



DEPAUL UNIVERSITY

ENVIRONMENTAL HEALTH & SAFETY

Laboratory Safety Training



Winter Quarter 2023

Click on the OSHA logo to read the standard!

OSHA's Lab Standard

Occupational Safety
and Health Administration

Performing chemical procedures using small quantities of hazardous chemicals on a laboratory scale

- Applies to laboratory use of hazardous chemicals
- Requires DePaul to have a Chemical Hygiene Plan (CHP)
 - Lab personnel have many responsibilities under the CHP that are covered in this training, but you should also thoroughly review the CHP.
- Employees must be provided with no cost medical consultations & examinations in certain circumstances

What do you need to
know when working
with hazardous
chemicals?





Specific hazards, including any posed by reactions/processes



Occupational exposure limits



How to detect their presence & signs of exposure



How to handle accidents & emergencies

The following slides will focus on each area

Know the Hazards

There are 2 main types of hazards posed by chemicals:

1. Health hazards

Toxic (acute, reproductive, specific organ), corrosive/irritant, carcinogenic, mutagen

2. Physical hazards

Explosive, flammable, pyrophoric, oxidizer, self-reactive, organic peroxide, gas under pressure

- Manufacturer labels describe hazards
- You must determine hazards of reactions

SDS Section 2: Hazard(s) Identification & Section 10: Stability and Reactivity

Occupational Exposure Limits

- OSHA set Permissible Exposure Limits (PELs) for many chemicals in 1970 – they recognize these are outdated and inadequate to protect workers' health
- See their [Annotated PEL Tables](#) for PEL values alongside other organizations' more protective occupational exposure limits

American Conference of Governmental
Industrial Hygienists' Threshold Limit Value

- SDSs list the PEL and the ACGIH[®] TLV[®], and any other exposure limit used or recommended by the SDS preparer
- If you think a respirator is required (including N95s) for a procedure, [contact EHS](#). There are additional requirements for people who wear respirators.

SDS Section 8: Exposure Controls/Personal Protection



Detecting Presence & Signs of Exposure

For all chemicals you use...

- Know how to detect their presence and accidental release
 - Consider all physical states they may appear in
 - Is there a recognizable smell? Color?
- Know the signs of exposure. Common exposure symptoms include: *eye, nose, throat, respiratory or skin irritation, fatigue, headache, dizziness, lightheadedness, coughing, wheezing, chest tightness, shortness of breath, nausea, vomiting*

Be aware that some chemicals have **delayed effects**.

SDS Section 4: First-Aid Measures & Section 9: Physical and Chemical Properties

Handling Accidents & Emergencies

- Being familiar with the information on the previous slides will better equip you to handle any accidents
- Know the location of safety equipment in all areas you use
 - Phones, fire alarms, fire extinguishers*, eye wash stations, safety showers, spill kits[⌘], first aid kits

Use your judgment. If you cannot contain a dangerous situation:

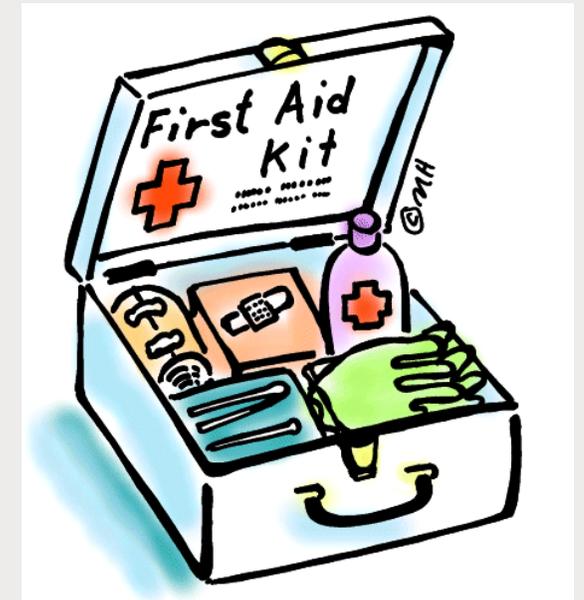
CALL 911 and then alert Public Safety

*Only use a fire extinguisher ON A SMALL FIRE if you have received training

[⌘]Ensure spill kits are stocked with appropriate materials to clean all spills you may encounter

