

MSE Seminar Laboratory Safety Skills

MSEGSAs Safety Committee

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Topics

- **Personal Protective Equipment**
 - Proper glove selection and use
 - When to use goggles and aprons
- **Chemical Responsibility**
 - Ordering
 - Storage
 - Handling and Labeling
 - Waste Disposal
- **Accident Procedures**
- **Lab Etiquette and Notebooks**

Personal Protective Equipment

- **Glove Selection**
 - **Based on material to be handled**
 - Chemical properties
 - Amount of chemical used
 - Temperature used
 - **Terms used by companies to rate gloves**
 - Permeation - time it takes the chemical to diffuse through the glove
 - Degradation - time it takes the chemical to break down the glove material

Glove Manufactures and Guides

- **Use Guidelines Available at Manufactures' websites**
 - **Microflex**
<http://www.microflex.com/Products/~media/Files/Literature/Microflex%20Chemical%20Resistance%20Guide.ashx>
 - **Kimberly-Clark**
 - <http://www.kcprofessional.com/us/mkt/ChemicalSelectorGuide/index.asp>
 - **Ansell**
http://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf

Latex (Natural Rubber)

- **Protects against solid irritants**
- **Used to keep finger grease from contaminating samples and equipment**
- **Protects against most aqueous (water based) solutions**
- **For incidental contact with most polar solvents (acetone, ethanol, and isopropyl alcohol.)**
- **Not recommended for methanol, acids or bases.**
- **Not recommended for non-polar (toluene) and chlorinated (methylene chloride) solvents.**

Nitrile

(Nitrile Butadiene Rubber)

- **Protects against solid irritants**
- **Protects against most aqueous (water based) solutions**
- **For incidental contact with most polar solvents (ethanol and isopropyl alcohol), non-polar solvents (toluene), chlorinated solvents (tetrachloroethylene), and dilute acids and bases.**
- **Not recommended for acetone or methanol.**

Neoprene (Polychloroprene) , Neoprene Natural Rubber Blends, Butyl Rubber

- **Suitable for extended contact with most polar, non-polar, and chlorinated solvents**
- **Suitable for most acids and bases**
- **Usually thicker and longer than disposable gloves**
- **Best for ketones and hydrocarbons**

From the Glove Selection Guides



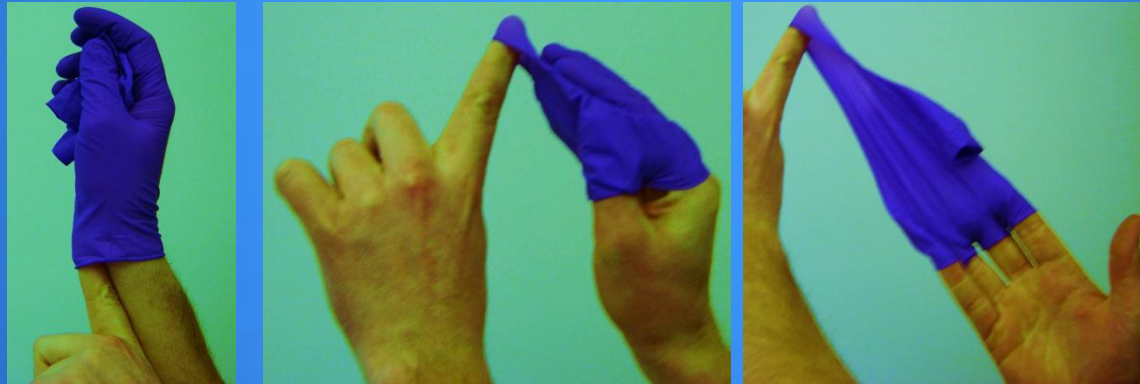
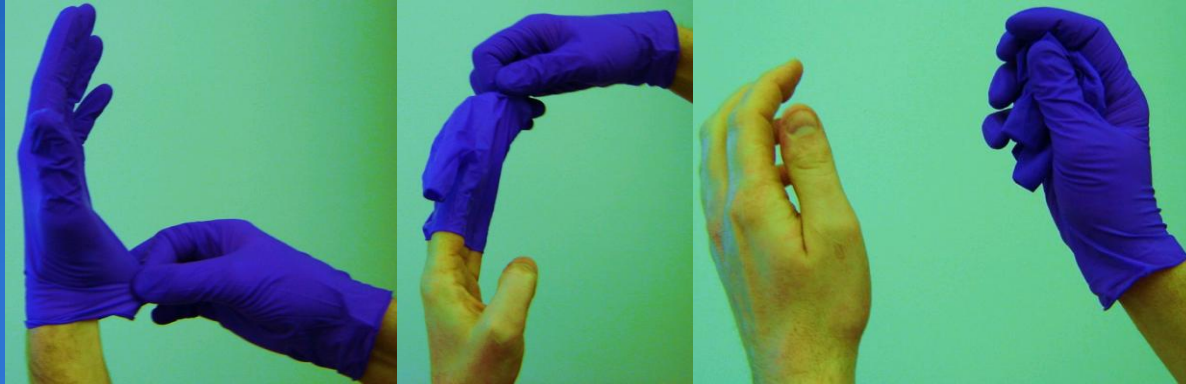
Chemical	Latex	Nitrile	Neoprene
solids	G	G	G
acetone	NR	NR	G
methanol	F	G	G
ethanol	G	G	G
isopropanol	G	G	G
hydrochloric acid (37%)	NR	NR	G
hydrogen peroxide (30%)	G	G	G
sodium hydroxide (50%)	G	G	G

