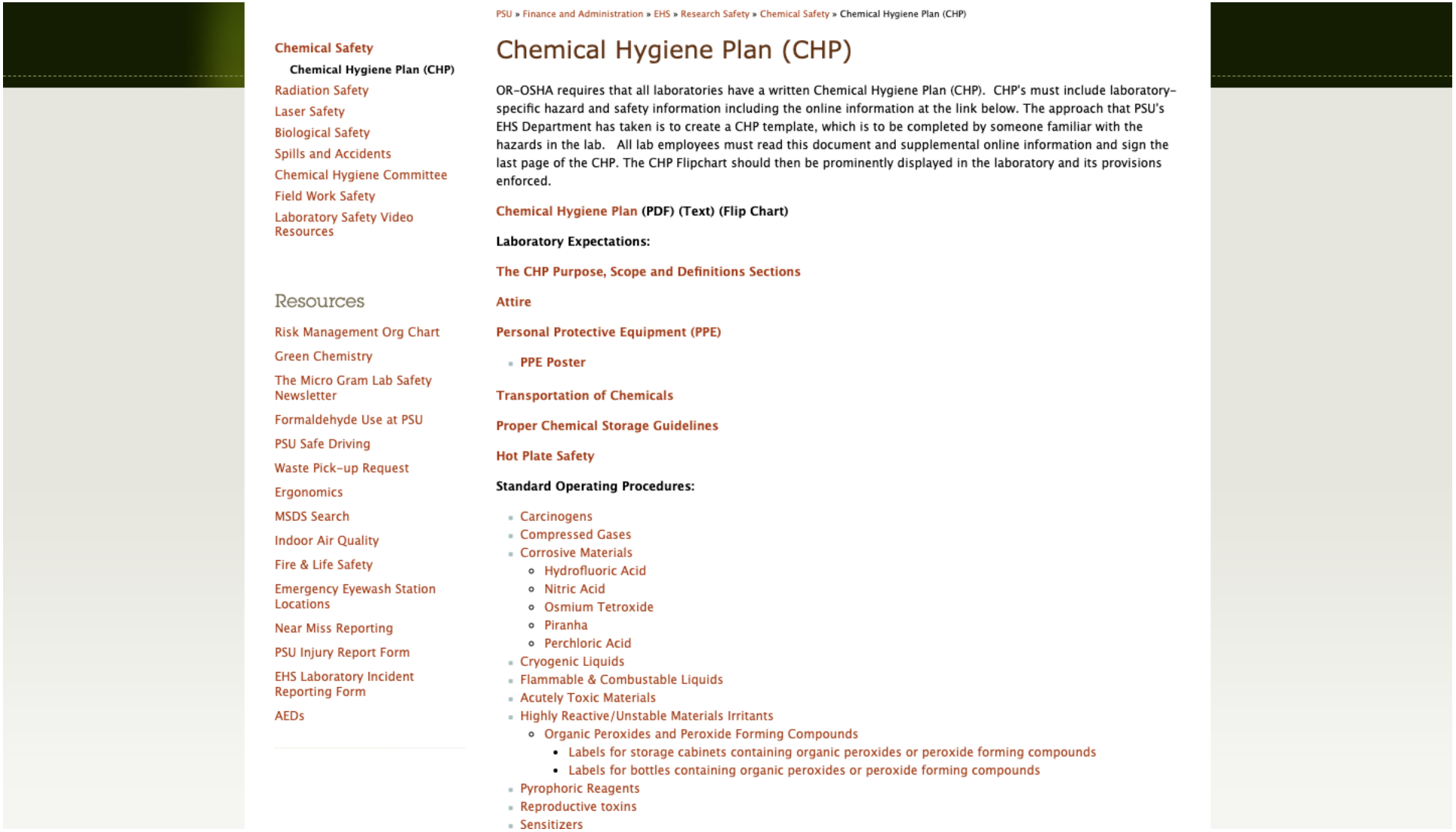
Chemical Hygiene Committee

The Chemical Hygiene Committee is:

An independent campus-wide group that discusses, recommends, and creates policies concerning laboratory safety at PSU.

They assess safety incidents.

They are developing the Chemical Hygiene Plan, which includes Standard Operating Procedures for the use of many Hazardous Materials.



PSU » Finance and Administration » EHS » Research Safety » Chemical Safety » Chemical Hygiene Plan (CHP)

Chemical Safety
Chemical Hygiene Plan (CHP)
Radiation Safety
Laser Safety
Biological Safety
Spills and Accidents
Chemical Hygiene Committee
Field Work Safety
Laboratory Safety Video Resources

Resources
Risk Management Org Chart
Green Chemistry
The Micro Gram Lab Safety Newsletter
Formaldehyde Use at PSU
PSU Safe Driving
Waste Pick-up Request
Ergonomics
MSDS Search
Indoor Air Quality
Fire & Life Safety
Emergency Eyewash Station Locations
Near Miss Reporting
PSU Injury Report Form
EHS Laboratory Incident Reporting Form
AEDs

Chemical Hygiene Plan (CHP)

OR-OSHA requires that all laboratories have a written Chemical Hygiene Plan (CHP). CHP's must include laboratory-specific hazard and safety information including the online information at the link below. The approach that PSU's EHS Department has taken is to create a CHP template, which is to be completed by someone familiar with the hazards in the lab. All lab employees must read this document and supplemental online information and sign the last page of the CHP. The CHP Flipchart should then be prominently displayed in the laboratory and its provisions enforced.

Chemical Hygiene Plan (PDF) (Text) (Flip Chart)

Laboratory Expectations:

The CHP Purpose, Scope and Definitions Sections

Attire

Personal Protective Equipment (PPE)

- PPE Poster

Transportation of Chemicals

Proper Chemical Storage Guidelines

Hot Plate Safety

Standard Operating Procedures:

- Carcinogens
- Compressed Gases
- Corrosive Materials
  - Hydrofluoric Acid
  - Nitric Acid
  - Osmium Tetroxide
  - Piranha
  - Perchloric Acid
- Cryogenic Liquids
- Flammable & Combustable Liquids
- Acutely Toxic Materials
- Highly Reactive/Unstable Materials Irritants
  - Organic Peroxides and Peroxide Forming Compounds
    - Labels for storage cabinets containing organic peroxides or peroxide forming compounds
    - Labels for bottles containing organic peroxides or peroxide forming compounds
- Pyrophoric Reagents
- Reproductive toxins
- Sensitizers

→ Chemical Hygiene Plan

Resources

Near-Miss and Incident Reporting Form for PSU Research and Teaching Lab Spaces

This Near-Miss and Incident input form consists of two pages. The first page is designed to collect the information necessary to describe the incident being reported. The second page is designed to help us understand how this incident relates to our lab safety program as well as other events in similar laboratories. These questions can also help stimulate thought about ways that the event could have been prevented or preparedness for it improved. After you submit the form, it will be reviewed by members of the EHS department and the Chemical Hygiene Committee for clarity.

Remember that response to any question is optional, however, the more information you provide, the more helpful the information we collect is likely to be to your fellow scientists on campus. This form is designed to help us gather data, not to get you or your lab mates in trouble. We may contact you with further questions or requests for clarification. At the end of the form there will be a section to include your e-mail address and your name, if you'd like to recieve follow-up information on the event you reported. It is not required, but it would be appreciated. We greatly appreciate you providing us this information so that we may follow up with you in order to make any necessary improvements to our laboratory safety program.

1. Narrative description of the event (please be as specific as possible):

Note: This form is only used to collect information and aid in spill clean up, restocking of spill materials, the prevention of hazards and repeat incidences.
This will *never* be used as a punitive measure.