First Aid

- Instructors/TAs are **NOT PERMITTED** to perform first aid (e.g. applying ointment or bandages to others, etc.) This is due to the risks involved with bloodborne pathogens. **Avoid all contact with other people's blood.**
- **If blood clean up is needed**, call Facility Operations who will send a custodian to assist.
- Instructors/TAs may only provide students with first aid supplies that they then apply themselves.
- Departments are responsible for ensuring first aid kits are available and stocked with basic supplies appropriate for their lab activities.



Facility Operations: 773-325-7377

If after 3:30pm, call Public Safety 773-325-7777

PLEASE NOTE:

All campus phones are able to dial 911 directly.

It is not necessary to include an extra 9 (but the call will still go through if you do).



Safety Data Sheets (SDSs)

contain all of this information & more!

- SDSs received with shipments of hazardous chemicals must be retained & readily accessible to employees.
- Periodically verify that SDSs are on file for all hazardous chemicals in use.
- For hazardous chemicals no longer in use, do not discard the SDS. OSHA considers them “employee exposure records” and requires they be retained for 30 years.



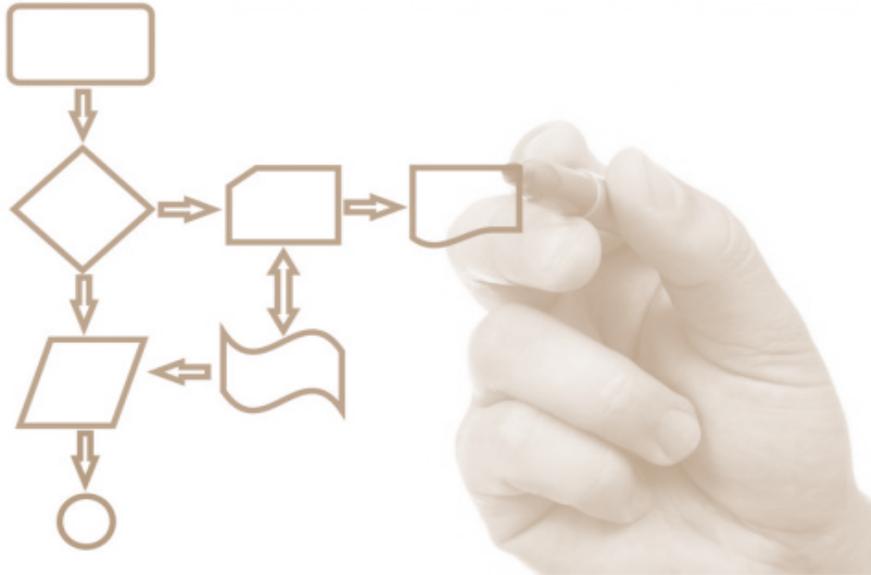
If SDSs are kept electronically:

A back up system (like also keeping paper copies) must be in place in the event of power outages, equipment failure, etc.

**How can you protect
yourself and others
from hazardous
chemicals?**



Build Safety In



- Health and safety risks must be evaluated **BEFORE** starting new experiments/procedures
- Methods to prevent chemical exposure must be included in standard operating procedures
- Everyone who works in the lab must be aware of the hazards and how to protect themselves

Personal Protective Equipment



- Appropriate lab attire:
 - Long sleeves & long pants
 - Closed-toe shoes
 - No jewelry
 - Pull long hair back
 - Avoid long nails that can interfere with gloves
- Safety goggles, nitrile gloves and lab coats are appropriate for most lab work
- Make sure to wear gloves that fit you snugly, but are not uncomfortably tight
- Some chemicals require the use of different PPE – use what is recommended on SDSs or other reliable sources
- Do not touch doorknobs or leave the lab with contaminated gloves on
- Do not wear synthetic fibers (polyester, nylon, etc.) when working with flammable materials – wear cotton