Note: Microflex makes the latex and blue nitrile gloves. Their guide has much less stringent requirements than Ansell and Kimberly Clark

Glove Rules in the Laboratory

- Wear the correct gloves for the job.
- Change disposable gloves after two hours of use.
- Wash hands once gloves have been removed.
- Disposable gloves must be properly removed and discarded.
- Non-disposable/reusable gloves must be washed and dried, as needed, and then inspected for tears and holes prior to reuse.
- Remove gloves before touching personal items, such as phones, computers, and pens.
- Do not wear gloves out of the lab. If gloves are needed to transport anything, wear one glove to handle the transported item.

Glove Removal



Goggles

- Safety glasses are not adequate protection from chemical splash, mists, and vapors.
 - Use goggles when pouring from large bottles of chemicals. Plus face shield when pouring acids and bases.
 - Use goggles when working with moderate to large volumes of chemicals.
- Types
 - Direct Vented - Impact protection only
 - Indirect Vented - Impact and splash protection
 - Non-Vented - Impact, splash, vapor, and mist



Lab Coats and Aprons

- Use disposable lab coats when the potential for contamination with hazardous chemicals is present.
- Use lab coats to protect your clothing. Store in the lab.
- Use chemical resistant aprons when working with large amounts of chemicals or pouring acids and bases. If contaminated, wipe down when finished.
- Tie back long hair and loose clothing that might be caught in machinery or fall into chemicals.










Chemical Responsibility

- **Ordering Chemicals**
 - **Purchase order must be signed before turning in to business office.**
 - **MSDS needed for new chemicals.**
 - **Purchase only what you need.**
 - **Scale down processes as much as possible.**
 - **Determine storage needs before ordering.**

Chemical Storage

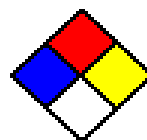
- Segregate by class and/or reactivity

EXAMPLE	Diborane
Blue = Health hazard	 <p>Ignites spontaneously in moist air.</p>
Red = Fire hazard	
Yellow = Reactivity hazard	
White = Special hazard	

Chemical Class	Example	Storage	Incompatibles
Corrosives Inorganic acid 	HCl, HNO ₃ , H ₂ SO ₄	Hood cabinet, Shelf liner	Flammable liquids & solids, bases, organic acids, oxidizers
Corrosives Organic acid 	Acetic, Lactic	Hood cabinet, Shelf liner	Flammable liquids & solids, bases, inorganic acids, oxidizers
Corrosives bases 	NH ₄ OH, NaOH, KOH	Hood cabinet, Shelf liner	Flammable liquids & solids, acids, oxidizers
Flammable Liquids 	Acetone, EtOH, MeOH	Flammable cabinet (or hood cabinet)	Corrosives, oxidizers
Oxidizers 	H ₂ O ₂ , KMnO ₄ , KClO ₃ , NaClO	On separate shelf	Flammable liquids & solids, corrosives, reducing agents
Reducing Agents 	Hydrides, oxalic acid, formic acid	On separate shelf	Oxidizers
Flammable Solids 	Powdered metals, charcoal, carbon	On separate shelf	Corrosives, oxidizers
Non-Reactive General	NaCl, Al ₂ O ₃	Cabinets, Benches	Check MSDSs to confirm

Handling and Labeling

- **Chemicals or prepared solutions must be properly labeled.**
 - Chemical name (as it appears on the MSDS)
 - Name of the chemical manufacturer or person who prepared the solution
 - Necessary handling and hazard information
 - Concentration or purity
 - Date prepared
 - Expiration or "use by" date



Chemical Name

Common Name

Manufacturer

Chemical Handling

- **Add acids and bases slowly to water or other solvents**
- **Make up only the amount of etchant or solutions that you really need to etch the samples**
- **When preparing etchants, do not make changes from published procedures.**

General Safety Guidelines for Hazardous Waste Management

- 1. Determine if your waste is hazardous**
- 2. Identify and separate waste by class**
- 3. Label hazardous waste containers**
- 4. Complete Hazardous Material Pickup Request Form**

Waste Disposal

- **Segregate by class**
 - Organic Acids
 - Inorganic Acids
 - Bases
 - Polar Solvents
 - Non-Polar Solvents
 - Chlorinated Solvents
 - Oxidizers
 - Reducing Agents
- Store by class - do not need to be in hood
- Use smaller bottles for less used chemicals
- Maintain label only 5-10 most abundant (except toxics)

