



KU

Wonderful Institute for
Sustainable Engineering

Personal Protective Equipment (PPE)

Presented by: Saufishan Akbar



WEDNESDAY, SEPTEMBER 16 AT 9:00AM



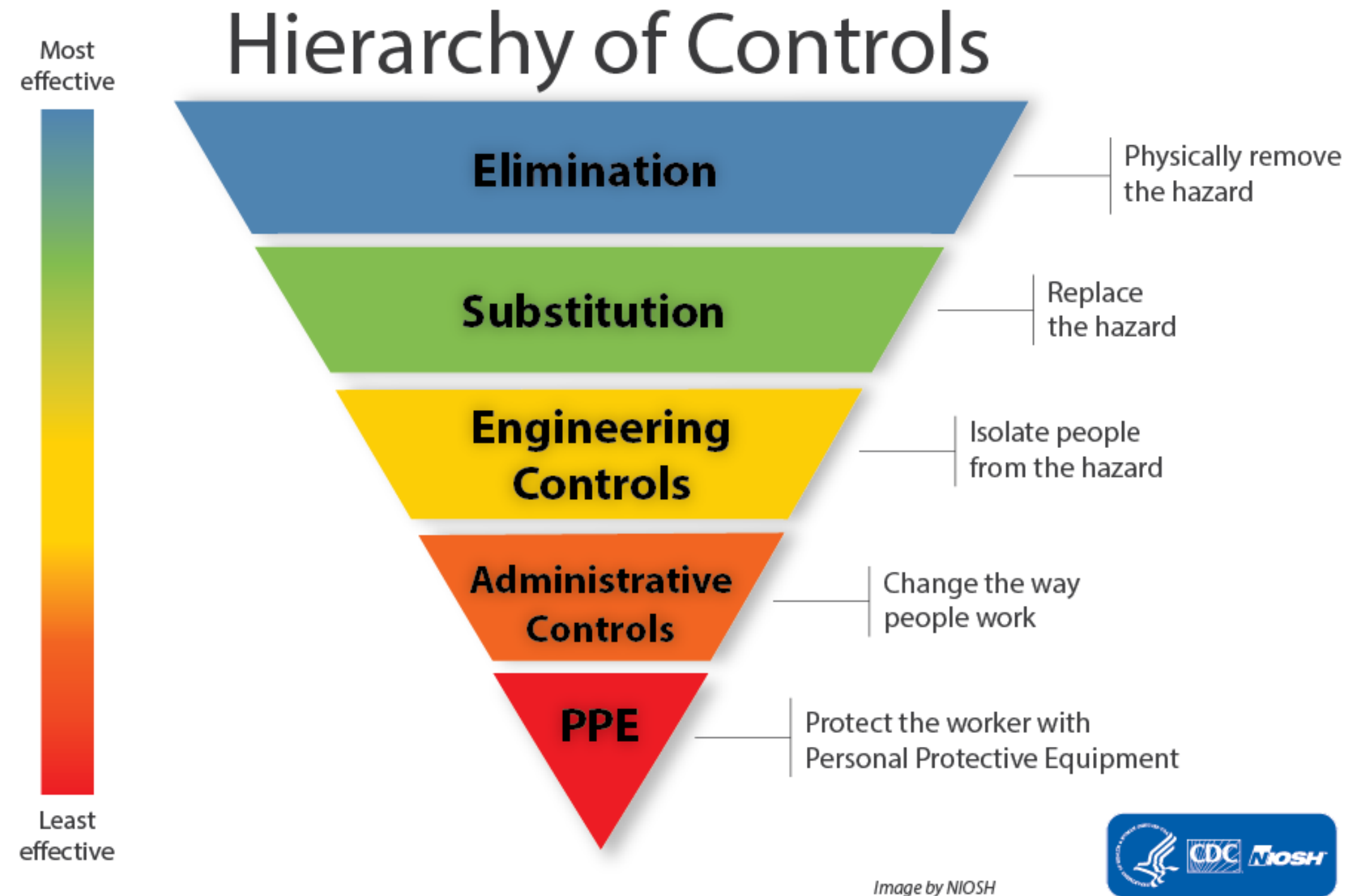
Attendance Check-In



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Hierarchy of Controls



" Hazard Assessment

- Injuries or illnesses can result from physical, chemical, thermal, electrical, radiological, mechanical, and other hazards
- Hazards and risks depend on environment and equipment
- [Laboratory Registration & Hazard Identification Form](#)
 - Used to identify and assess laboratory hazards and potentially harmful materials
 - Includes lab safety equipment, physical hazards, chemical hazards, biological hazards, etc.
- Hazard assessments are important to evaluate potential hazards and develop appropriate protective measures

" Hazard Assessment

- Be familiar with workplace facilities that may harbor hazards
- Look for warning signs and postings outside of hazardous areas
- Always consult the safety data sheet (SDS) for any chemical you are using

What is PPE?