SDS Section 8: Exposure Controls/Personal Protection

Fume Hoods

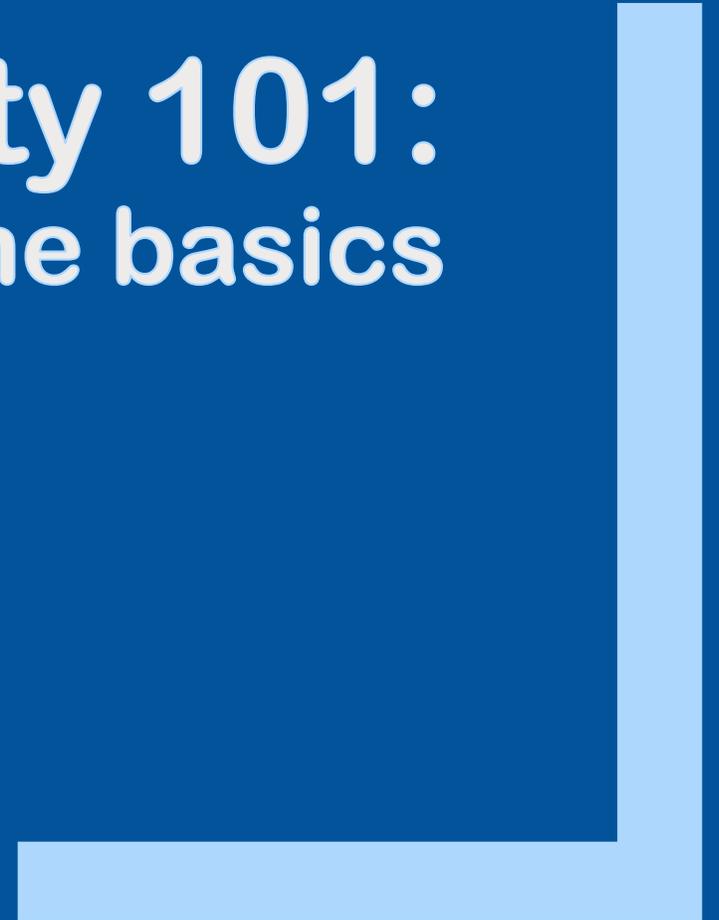


Click the hood to view the
EHS Fume Hoods Manual

- Use to contain procedures whenever feasible
- Only perform work with the sash at 18 inches or lower
- Keep materials 6 inches back from the sash plane
- Close containers when not actively in use
- Close sash completely when done working
- Do not use for excessive storage – this affects airflow and reduces the hood’s ability to perform its function
- All hoods are certified annually by a contractor
- If you suspect a hood is malfunctioning, immediately remove it from service and report to your department chair

Lab Safety 101:

Let's review some basics



Understanding Chemical Labels

The 6 Basic Elements of a GHS-Compliant Label

Product Identifiers 1 → **Turpentine**
UN No. 1234
CAS No. 12-34-5

Signal Word 2 → **DANGER**

Hazard Statement(s) 3 → Flammable liquid and vapour; Harmful if inhaled; Harmful in contact with skin; Harmful if swallowed; May be fatal if swallowed and enters airways; Causes serious eye irritation; Causes skin irritation; May cause an allergic skin reaction; Toxic to aquatic life with long-lasting effects

Precautionary Statement(s) 4 → Keep out of reach of children. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. IF SKIN IRRITATION OCCURS: Seek immediate medical attention.

Supplier Identification 5 → Fill Weight: 12.34 lbs. Lot Number: A1234556
Gross Weight: 12 lbs. Fill Date: 1/12/1234
Expiration Date: 1/12/1243
Example Company • 123 Example Rd • Brisbane, QLD 4000 • www.examplecompany.com • 123-456-789

6 → **Pictogram(s)**

See SDS for further information.