Resources

Near-Miss and Incident Reporting Form for PSU Research and Teaching Lab Spaces

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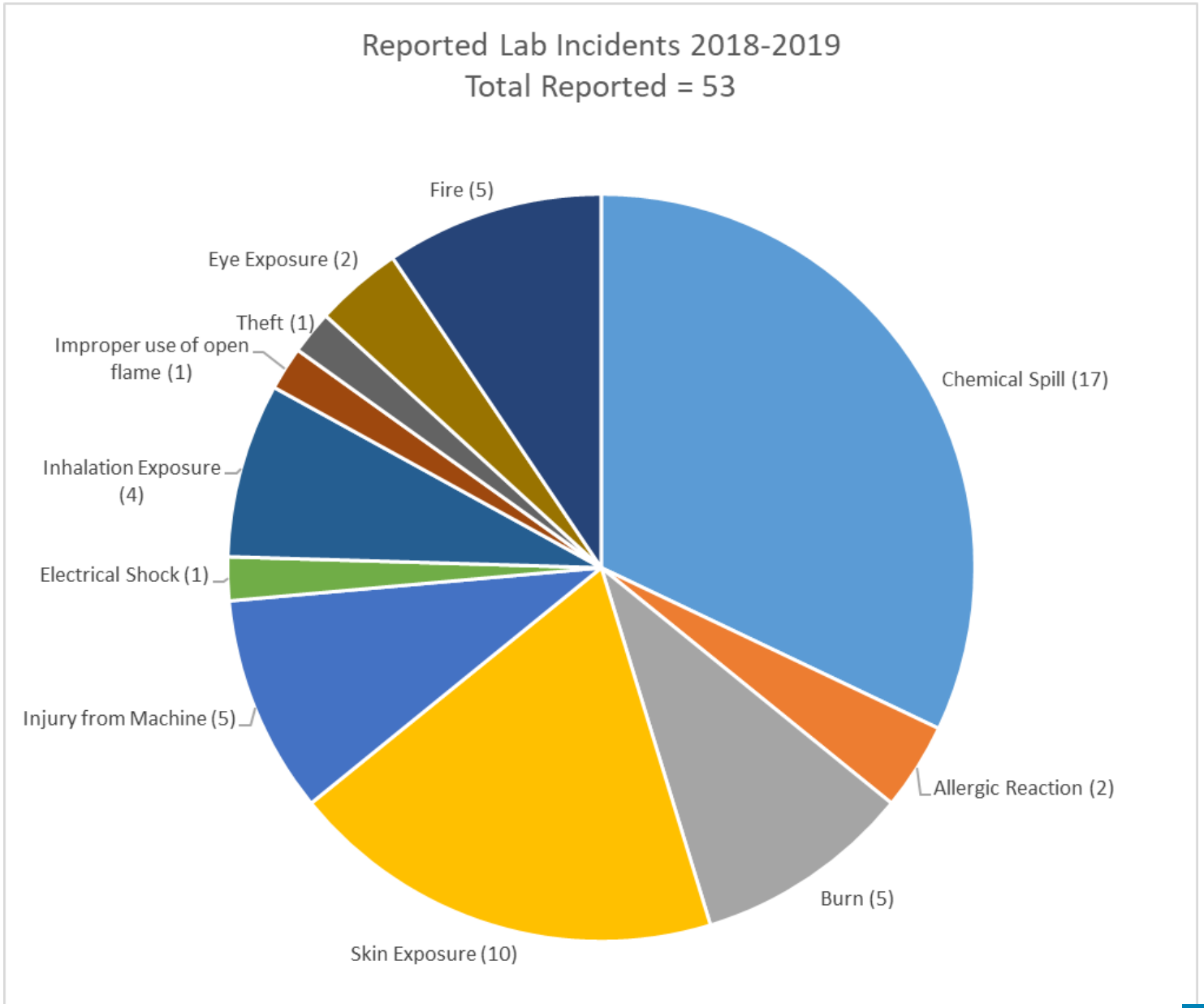
1. Narrative description of the event (please be as specific as possible):

→ Near-Miss and Incident Reporting Form

Resources


Reported Lab Incidents 2018-2019
Total Reported = 53
Fire (5)
Eye Exposure (2)
Theft (1)
Improper use of open flame (1)
Inhalation Exposure (4)
Electrical Shock (1)
Injury from Machine (5)
Skin Exposure (10)
Burn (5)
Allergic Reaction (2)
Chemical Spill (17)

Resources

Lab Assessments

These are *some* of the questions that make up the Lab Assessment.

(Is your) Chemical Inventory up-to-date?

Are *all* containers clearly labeled with chemical name?
This includes wash and spray bottles, and carboys—even if it's water.

Are chemicals segregated to avoid incompatibilities?

Are chemicals not being stored in fume hoods?

Are gas cylinders secured with chain or nylon straps?

Are the fume hoods functioning properly?

Are all fire extinguishers unobstructed?

Are eyewashes, drench hoses, and safety showers unobstructed?

Lab Assessments

Are shelves higher than 6 feet anchored to the wall?

Does your lab have a Spill Kit?

Are the counter or bench tops free of any residual chemical spills?

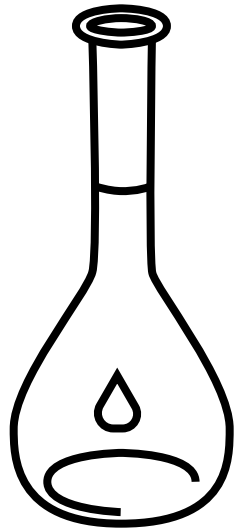
Are flexible cords not damaged or run under doors, rugs, etc?

Are power strips/surge protectors plugged directly into wall outlet?

Have you completed Lab Safety training and any supplemental training sessions—Radiation, Hydrofluoric Acid, Formaldehyde?

Question

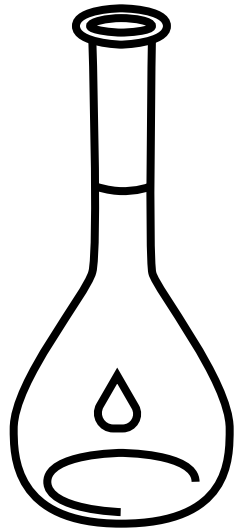
What are some ways that we can influence safety in our laboratories?



Question

There are many ways in which we can ensure safety—even before we start using chemicals.

These can be called the Fundamentals of Lab Safety



Fundamental Categories

Cleanliness

Laboratory Space

Personal Boundaries

Hazard Awareness

Standard Operating Procedures

Appropriate attire must be worn at all times.

Attire: these are the clothes you wear to work in the lab.

There must be *no exposed skin* below the waist and only closed-toe shoes are permitted.

This includes ankles!

Your attire must cover these areas!

#chemical hazards
#personal

Appropriate attire must be worn at all times.

This applies to all students, employees, or volunteers who are handling chemicals or working in an environment in which chemicals are being handled.

Appropriate attire must be worn at all times.

For your consideration:

Natural fibers

Loose fitting clothing

Pants, above-ankle socks, and closed-toe shoes are most preferred.

Bring a second change of clothes that you can change into in case an incident occurs—EHS can also provide a set of clean scrubs to get you home.

Appropriate attire must be worn at all times.

Please keep hair that is longer than shoulder-length tied up or back and away from potential hazards.

Hazards include chemicals and heat sources, but also tools that you would find in the machine shop.

Appropriate personal protective equipment (PPE) must be worn at all times.

Its Purpose?

To mitigate the harm that may result from the risks in the laboratory.

It is essential to carry out a PPE assessment that is accompanied by a hazard assessment for *every* activity in the laboratory.

Required at all times for *anyone* handling chemicals and working in an environment in which chemicals are being handled.

#chemical hazards
#personal
#procedure

PPE—Eyes

UVEX Stealth Goggles

Visorgogs

Required at all times for handling chemicals and working in an environment in which chemicals are being handled.

You can wear any type you like, so long as it follows the ANSI standard **Z87+D3.**

PPE—Eyes

Z87+D3

D3 refers to chemical splash protection!

Z87+ is impact only! Important in the lab, too.

Make sure you have the correct eye protection.

TAs, please check any unfamiliar goggles.

Contact Lenses

Contact lenses should not be worn when handling chemicals.

Contact lenses are not protective devices and safety goggles must be worn when handling chemicals or in an environment where chemicals are being used.

Eye protection (goggles) must cover prescription eyewear.

Some chemicals are known to react with contact lens material.
A few of these chemicals are:
Dichloromethane, Isopropanol,
and Ethyl Alcohol.

PPE—Body

Required at all times for handling chemicals and working in an environment in which chemicals are being handled.

Lab coats are barriers for chemicals and contamination.

They can also be carriers of contamination, so exchange them for a clean coat regularly.

PPE—Body

The Lab Coat program is managed by the Chemistry Stockroom.

White Lab Coats are FREE for you to use in the labs!

Stop by Room 280 SRTC by to pick up, return, or exchange!

Not a requirement to use this service, but wearing and laundering lab coats is—you *may not* launder them at home.

PPE—Body

When choosing a lab coat, please ensure that the coat sleeves can reach your wrists when your arms are fully extended.

The coat cuff to glove overlap area is a potential splash hazard zone that must not be left unprotected.

This can also be a reminder of another vulnerable spot for spills, the lower legs and ankles—be sure that your attire covers these areas, all the way to your footwear.

PPE—Body

When working with flammable or pyrophoric materials, a flame resistant lab coat should be worn.

Clarification: this is not flame-*proof.*

These coats are not free for lab use. If you are required to use one, your PI can pay for this through a grant.

PPE—Body

Lab Coats may be worn in the hallways, especially when transporting chemicals.

Undergraduates in teaching labs are encouraged to keep their lab coats in the labs.

Lab coats *are not allowed* in restrooms, offices, non-lab spaces, and outside the building.

Why?

PPE—Body

Do you have work in multiple locations and different hazard areas?

Need an additional coat?

Stop by the Stockroom!
Room 280 SRTC!

PPE—Body

Returning Coats:
Any coats with incidental spills and normal wear-and-tear can be returned to the Stockroom and exchanged for a newly laundered coat.

Work with Radioactivity?
Have your coat scanned by EHS before you exchange.

Major spill?
Coats can be sent out as waste!
Inform Stockroom staff if this occurs (and come pick up a fresh coat).

PPE—Hands

Gloves should be worn when handling chemicals.

These are not impervious to all chemicals that are health hazards—there is no guarantee.

Change gloves often.

PPE—Hands

"(These gloves provide) incidental barrier protection and tactile sensitivity to the wearer. (They are) ...not designed for applications involving prolonged, direct exposure to chemicals."

—Kimberly-Clark
Chemical Resistance Guide

PPE—Hands

Gloves should not be worn outside of lab areas.

Be aware of the potential for cross-contamination when wearing gloves.

Don’t touch eyes, face, hair, or other areas on your person.

Don’t touch doors, phones,keyboards, pens, etc, while wearing gloves.