PURDUE UNIVERSITY HAZARDOUS WASTE DISPOSAL TAG
Chemical Ingredients

Principle Investigator: _____

Contents (Print)

1. _____	95	_____
2. _____	95	_____
3. _____	95	_____
4. _____	95	_____
5. _____	95	_____
6. _____	95	_____
7. _____	95	_____
8. _____	95	_____
9. _____	95	_____
10. _____	95	_____

Comments: _____

REM Pickup Form

HMM-001

Hazardous Material Pickup Request

(Located on our website: <http://www.purdue.edu/rem/home/files/forms.htm#HMM001>)
Send to **REM, LMSE** via campus mail or **Fax 49-61106**

PI: _____ PI Telephone #: _____

Requested By: _____ Date: _____

Telephone #: _____ E-Mail: _____

Building: _____ Room/Shop: _____ Waste Location

Department: _____ Dept. Code: _____

When filling out this form remember the following:

- All mixture materials must be submitted in a percentage format. Each Container's percentage must add up to 100% (See Example Below).
- Chemical descriptions on this form must match the container label.
 - Always include as much information as possible.
 - Only submit known mixtures or chemicals.
 - Absolutely no chemical formulae, abbreviations acronyms or structures.
- When submitting trade products:
 - It is your responsibility to provide the product information.
 - An accurate chemical description of the product must accompany the form (i.e. an MSDS).
- Make sure all writing is legible.
- Forms completed improperly can cause severe delays in pickup times.

Example Pickup Line:

1	Acetone 50%, Benzene 10%, Dichloromethane 20%, Acetic Acid 10%, Water 10%, Trace Silver	5	5 gal.	5 gal.	S	L
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I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Item #	Chemical Description (List Each Container)	Number of Containers	Container Size	Amount of Waste in Container	Spent/ Usable	Solid/ Liquid/ Gas/ Aerosol

Special Comments or Instructions: _____

1

- Containers capped & clean
- Labels match form
- Full chemical names
- Most abundant 5 chemicals (except for toxic chemicals)
- Note location in comments

Accident Procedures

Worker's Compensation Flow Chart for Obtaining Medical Care on Day of Injury

Examples of Injuries

Abrasions, bruises, minor lacerations	Chest Pain
Punctures, splinters	Shortness of breath or difficulty breathing
Minor burns	Diabetic emergencies
Dirt or dust in the eye	Loss of consciousness, combative, or confused
Sprains, strains	Head injury or serious blow to the head
Repetitive motion injuries	Uncontrolled bleeding
Rashes	Fractures and dislocations
	Falls from height or down stairs
	Injuries of the spine -- neck or back, severe back pain
	Eye injuries / chemicals in the eye
	Chemical burns
	Any injury that causes severe pain

**Some of the above may not be conditions that qualify under Worker's Compensation but are emergency events that require prompt action.*



- OK to be driven by supervisor or a designated employee in a University vehicle.
- OK for employee to drive themselves if it is safe for them to do so

Transport to designated medical facility



Call for an ambulance.

(Call 911 from any phone and tell the operator that the injury is on the Purdue University campus. In Lafayette/West Lafayette, they will transfer you to the Purdue dispatcher.)

Transport to local hospital ER.

Whenever there is doubt about the severity of an injury, err on the side of caution and call for an ambulance.

Accident Procedures

Purdue Worker's Compensation and Disability Guide

The employee and the supervisor need to work together to handle two main responsibilities:

- Arranging for the employee to receive the medical treatment he or she needs.
- Completing the required Worker's Compensation reports.

Medical Treatment

- If you're an employee who gets hurt or sick on the job, report the incident to your supervisor immediately.
- You should not use your personal physician for work-related injuries or illnesses.
- If you need medical attention, your supervisor should help you get to one of the medical providers on the list below.

Approved Providers for Worker's Compensation

- **Indiana University Health Arnett Occupational Health Center, 3746 Rome Drive Phone: 448-8708**
Use for non-emergency treatment. Hours: 8 a.m. – 5 p.m., Monday-Friday.
Extended hours are available through the Indiana University Health Arnett Urgent Care on Salisbury or Greenbush, 8 a.m.-8 p.m. daily.
- **Regional Occupational Care Center (ROCC), Unity Health Care Center, 1321 Unity Place, Creasy Lane. Phone: 446-2450**
Use for non-emergency treatment. Hours: 8 a.m.-6 p.m., Monday through Friday.
Extended hours are available through Unity Immediate Care, 8 a.m.-8 p.m. daily, except Christmas.
- **Franciscan St. Elizabeth Health – Lafayette East & Lafayette Central**
- **Indiana University Health Arnett Hospital**
Use for serious injuries.
Use for treatment when the occupational health centers and the extended hours facilities are closed.
Hours: Always open

Lab Etiquette

- **Clean up after yourself**
- **Return equipment and chemicals to the proper location**
- **Ask before taking something from the lab**
- **Do not block eyewashes and showers**
- **If you use the last of a common lab item, order more**
- **Do not go through drawers marked for other students**

Notebooks

- **Develop and maintain a sample reference and labeling system**