Source: <https://www.bronsonsafety.com.au/blog/the-6-basic-elements-of-ghs-labelling/>

Labels must contain all information required by the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Pictogram Meanings

Pictograms are graphic symbols used to communicate specific information about the hazards of a chemical.

<p>Health Hazard</p>  <ul style="list-style-type: none"> • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity 	<p>Flame</p>  <ul style="list-style-type: none"> • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides 	<p>Exclamation Mark</p>  <ul style="list-style-type: none"> • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
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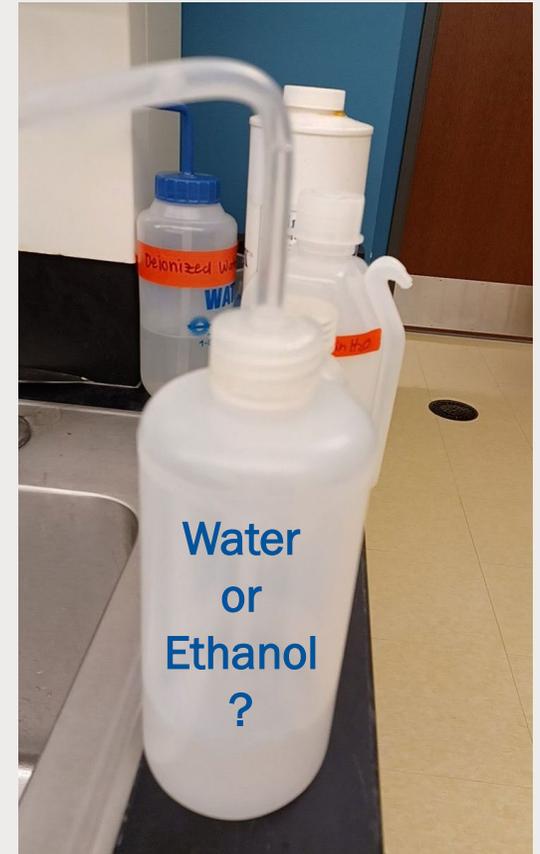
<p>Gas Cylinder</p>  <ul style="list-style-type: none"> • Gases Under Pressure 	<p>Corrosion</p>  <ul style="list-style-type: none"> • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals 	<p>Exploding Bomb</p>  <ul style="list-style-type: none"> • Explosives • Self-Reactives • Organic Peroxides
<p>Flame Over Circle</p>  <ul style="list-style-type: none"> • Oxidizers 	<p>Environment (Non-Mandatory)</p>  <ul style="list-style-type: none"> • Aquatic Toxicity 	<p>Skull and Crossbones</p>  <ul style="list-style-type: none"> • Acute Toxicity (fatal or toxic)

Labeling Your Containers

Whenever you transfer chemicals from their original containers into other containers (called “secondary containers”), these secondary containers must be labeled with the contents.

Label all containers in the lab (even for nonhazardous materials, like water) to avoid confusion.

If bottles are too small for a label, letters/numbers that reference a log are acceptable as long as all lab users are aware of this practice.



Safe Storage

- It is much safer to store chemicals by their hazard(s) rather than alphabetically
- Use any special cabinets you have as they are intended
- It is a best practice to store all chemical containers in cabinets rather than on the lab bench or in hoods
- Wash and dry glassware/equipment after use and promptly return to storage – do not let items build up in sinks

Click the image to view details on suggested storage groups
(Source: The University of Vermont)



Laboratory waste

Hazardous waste

Much of the chemical waste generated in labs is considered “hazardous waste” according to federal and state regulations.

EMPTY CONTAINERS can be put in the trash **UNLESS** they contained a P-listed waste (see Appendix A of the [Waste Disposal Guide](#) for the list). Consult with EHS for P-listed waste disposal procedures.