Wash your hands after you remove and dispose of your gloves.

PPE—Hands

Heavy-duty gloves have the potential to increase the level of hazards due to a loss of manual dexterity.

Refer to a glove selection chart to choose the right glove for the chemicals that you are handling.

8th EDITION Permeation/Degradation Resistance Guide for Ansell Gloves

The first square in each column for each glove type is color coded to provide an overall rating for both Degradation and Permeation. The letter in each colored square is for Degradation alone.

- GREEN: The glove is very well suited for application with that chemical.
- YELLOW: The glove is suitable for that application under careful control of its use.
- RED: Avoid use of the glove with this chemical.

SPECIAL NOTE: The chemicals in this guide highlighted in BLUE are experimental carcinogens, according to the ninth edition of Sax' *Dangerous Properties of Industrial Materials*. Chemicals highlighted in GRAY are listed as suspected carcinogens, experimental carcinogens at extremely high dosages, and other materials which pose a lesser risk of cancer.

CHEMICAL	LAMINATE FILM BARRIER™			NITRILE SOL-VEX®			UNSUPPORTED NEOPRENE 29-SERIES			SUPPORTED POLYVINYL ALCOHOL PVA™			POLYVINYL CHLORIDE (Vinyl) SNORKEL®			NATURAL RUBBER *CANNERS AND HANDLERS™			NEOPRENE/ NATURAL RUBBER BLEND *CHEMI-PRO®			BUTYL UNSUPPORTED CHEMTEK™ BUTYL			VITON/BUTYL UNSUPPORTED CHEMTEK™ VITON/BUTYL		
	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate
1. Acetaldehyde	■	380	E	P	—	—	E	10	F	NR	—	—	NR	—	—	E	13	F	E	10	F	—	—	—	—	—	—
2. Acetic Acid, Glacial, 99.7%	■	150	—	G	158	—	E	390	—	NR	—	—	F	45	G	E	110	—	E	263	—	E	>480	—	DD	>480	—
3. Acetone	▲	>480	E	NR	—	—	G	10	F	P	143	G	NR	<5	—	E	10	F	G	12	G	E	>480	E	DD	93	VG
4. Acetonitrile	▲	>480	E	F	30	F	E	20	VG	■	150	G	NR	—	—	E	4	VG	E	13	VG	E	>480	E	DD	70	E
5. Acrylic Acid	—	—	—	G	120	—	E	395	—	NR	—	—	NR	—	—	E	80	—	E	67	—	—	—	—	—	—	—
6. Acrylonitrile	▲	>480	E	—	—	—	—	—	—	▲	>480	—	—	—	—	E	5	F	—	—	—	E	>480	—	E	>480	—
7. Allyl Alcohol	▲	>480	E	F	140	F	E	140	VG	P	—	—	P	60	G	E	10	VG	E	20	VG	E	>480	—	E	>180	—
8. Ammonia Gas	■	19	E	▲	>480	E	▲	>480	—	—	—	—	—	—	—	—	—	—	■	27	E	—	—	—	—	—	—
9. Ammonium Fluoride, 40%	▲	>480	E	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
10. Ammonium Hydroxide, Conc. (28-30% Ammonia)	E	30	—	E	>360	—	E	250	—	NR	—	—	E	240	—	E	90	—	E	247	—	E	>480	—	E	>480	—
11. n-Amyl Acetate	▲	470	E	E	198	G	NR	—	—	G	>360	E	P	—	—	NR	—	—	P	—	—	E	128	G	F	<10	F
12. Amyl Alcohol	▲	>480	E	E	>480	E	E	348	VG	G	180	G	G	12	E	E	25	VG	E	52	VG	E	>480	E	E	>480	E
13. Aniline	▲	>480	E	NR	—	—	E	145	F	F	>360	E	F	62	G	E	25	VG	E	82	G	E	>480	E	E	>480	E
14. Aqua Regia	—	—	—	F	>360	—	G	>480	—	NR	—	—	G	120	—	NR	—	—	G	193	—	E	>480	—	E	>480	—
15. Benzaldehyde	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	G	10	VG	G	27	F	E	>480	E	E	100	E
16. Benzene (Benzol)	▲	>480	E	P	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	E	20	F	E	253	VG
17. Benzotrichloride	▲	>480	E	E	>480	E	NR	—	—	—	—	—	G	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
18. Benzotrifluoride	▲	>480	E	E	170	G	—	—	—	—	—	—	G	<10	F	P	50	G	P	—	—	—	—	—	—	—	—
19. Bromine Water	—	—	—	E	>480	E	E	>480	E	NR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20. 1-Bromopropane (Propyl Bromide)	▲	>480	E	▼	23	F	▼	<10	P	▲	>480	E	▼	<10	F	▼	<10	P	▼	<10	P	▼	10	P	■	182	VG
21. 2-Bromopropionic Acid	▲	>480	—	F	120	—	E	460	—	—	—	—	G	180	—	E	190	—	G	190	—	—	—	—	—	—	—
22. n-Butyl Acetate	▲	>480	E	F	75	F	NR	—	—	G	>360	E	NR	—	—	NR	—	—	P	—	—	E	80	G	DD	<10	F
23. n-Butyl Alcohol	▲	>480	E	E	>360	E	E	270	E	F	75	G	G	180	VG	E	35	VG	E	75	VG	E	>480	E	E	>480	E
24. Butyl Carbitol	—	—	—	E	>323	E	G	188	F	E	>480	E	E	397	VG	E	44	G	E	148	G	—	—	—	—	—	—

PPE—Hands

From the Ansell *Glove Selection Chart* these gloves are not compatible with the following chemicals:

Acetone
Aniline
Benzaldehyde
Chloroform
1,4-Dioxane
Ethyl Acetate
Methylene Chloride
Nitric Acid
Sulfuric Acid
Tetrahydrofuran

PPE—Hands

Kimberly Clark Nitrile gloves (pictured) have <1 to 5 minute permeation break-through times for glove ratings of *Poor* or *Not Recommended.*

Change your Gloves often!


1
Pinch and hold the **outside** of the glove near the wrist area.


2
Peel downwards, away from the wrist, turning the glove inside-out.


3
Pull the glove away until it is removed from the hand, holding the inside-out glove with the gloved hand.


4
With your un-gloved hand, slide your finger/s under the wrist of the remaining glove. **Do not touch** the outer surface of the glove.


5
Peel downwards, away from the wrist, turning the glove inside out.


6
Continue to pull the glove down and over the inside-out glove being held in your gloved hand.

PPE—Additional

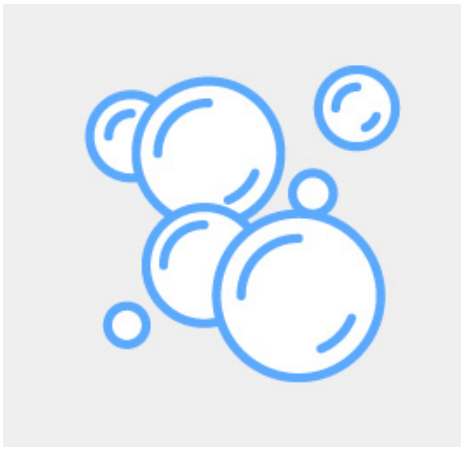
Face Shield—
not rated for splash protection and
must be worn with goggles!

Cold/Hot Gloves

Ear plugs

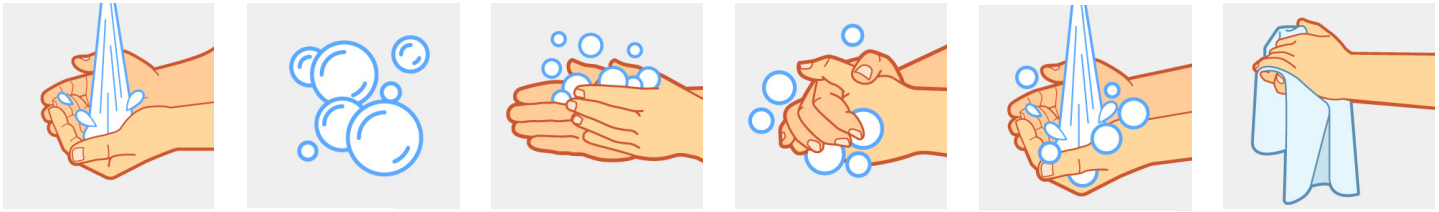
Blast Shield/Safety Shield

Always wash your hands before leaving the lab and after removing gloves and PPE.



#chemical hazards
#personal
#cleanliness

Always wash your hands before leaving the lab and after removing gloves and PPE.



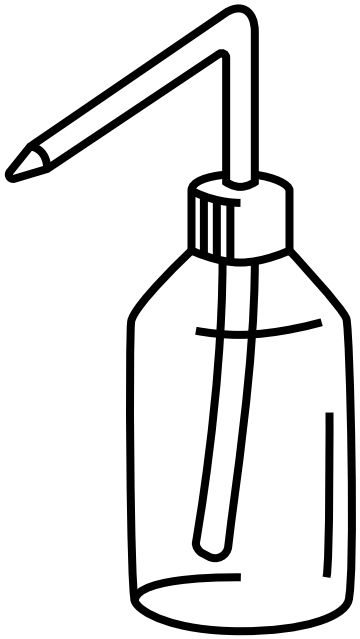
#chemical hazards
#personal
#cleanliness

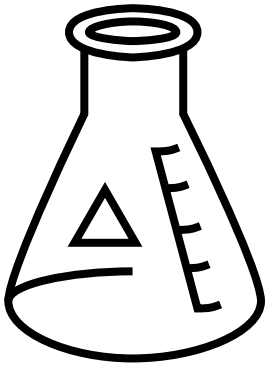
No food or drink in the lab.

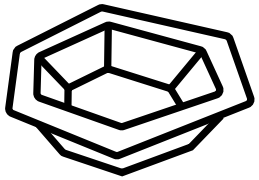
Do not drink from water sources in the lab.

#chemical hazards
#lab space
#personal

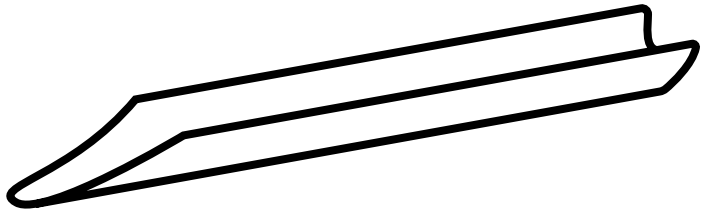
Always be aware of your personal surroundings and other activities in the lab.







Also, keep others aware of things that impact your work. Inform others in the lab of what you are doing.
If a near-miss or incident occurs, let them know.



#personal
#lab space

Headphones/earphones must not be worn in the lab.

A single earbud *can* be worn.

#personal
#lab space

Headphones/earphones must not be worn in the lab.

If sound is played in the lab through an amplified system, it must not exceed a volume at which verbal warnings and alarms can be clearly heard.

Headphones/earphones must not be worn in the lab.

An option for more personalized listening:

Bone conduction headphones

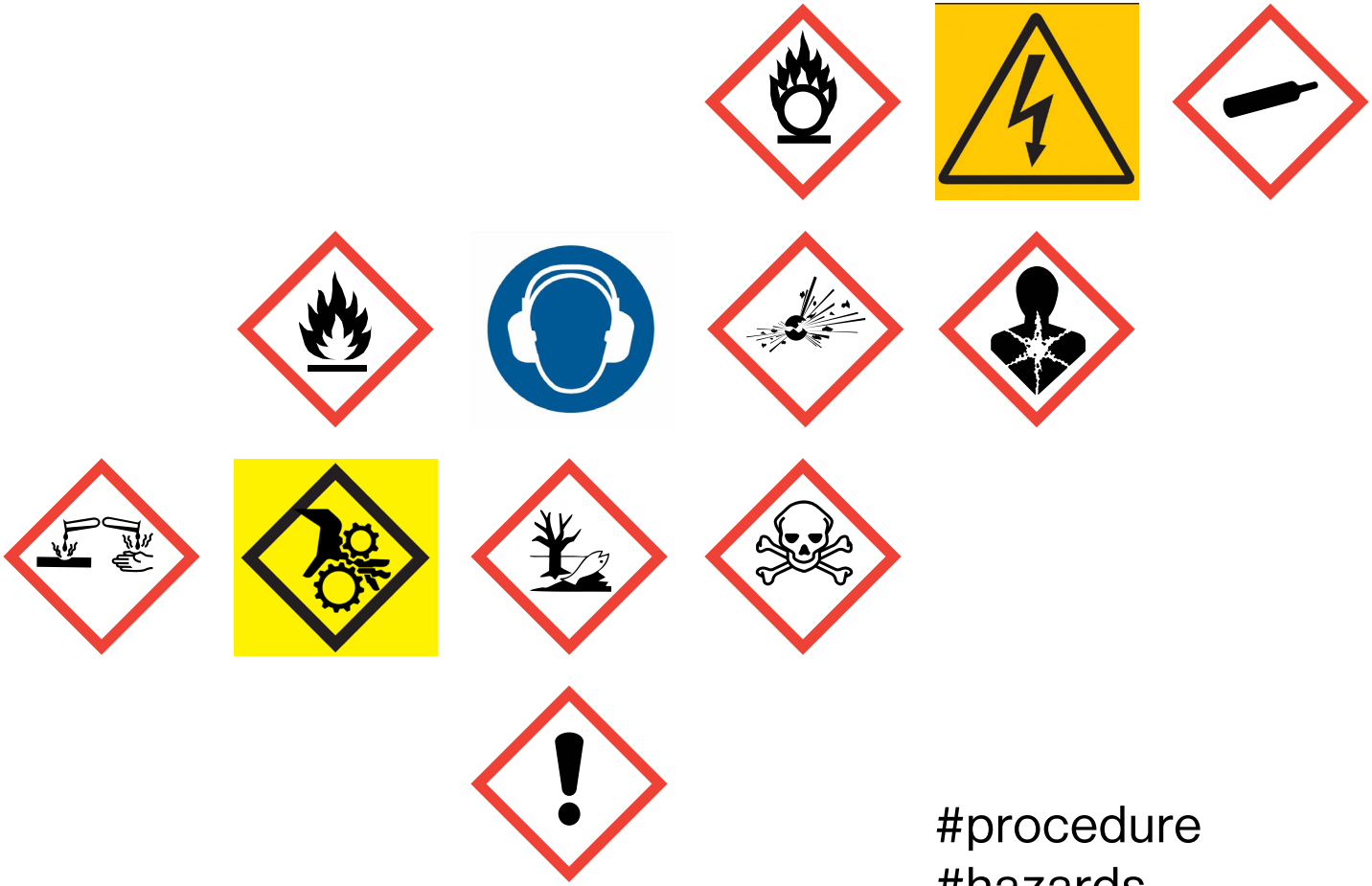
All work areas must be kept clean, clear, and free from all hazards.

#cleanliness
#lab space
#chemical hazards

All floors, passageways, exits, and entrances should be clear and unobstructed at all times.

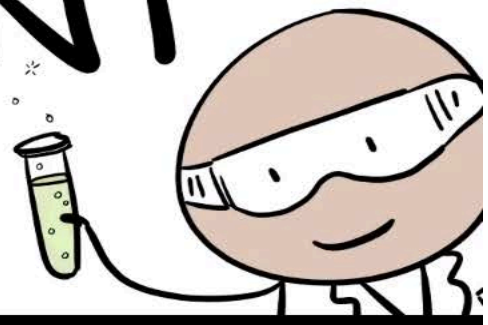
#cleanliness
#lab space

An assessment of all hazards must be carried out before any procedure is attempted.



#procedure
#hazards
#chemical hazards

LABORATORY RISK ASSESSMENT



An assessment of all hazards must be carried out before any procedure is attempted.

And don’t forget.

The Stockroom, EHS, and Fire Prevention Services are resources for you and your lab to help identify and mitigate potential risks in the lab.

Before obtaining chemicals from the Stockroom, you'll be required to fill out a Chemical Hazard Assessment form.

Reach Out if you have any questions!

#procedure
#hazards
#chemical hazards

Hazard Assessment for a Chemical

The research laboratory is a unique, ever-changing environment. Research experiments change frequently and may involve a wide variety of hazards (for example, chemical, physical, biological, radiological, and so forth). The individuals or teams of people conducting the experiments may be at varying stages in their academic or professional careers. Their backgrounds and experiences may vary, but hazard identification, hazard evaluation, and hazard mitigation in laboratory operations are critical skills that must be part of any laboratory worker's education. Furthermore, integrating these concepts into research activities is a discipline researchers must establish to ensure a safe working environment for themselves and their colleagues.

Hazard assessment is a continuous process. Once an assessment is made and well-thought-out controls are put in place, there needs to be an assessment of the effectiveness of the controls, which leads back to an updated hazard assessment.

***Please consult the SDS for the chemical you are assessing while filling out this form.

→ Chemical Hazard Assessment

Resources

Chemistry Stockroom

Science Research and Teaching Center, Room 280
chemstrm@pdx.edu
(503)725-4273

Environmental Health and Safety

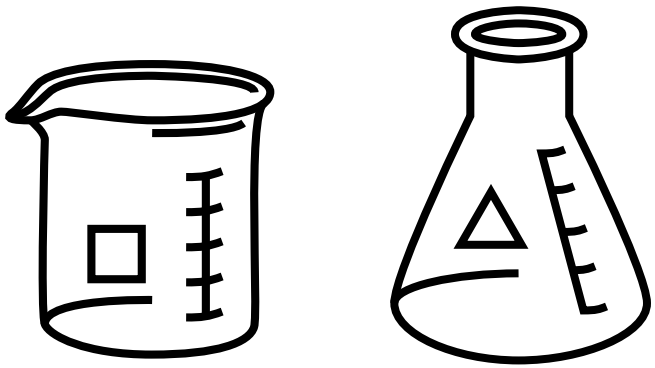
Research EHS Staff
Science Resarch and Teaching Center Room 144
EHS-group@pdx.edu
(503) 725-5269

Fire Prevention

University Services Building
go.pdx.edu/firesafety
(503)725-4325

You should not work alone in the lab.