COMPLETELY DEFACE all empty containers before disposal.

Biohazardous waste

Includes all items considered “regulated waste” by [OSHA’s Bloodborne Pathogens Standard](#) and “potentially infectious medical waste” by the Illinois EPA. See [DePaul’s Exposure Control Plan](#) for more information.

Place in red containers labeled with the biohazard symbol and word “Biohazard”:

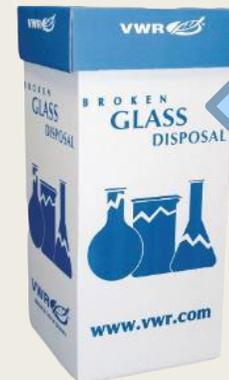


Use appropriate sharps containers when needed.

Radioactive waste



Please contact EHS and Radiation Safety Officer [John Dean](#) prior to purchasing radioactive materials and if you have any in need of disposal.



Regular trash

Clean broken glass must be placed in designated boxes. This is for the protection of our custodians.

When full, these boxes may be placed in any **NON-RECYCLING DUMPSTER**. If you need help transferring them to a dumpster, please make a janitorial work order and leave them inside the lab for pick up. Tape boxes shut.

UNCONTAMINATED lab debris (gloves, towels, plastic, rags, etc.) can be disposed of as regular trash.

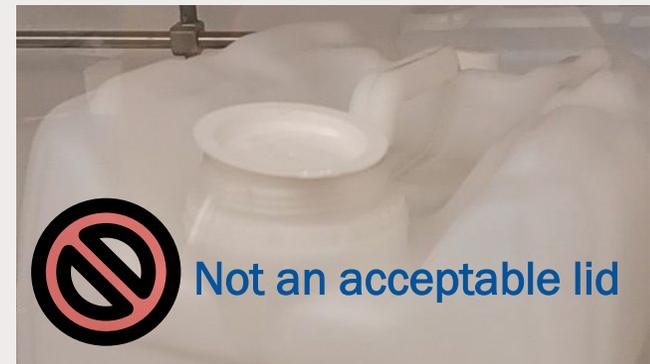
Drain Disposal

- Most chemical waste you generate is hazardous waste, or cannot go down the drain due to water treatment facility rules
- Not much can be drain disposed beyond soap and water
- If you are unsure whether something can be drain disposed, please [contact EHS](#)



Hazardous Waste Storage

- You are allowed to store up to 55 gallons of hazardous waste in your lab as long as certain conditions are met. This is called a **Satellite Accumulation Area**.
 - Waste must be near the process that generates it
 - Waste containers must have securely fitting lids and be kept **CLOSED** (except while actively adding waste)
 - No need to date waste containers; they can accumulate until the 55 gal limit is met
- Take care not to create unknown waste which can be \$\$\$\$ to characterize and dispose of
 - Ensure labels do not degrade due to chemical splatter or time
 - Label all secondary and waste containers immediately



Hazardous Waste Labeling

- Please label waste generated in your lab with the following:

- The words “Hazardous Waste”
- Generator Name/Lab
- All contents (list the % of each if possible)

EHS can provide you with labels or you may create your own.

Writing directly on containers is also fine.

Hazardous Waste

Bldg/Lab # _____ Owner _____

Contents

1) _____ % _____

2) _____ % _____

3) _____ % _____

4) _____ % _____

5) _____ % _____

6) _____ % _____

7) _____ % _____

8) _____ % _____

Questions/Concerns call EHS 5-3344

Supplies EHS Can Provide



40 gal “bio bins”

All containers (except bio bins) can be open top (entire lid removable) or closed top (small opening) and translucent or opaque plastic/metal

5 gal buckets & “carboys”



15 gal



30 gal



55 gal



Bio Bins

Each bio bin comes with a liner. Place all waste inside this liner and make sure it does not slip down. It must be tied shut before the bin is transported off-site.