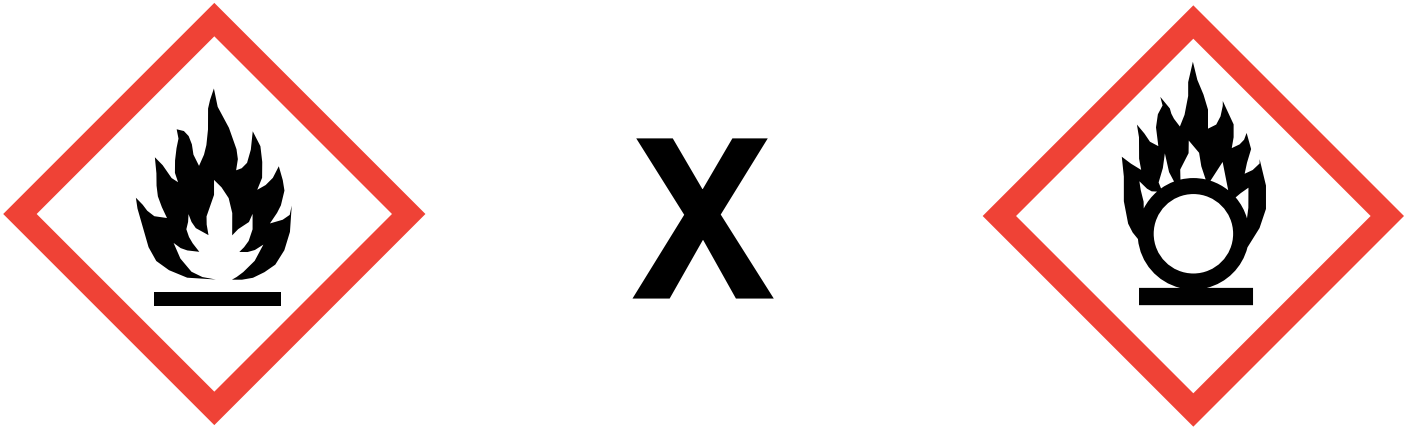
More hazardous procedures must not be undertaken alone.



#personal
#chemical hazards

WORKING ALONE IN THE LAB?

Be aware of chemical incompatibilities.



Can you name some chemical pairs that are not compatible?

Why are these classes not compatible?

#chemical hazards

Be aware of chemical incompatibilities.

Acetic acid	Nitric acid, peroxides, permanganates
Acetone	Hydrogen peroxide
Hydrocarbons	Bromine, Chlorine, peroxides
Sulfuric acid	chlorates, perchlorates, permanganates

Be aware of the scope for cross-contamination!

Do not sit on work benches.

Do not leave personal items on work benches—
phones, wallets, pens, keys.

Remove gloves and wash your hands
before you leave the lab, use computers, pens, etc.

#chemical hazards
#cleanliness
#personal
#lab space

Do not store lab notebooks or other research papers in the lab, where there is a flame (and contamination) hazard.

#chemical hazards
#lab space

All chemicals should be appropriately stored when they are not in use.

flammable cabinet

Chemicals must be stored in cabinets or shelving appropriate to the hazard class of the chemical.

Open shelving for non-hazardous chemicals must have a lip to prevent containers from falling.

#chemical hazards

All chemicals should be appropriately stored when they are not in use.

corrosives cabinet

Put chemicals away after use!
Do not store them on bench tops, near balances, or in hoods.

Keep an inventory of all of your chemicals. This should include solutions and products that you have made.

Consider reducing the amount of chemicals in your research lab.

All chemicals should be appropriately stored when they are not in use.

storage bin

Secondary containment must be used when working with chemicals.

It can be used in storage as well—to organize and support small bottles.

Secondary containment must be used whenever appropriate.

chemical carrier

Secondary containment is required for all transport of any chemicals.

Please borrow from the Stockroom if your lab is without one.

Simple and cheap option:
bucket, lid, and packing material.

Wear PPE—Lab Coat, Goggles, Gloves

Keep one hand free and without a glove to open doors and press elevator buttons.

#chemical hazards

Secondary containment must be used whenever appropriate.

Something larger? Use a sturdy cart.

Must have at least a 2" lip for spill containment.

Wheels should be strong with swivel casters and have a large enough diameter to roll over uneven surfaces.

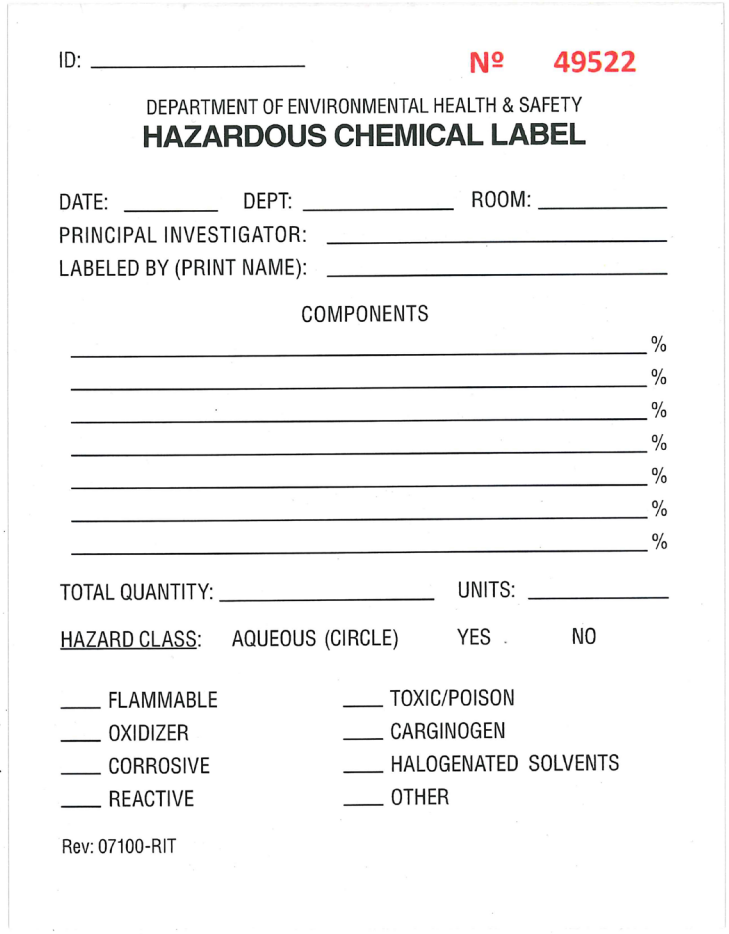
Secondary containment must be used whenever appropriate.

Gas cylinders, Liquid Nitrogen dewars, and 20L Drums do not need secondary containment.

Dry Ice can be transported within in an insulated container (styrofoam) with fitted lid.

Limit the amount of waste stored in the laboratory.

The Waste Label for use in documenting and processing waste at PSU!



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DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY

HAZARDOUS CHEMICAL LABEL

DATE: _____ DEPT: _____ ROOM: _____

PRINCIPAL INVESTIGATOR: _____

LABELED BY (PRINT NAME): _____

COMPONENTS

_____ %
_____ %
_____ %
_____ %
_____ %
_____ %
_____ %

TOTAL QUANTITY: _____ UNITS: _____

HAZARD CLASS: AQUEOUS (CIRCLE) YES NO

___ FLAMMABLE
___ OXIDIZER
___ CORROSIVE
___ REACTIVE
___ TOXIC/POISON
___ CARGINOGEN
___ HALOGENATED SOLVENTS
___ OTHER

Rev: 07100-RIT

#chemical hazards
#procedure

got waste?

If you have waste, contact EHS through:

Work Order (503-725-2fix) http://pdx.edu/facilities

DO NOT carry waste in hallways, stockpile in lab, or bring directly to EHS or Chemistry Stockroom.

Waste includes:

Used or unwanted chemicals
Items contaminated with biological or radioactive materials
Sharps
Discarded laboratory glassware
Batteries, light tubes/bulbs
Used Oil

Environmental Health & Safety

SRTC 144, ehs-group@pdx.edu

Portland State UNIVERSITY

Limit the amount of waste stored in the laboratory.

EHS will also pick up:

Mercury Thermometers

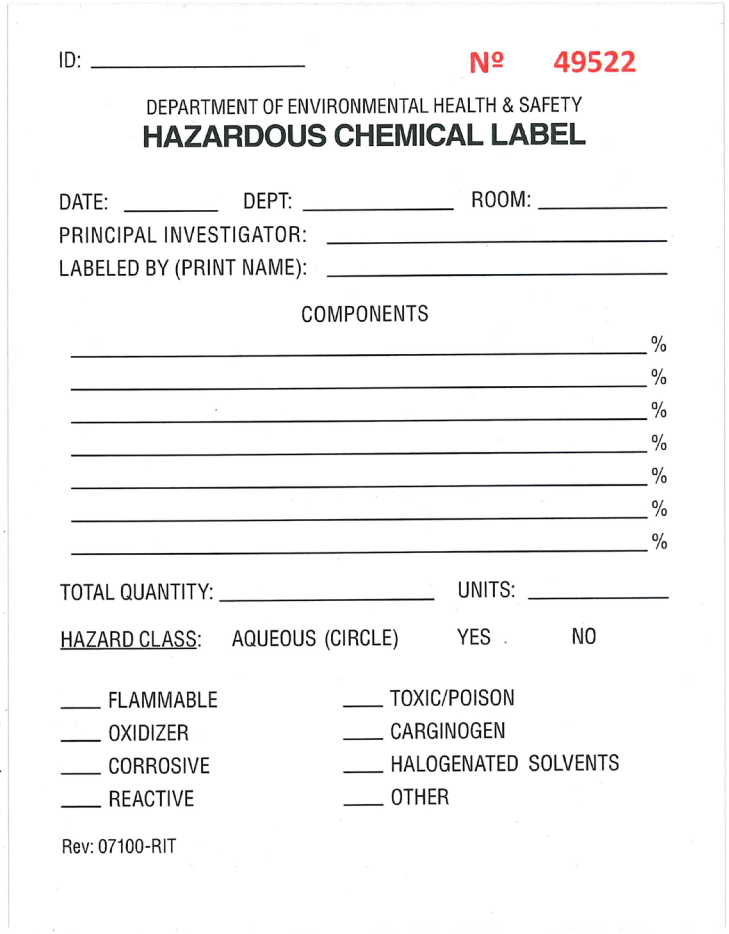
EHS can also provide:

Waste containers (1–4L)

Sharps containers (various sizes)

Glass boxes (bench top and floor)

Biohazard bins and containers



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LABELED BY (PRINT NAME): _____

COMPONENTS

_____ %
_____ %
_____ %
_____ %
_____ %
_____ %
_____ %

TOTAL QUANTITY: _____ UNITS: _____

HAZARD CLASS: AQUEOUS (CIRCLE) YES NO

___ FLAMMABLE
___ OXIDIZER
___ CORROSIVE
___ REACTIVE
___ TOXIC/POISON
___ CARGINOGEN
___ HALOGENATED SOLVENTS
___ OTHER

Rev: 07100-RIT

Limit the amount of waste stored in the laboratory.

No waste can be removed from your lab without a Waste Label.

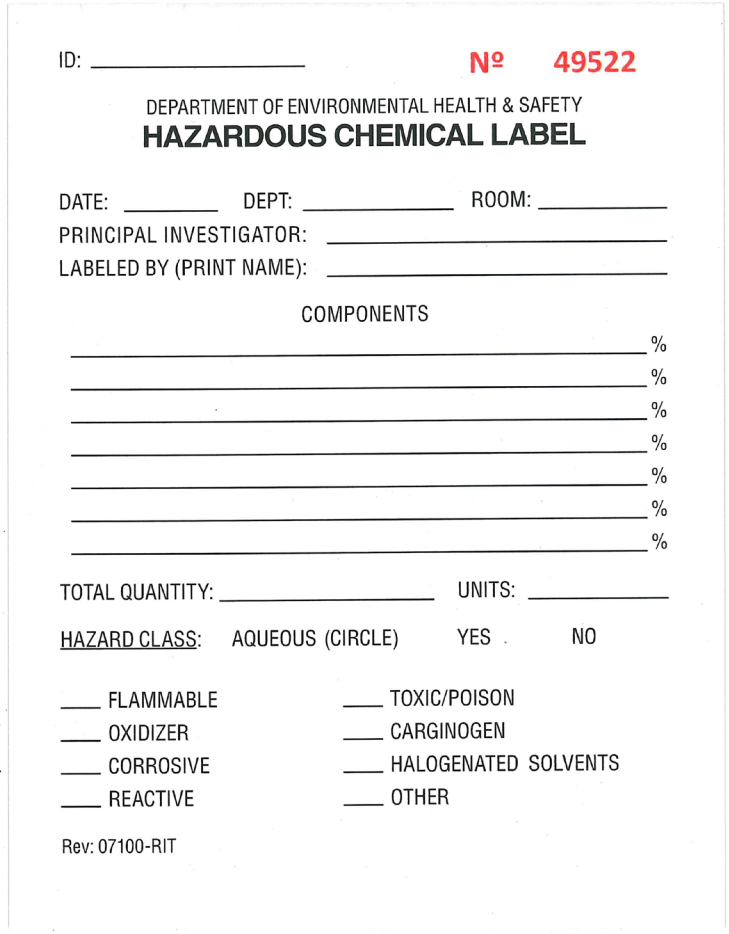
Start a waste label immediately—attach it to a waste container with tape.

Ask EHS if you have any reservations, hesitations, or questions about waste disposal.

When in doubt, tag it separately!

Submit a work order.

➔ pdx.edu/facilities/home



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DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY

HAZARDOUS CHEMICAL LABEL

DATE: _____ DEPT: _____ ROOM: _____

PRINCIPAL INVESTIGATOR: _____

LABELED BY (PRINT NAME): _____

COMPONENTS

_____ %
_____ %
_____ %
_____ %
_____ %
_____ %
_____ %

TOTAL QUANTITY: _____ UNITS: _____

HAZARD CLASS: AQUEOUS (CIRCLE) YES NO

___ FLAMMABLE
___ OXIDIZER
___ CORROSIVE
___ REACTIVE
___ TOXIC/POISON
___ CARGINOGEN
___ HALOGENATED SOLVENTS
___ OTHER

Rev: 07100-RIT

Limit the amount of waste stored in the laboratory.

Write the full IUPAC name of the chemical on the waste label.

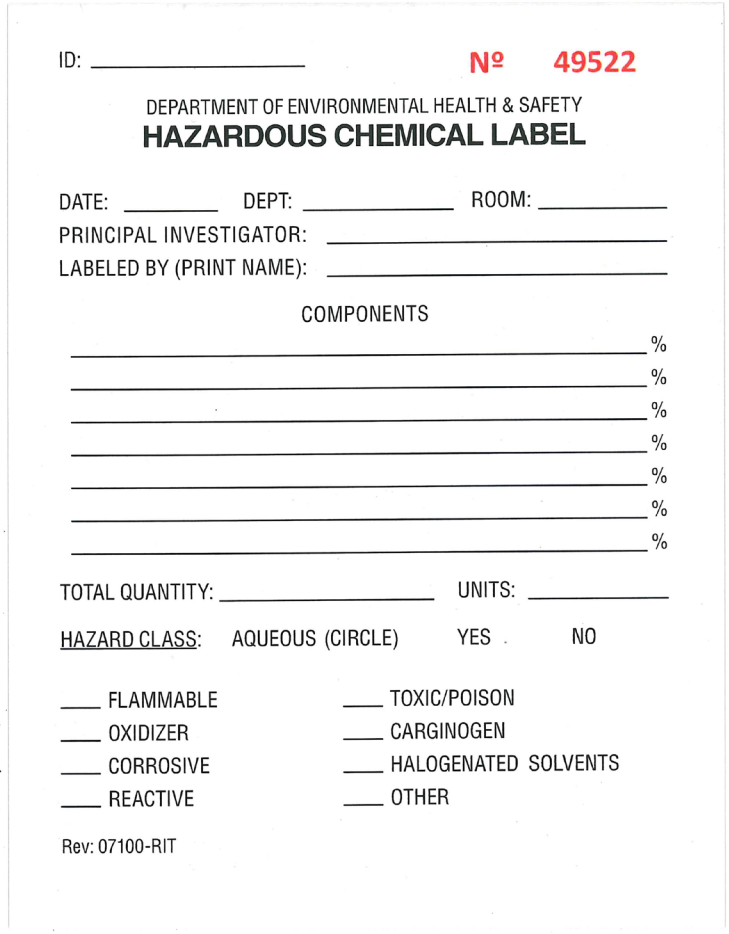
HCl ≠ Hydrochloric Acid

Write the percentages of each part of the waste profile.

Do not collect or send waste that contains Flammables and Oxidizers!

Unsure? Keep the waste separate.

Ask EHS (5-3403).



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DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY

HAZARDOUS CHEMICAL LABEL

DATE: _____ DEPT: _____ ROOM: _____

PRINCIPAL INVESTIGATOR: _____

LABELED BY (PRINT NAME): _____

COMPONENTS

_____ %
_____ %
_____ %
_____ %
_____ %
_____ %
_____ %

TOTAL QUANTITY: _____ UNITS: _____

HAZARD CLASS: AQUEOUS (CIRCLE) YES NO

___ FLAMMABLE
___ OXIDIZER
___ CORROSIVE
___ REACTIVE
___ TOXIC/POISON
___ CARGINOGEN
___ HALOGENATED SOLVENTS
___ OTHER

Rev: 07100-RIT

Limit the amount of waste stored in the laboratory.

What can go down the drain?

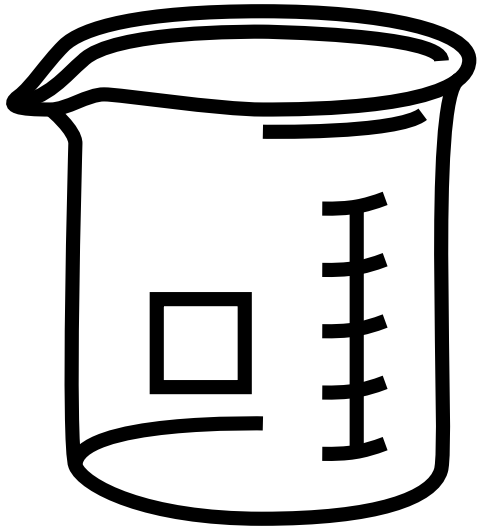
When is something empty?

What can go in the trash?

Who picks up hazardous waste?

What do I do if I am not sure?

How much does it cost?