Sharps and anything that could puncture a bag must be put in a hard-walled sharps container prior to placement in a bio bin (or any other collection containers provided by departments).

Sharps include all needles/syringes (even if unused), pipettes, scalpels, slides, etc.

When bio bins are about $\frac{3}{4}$ full, contact EHS for pick up.



Tips for Reducing Waste

- Practice smart chemical procurement
 - Be realistic about the quantities you need
 - Bulk buys are not usually a good deal when it comes time to dispose of them
- Use the principles of green chemistry to design experiments that use less hazardous reagents and produce less waste
- Use [Vertère](#) to manage your inventory and share with colleagues

A Note on Inventories



You should regularly update and ensure your inventory is accurate on [Vertère](#).

At a minimum, inventories should be updated annually.

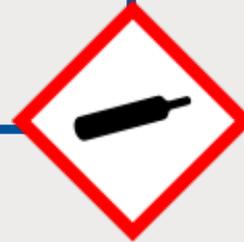
In the event of a fire, these inventories will be shared with the responding fire department.

If you need to request Vertère access for someone in your lab, please contact [Rick Niedziela](#).

Non-Chemical Hazards

Please watch this brief [video](#) on other lab hazards, including but not limited to:

- Compressed gas cylinders
- Electrical shock
- Extreme temperatures
- Slips, trips and falls
- Sharp objects



Do not chain cylinders together. Each cylinder must be anchored separately to a sturdy surface.

Store oxygen cylinders at least 20 feet away from any fuel gas (hydrogen, carbon monoxide, methane, propane) cylinders.

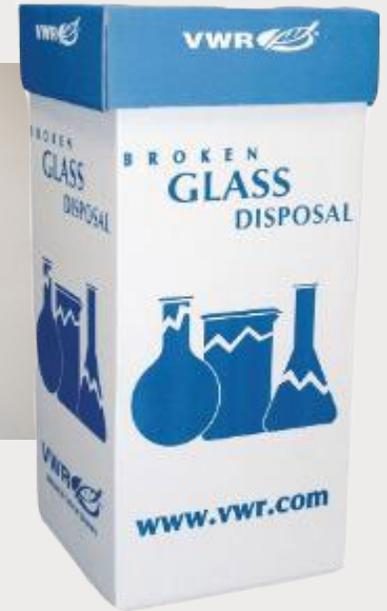
Cap cylinders during transport and when not in use.

Remove empty cylinders promptly and according to departmental procedures.

Click the pictogram to view the EHS Compressed Gas Safety Manual.

Sharp Objects

- Be aware of sharp objects in the lab including any needles and broken glass and follow your supervisor's instructions for their handling and proper disposal.
- Never pick up broken glass with your hands. Always use a broom and dustpan, tongs, or other appropriate device.
- Always deposit (clean) broken glass in designated broken glass boxes. If the glass is contaminated, ask your supervisor for help.
- Never recap needles or remove needles from syringes. Deposit the entire syringe directly into a sharps container after use.



Emergency Procedures

- Know all potential evacuation routes from the labs you work in
- Review the [CHP](#) for spill response information and guidance on handling different types of chemical exposures
- Know what emergencies could occur in your lab and review the [Emergency Plan for Hazardous Materials Incidents](#)

If a chemical exposure occurs:

- If the person is having trouble breathing or staying conscious, **CALL 911** and then alert Public Safety
- If needed, assist the person in using a safety shower or eye wash station
- If you are unsure how to respond, you can always call the Illinois Poison Center for free and confidential assistance. They are qualified to provide guidance on any potentially hazardous exposures.



Always keep aisles
and exits clear



&

do not block access
to emergency equipment



Reporting

- Remember that any time anyone experiences a medical emergency on campus, you are advised to call 911 immediately, and then Public Safety.
- All accidents or injuries that occur on University property, whether life threatening or not, must be promptly reported to Public Safety so that a report can be issued. Keep Public Safety's number in your phone for easy access: **(773) 325-7777**
**Minor spills need to be reported to Public Safety only if someone came in contact with the spill, was injured, or the situation poses danger to people or property.*



Please notify EHS via [online incident report form](#) within 72 hours of all laboratory incidents involving hazardous chemicals (including minor spills).