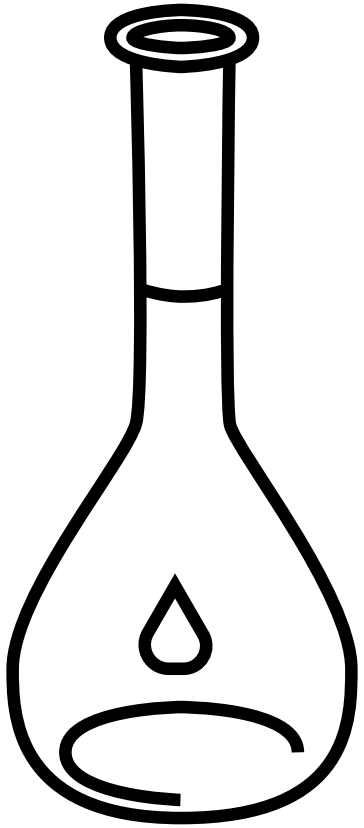


Limit the amount of waste stored in the laboratory.

Aqueous Waste can go down the drain as long as the following criteria are met:

- Non-toxic
- No Organics
- pH 4–10 (safest range)
- less than 1L per day
- under 10% by weight of solute
  90% or more must be water!

All requirements must be met!



Dilution Calculations

pH is a log scale reading.
To change pH in any direction,
the concentration of H+ or OH- ions
must change by an order of magnitude—
without neutralization for acids, this is
the equivalent of a 10X dilution.

You know that you can't pour this small amount down the drain, but how much water would it take to get this to pH 4?

1X

Let's run through the calculations!
Say you have 10mL of 37% (12M)
concentrated hydrochloric acid.

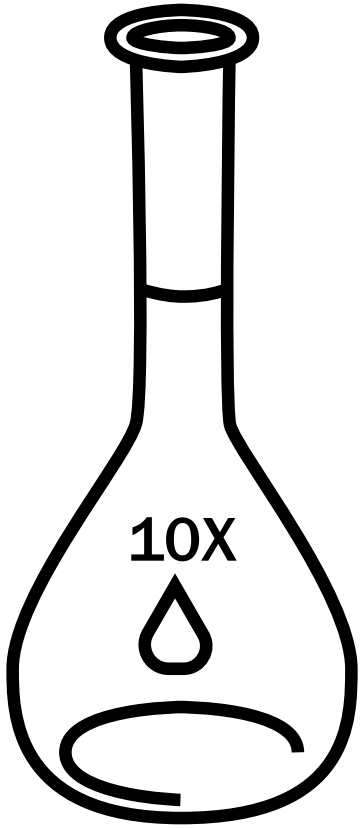
The starting pH value is as follows:
12M HCl (10mL, .01L)
pH=-log[H+]
pH=-1.079

Dilution Calculations

10X Dilution 1
added acid to 90mL water
Always Add Acid to water!
1.2M (.1L, 100mL total solution)
pH=-0.079

10X Dilution 2 (100X)
added dilution 1 to 900mL water
(HCl added to 990mL water)
0.12M (1L, 1000mL total)
pH=0.921

10X Dilution 3 (1000X)
added dilution 2 to 9,000mL water
(HCl added to 9990mL water)
0.012M (10L total, 10,000mL)
pH=1.92

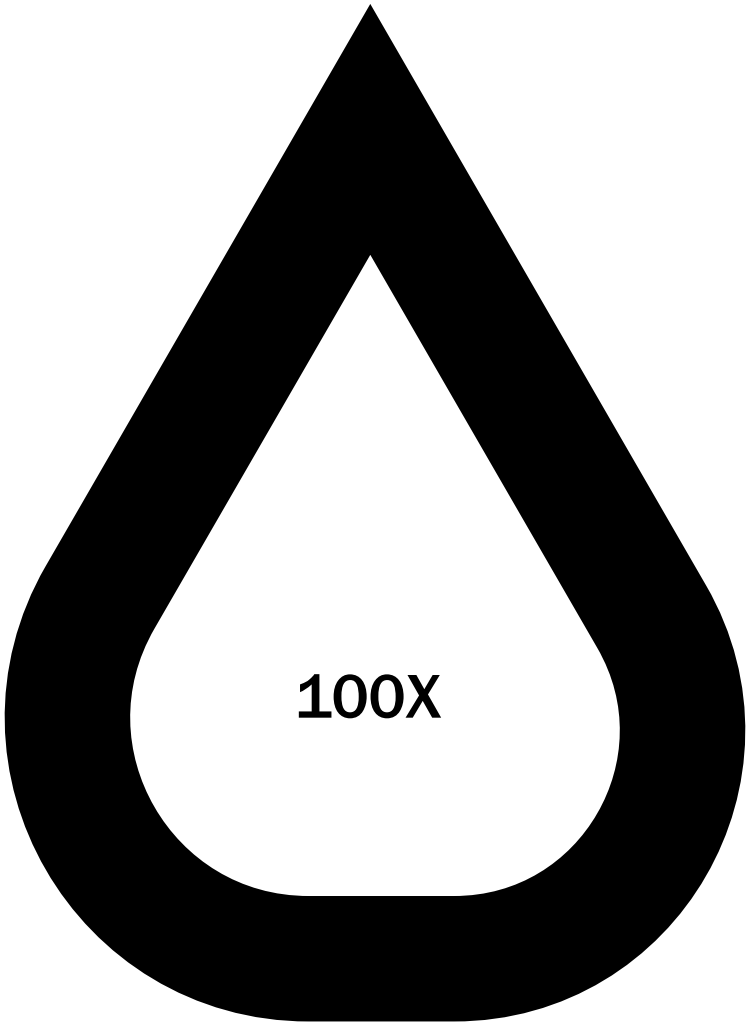


Dilution Calculations

10X Dilution 4 (10000X)
added dilution 3 to 90,000mL water
(HCl added to 99,990mL water)
0.0012M (100L total, 100,000mL)
pH=2.92

10X Dilution 5 (100000X)
added dilution 4 to 900,000mL water
(HCl added to 999,990mL water)
0.00012M (1000L total, 1and10^6mL)
pH=3.92

10X Dilution 6 (1,000,000X)
added dilution 5 to 9,000,000mL water
(HCl added to 9,999,990mL water)
0.000012M (10,000L total, 1x10^7mL)
pH=4.92



Limit the amount of waste stored in the laboratory.

A container is empty with less than 1% of original amount.
4L container? up to 40mL.

Rinse 3X. Save the rinse!
Especially if the chemical is a P or U-listed chemical—*Acutely Toxic*

Deface Label—scratch off/mark up
Write “MT” on container

Dispose of the container in Glass box or Recycle bin.

You can also have EHS pick up any empty containers—recycle within PSU.

Limit the amount of waste stored in the laboratory.

Most Common P and U listed Wastes

Acetaldehyde

Acetone, Acetonitrile

1-Butanol

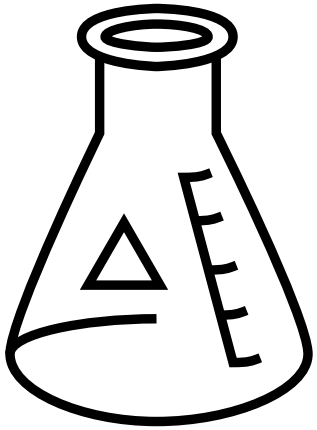
Chloroform

Ethyl Acetate

Ethyl Ether

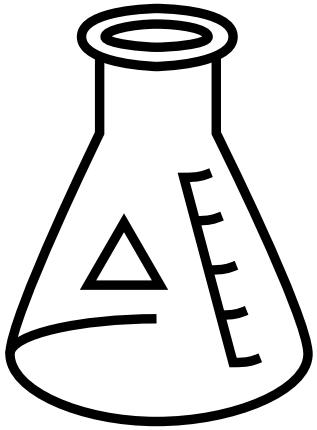
Mercury

Toluene



Limit the amount of waste stored in the laboratory.

What are some other ways that we can reduce waste in our laboratories?

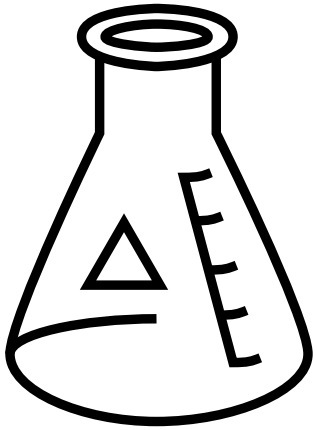


Limit the amount of waste stored in the laboratory.

Work at the smallest scale possible.

Purchase the smallest amounts of reagents from distributors (Fisher, VWR, Nurnberg) or the Stockroom.

Use the Chemistry Stockroom and the Inventory to find readily-available chemicals on campus.



Follow the standard operating procedure (SOP) for any equipment used, and create the SOP for any new procedure or synthesis.

➜ Standard Operating Procedures

#chemical hazards

Follow the standard operating procedure (SOP) for any equipment used, and create the SOP for any new procedure or synthesis.

What would a procedure look like for the transportation of a gas cylinder—empty or full?

What safety hazards exist?

What chemical hazards exist?

How do you document and communicate this?

Follow the standard operating procedure (SOP) for any equipment used, and create the SOP for any new procedure or synthesis.

Heavy

Rusty and dirty

Awkward size and balance

Must stay upright!

Extremely High Pressure

Can become a rocket.

Expansion to create toxic atmosphere.

What tools do you use?

Leak check the cylinder and the system!

Follow the standard operating procedure (SOP) for any equipment used, and create the SOP for any new procedure or synthesis.

Before you move a Gas Cylinder:

Close the valve at the tank.

Remove regulator.

Replace cap.

Remove from secure storage at gas cylinder rack.

Use a cylinder cart to move to the Chemistry Stockroom to exchange.

Give the Stockroom a "heads-up" call.

Follow the standard operating procedure (SOP) for any equipment used, and create the SOP for any new procedure or synthesis.

Please contact the Stockroom if you want to transport a cylinder from SRTC to the Engineering Building or other locations on campus—and vice versa.

We can help you plan the safest route.

Additional Notes

Hot Plates

Fume Hoods

Dispensing Chemicals

Documentation

Hot Plates

Periodically test the function of the “off” switch! Does the hot plate cool when you turn it off?

Always check equipment prior to use. What is the condition of the cord?

Keep the power cord away from the heated surface of the hot plate.

Never store flammable or combustible materials near the hot plate.

Limit the use of flammable materials when using an older-model hot plate.

Heat and cool slowly.

Never heat a closed system.

Additional Notes

Hot Plates

Use only heat-resistant, borosilicate glassware, and check for cracks before heating.

Do not overfill glassware.
Use the appropriate size vessel for what you will be heating. Never fill vessel more than 1/2 full.

Make sure that the surface of the hot plate is larger than the object that is being heated.

Use boiling stones or a stir bar in liquids to facilitate even heating and boiling.

Do not evaporate all the solvent or heat a mixture to dryness—this may crack the glass.

Additional Notes

Hot Plates

Use the appropriate setting when heating liquids, including water.

Do not use the highest setting to heat low-boiling liquids. This can produce surface temperatures as high as 540 °C (1004 °F).

Use care when removing hot glassware or when pouring hot liquids.

Use tongs or heat-resistant gripping devices or gloves, and remember that glassware may stay hot for some time.

Hot glassware looks the same as cold glassware.

Additional Notes

Hot Plates

Use appropriate ventilation, such as a fume hood or snorkel.

Turn off and unplug hot plates and all other heating devices after use!

If there has been a spill, unplug the hot plate immediately.

Clean the hot plate after it has cooled down. Read manufacturer's instructions before using heating devices.

Register the device with the hot plate manufacturer so you will be notified of any warnings or recalls.

Additional Notes

Fume Hoods

➔ Fume Hood Safety Video

Additional Notes

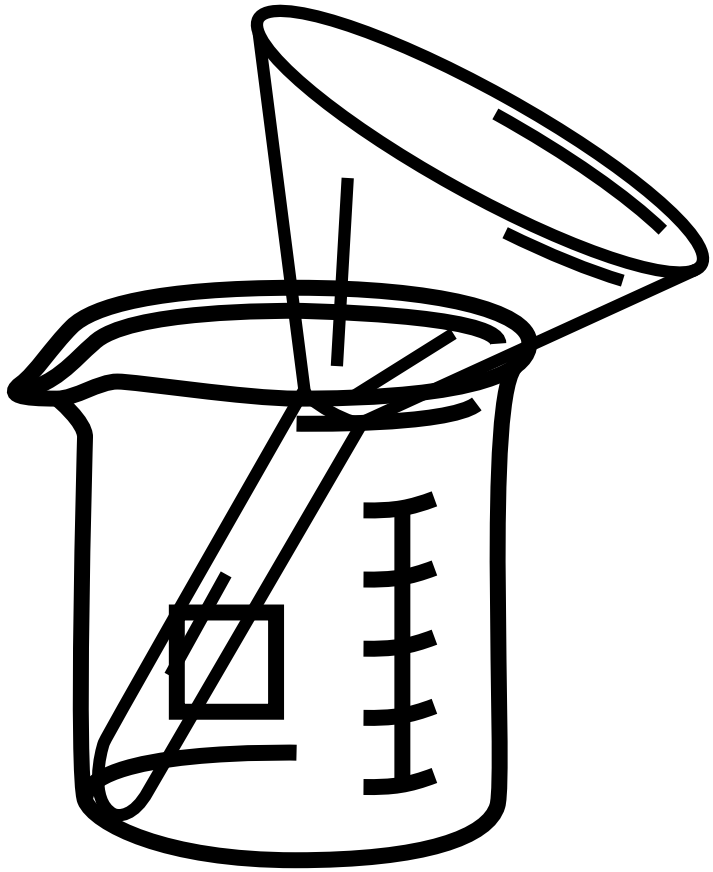
Dispensing Chemicals

Wear your PPE:
Gloves, Goggles, and Lab Coat!

Use a funnel.

Have spill neutralizing material nearby if you are working with a corrosive.

After dispensing corrosives (in a hood), place the funnel into a large beaker and pour neutralizing materials into the funnel.
Once the bubbling stops, you can rinse the funnel and beaker in the sink.



Acids: Sodium bicarbonate
Bases: Citric Acid

Additional Notes

Dispensing Chemicals

You should not pour anything from a container over 4L.

Use a hand pump for 20L drums.

Visit the Stockroom if you need to purchase a hand pump.

The Stockroom also purchases common solvents and corrosives in bulk and the staff can safely dispense any of these into any size container that you require.

Additional Notes

Documentation

What will happen to your samples after you have finished PSU?

What kinds of safety issues does this create?

How will someone know what you have made?

Consider the legacy of all of your work.
How do you document what you have created?

Documentation

When possible, write the entire IUPAC name on the label.

Elemental shorthand is acceptable, but not for waste.

Handwritten labels are okay, but tape-labels and ink are fairly impermanent.

Additional Notes

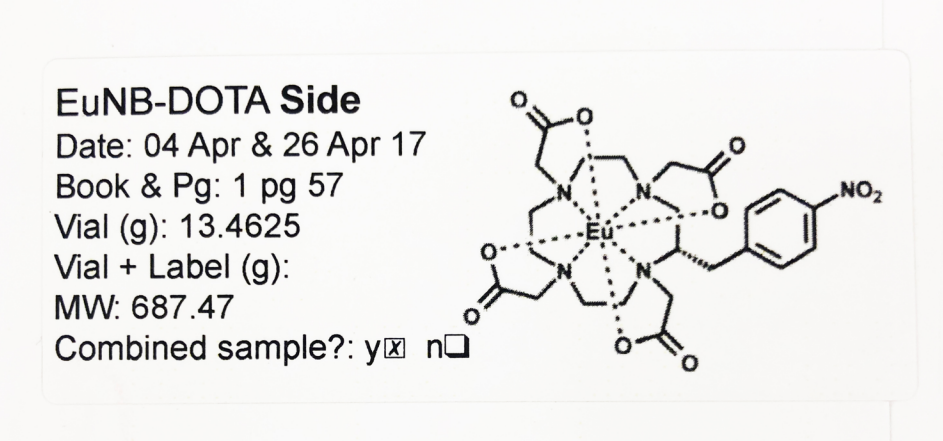
Documentation

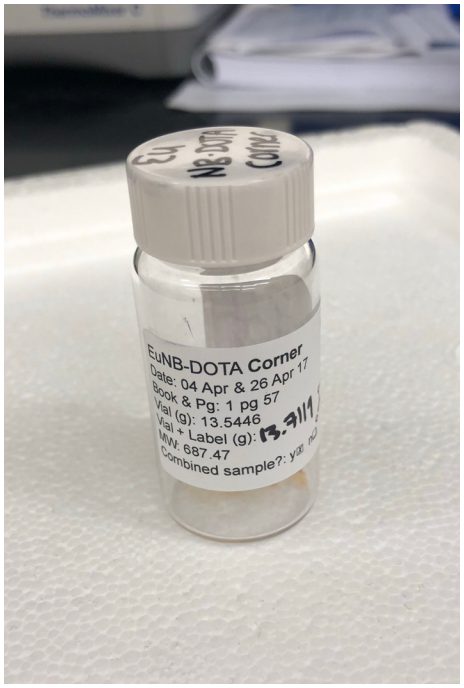
If the container is too small, use a shorthand name, or create a reference system that can be traced to a lab book or a database.

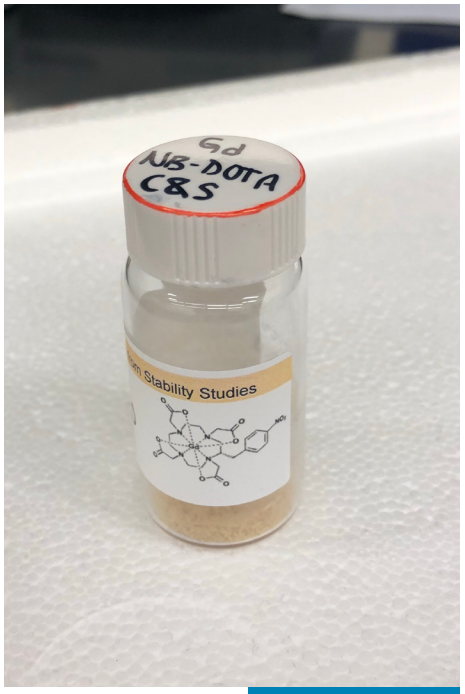
Then indicate where that information is!

We recommend Avery GHS labels with a piece of tape covering the label.

You can design the labels and create pdfs with their web application as well.







Additional Notes

It’s Time for a Break!