- If an incident occurs related to an IACUC/IBC protocol, report it to the [Office of Research Services](#).

A Note on Lab Security

- Be aware of your surroundings
 - Take note of anyone or anything suspicious and promptly report to Public Safety at **773-325-7777** (5-7777 from campus phones)
- If you don't have an automatic locking door, lock whenever you leave
- Review Public Safety's recommended [active shooter training](#)
 - Consider sharing it with students as part of their safety training

Where can you get
help with lab safety
issues?



Lab Coordinators

Biology



Rima Barkauskas
(773) 325-1891



Claire Behrens
(773) 325-7595

Environmental
Science



Maggie Workman
(773) 325-7445

Chemistry

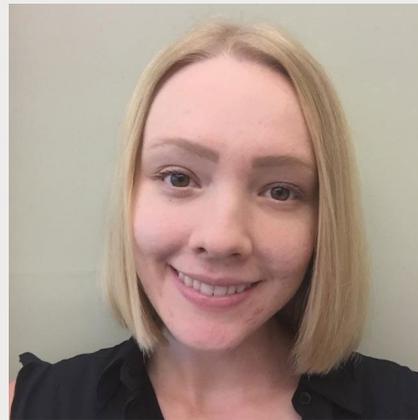


Corey Lin
(773) 325-7368

- These are your departmental contacts for chemical procurement, waste disposal and general lab safety questions
- Can assist you with using Vertére for chemical inventory and sharing

Environmental Health & Safety (EHS)

ehs.depaul.edu | 773-325-3344 | ehsoffice@depaul.edu



Katie Abma
Senior EHS Analyst
kabma@depaul.edu
773-325-8985

Office of Research Services (ORS)

research.depaul.edu

- ORS promotes, facilitates and supports research, scholarship, teaching and creative activities
- Some research requires approval by ORS committees
 - Institutional Biosafety Committee (IBC)
 - Institutional Animal Care and Use Committee (IACUC)
 - Institutional Review Board (IRB) for research involving human subjects

Lab Safety Training

There are 2 types:

1

This training (that you're almost done with)!

Faculty, Staff & Students with Lab Duties:

This training is required annually for all faculty, staff, and students with lab duties.

[*Year-round link to this training](#)

[*List of personnel who are current on this training](#)

2

Students in Lab Classes (D2L):

A separate training and quiz hosted on D2L for students in lab classes. This training is required for **ALL LAB CLASSES** except ENV 260: Environmental Data Analysis this quarter.

Resources

All links in this training and a few more are listed below for your convenience:

[OSHA's Lab Standard](#)

[Annotated PEL Tables](#)

[Are OSHA's PELs Safe? OSHA Says No](#)

[EHS Resources](#): Chemical Hygiene Plan, Exposure Control Plan, Fume Hoods Manual, Compressed Gas Safety Manual, Waste Disposal Guide and more

[EHS Incident Report Form](#): For reporting any laboratory incidents involving hazardous chemicals, **including minor spills**

[Background on GHS](#)

[GHS Pictograms](#)

[Suggested Chemical Storage Groups](#)

[OSHA's Bloodborne Pathogens Standard](#)

[Vertére](#)

[Emergency Plan: Hazardous Material Incidents](#)

[Illinois Poison Center: 1-800-222-1222](#)

[Active Shooter Training](#)

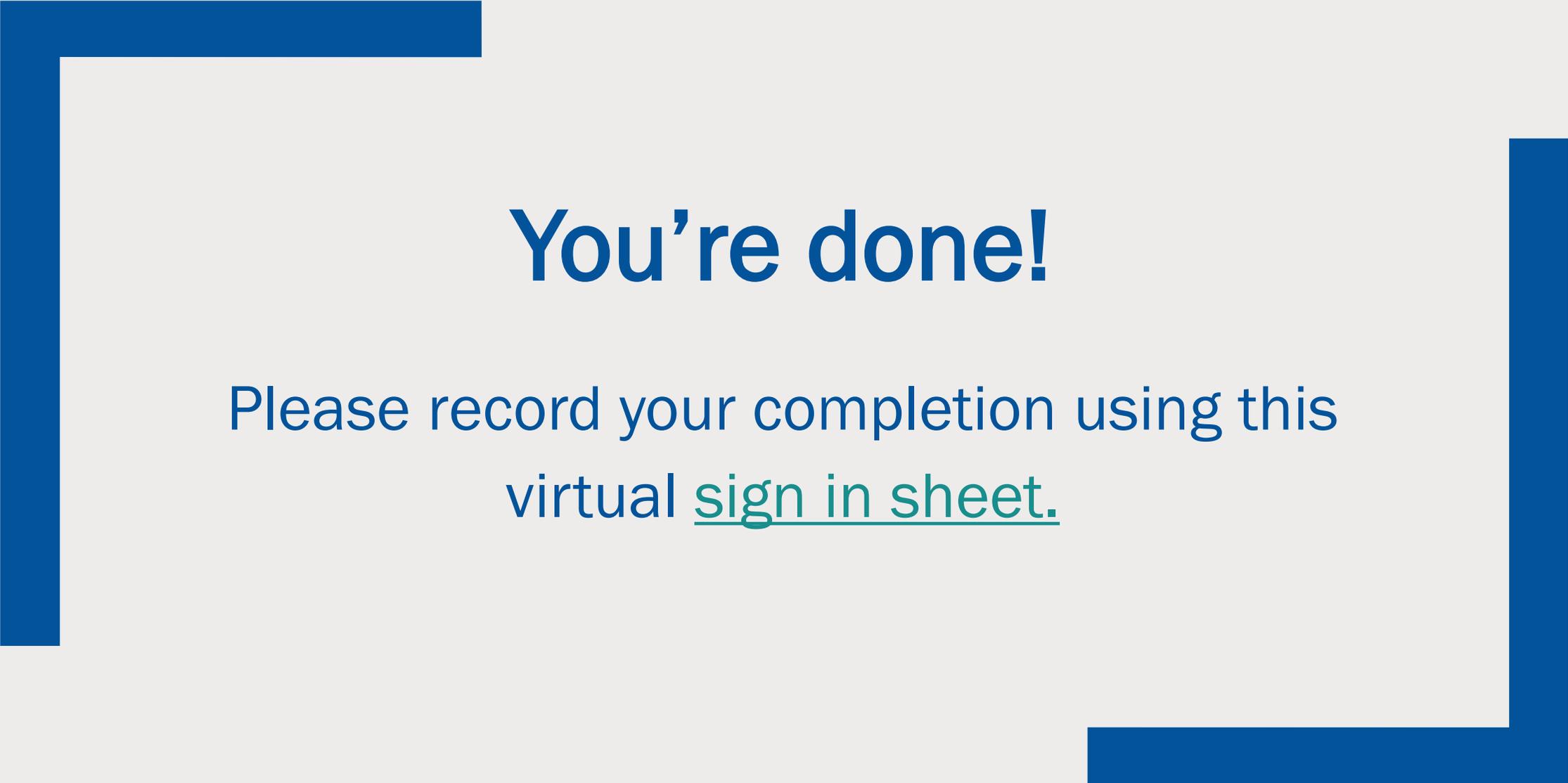
[Chemical Safety information from the Library's Chemistry & Biochemistry Research Guide](#)

[Environmental Health & Safety](#)

[Office of Research Services](#)

[Year-round link for this training](#)

[List of personnel who are current on this training](#)



You're done!

Please record your completion using this
virtual [sign in sheet](#).