Personal Protective Equipment

- Equipment used to minimize exposure to hazards that can cause serious workplace injuries and illnesses
- Includes items such as:



Gloves



Safety glasses



Lab coats



Earplugs



Hard hats

^{IV} Roles & Responsibilities

KU Environment, Health, and Safety (EHS)

- Assists in selection of PPE
- Assists in development of training
- Provides periodic audits of machine safeguards

Your Department

- Ensures machines and tools have the appropriate safeguards
- Provides PPE to employees when necessary
- Provides proper training to employees

^{IV} Roles & Responsibilities

Your Supervisor

- Analyzes work to determine the safest and most efficient procedure along with physical protection needed
- Only assigns tasks to qualified and trained individuals

Employee/Student (YOU)

- Work safely
- Operate machinery with safeguards in place
- Wear, care for, and store PPE properly
- Inform supervisor if PPE needs replacement

SDS Example: Benzene

SECTION 2. HAZARDS IDENTIFICATION

Benzene SDS

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

- Flammable liquids : Category 2
- Skin irritation : Category 2
- Eye irritation : Category 2A
- Germ cell mutagenicity : Category 1B
- Carcinogenicity : Category 1A
- Specific target organ toxicity - repeated exposure : Category 1 (Blood)
- Aspiration hazard : Category 1
- Long-term (chronic) aquatic hazard : Category 3

- Hand protection
- Material : Fluorinated rubber
 - Break through time : 480 min
 - Glove thickness : 0.7 mm
 - Protective index : Full contact
 - Manufacturer : Vitoject® (KCL 890 / Aldrich Z677698, Size M)
- Material : Fluorinated rubber
- Break through time : 480 min
 - Glove thickness : 0.7 mm
 - Protective index : Splash contact
 - Manufacturer : Vitoject® (KCL 890 / Aldrich Z677698, Size M)
- Manufacturer : data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
- Remarks : Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be

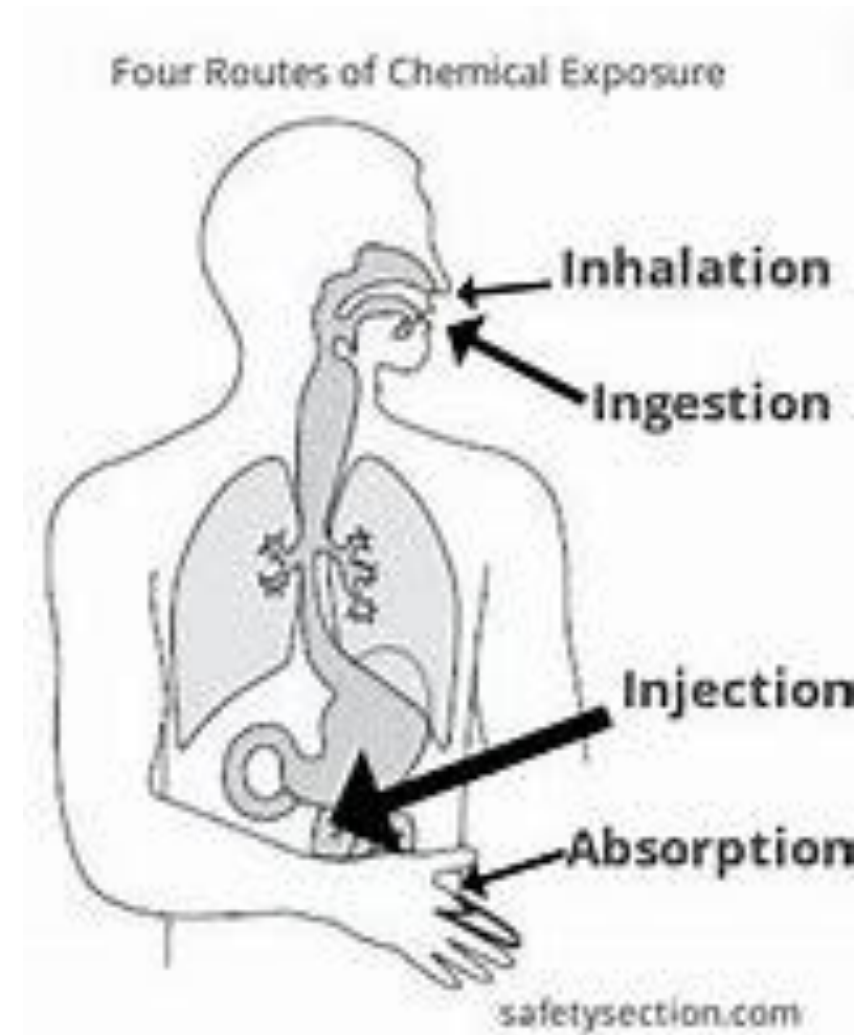
Based on the SDS and listed hazards, you can make an informed decision on what PPE to wear



Preventing Exposure

Exposure Routes:

- Inhalation → Lungs
- Ingestion → Swallowing
- Absorption → Skin or eyes
- Injection → Via needle



^{VI} Overview of PPE

Minimum Level Laboratory Safety Attire



More Resources available at KU EHS

- Training Courses available on Canvas
<https://ehs.ku.edu/canvas>

Eye and Face Protection

- Determined by a hazard assessment of relevant material
- Examples include:



Safety glasses w/ Impact/side shield protection
- Stronger than glasses



Safety goggles – Impact and chemical splash protection
- surround the entire eye area



Face shield
- cover the entire face

Safety eyewear should meet ANSI Z87 standards

****Note: Normal prescription glasses are not safety glasses*

Eye and Face Protection

Practical Demonstration of the Importance of PPE



Chemical Eye Burns

Alkali – Most dangerous; penetrates more rapidly than acids

- Higher pH causes more damage
- Cause severe injury to cornea and lens
- Examples: ammonia, lye, magnesium
- Everyday products: fertilizers, cleaning products

Acids - Usually only damage the front of the eye but can cause blindness

- Examples: sulfuric acid, hydrochloric acid, acetic acid
- Everyday products: glass polish, nail polish remover, battery acid

Irritants - Have a neutral pH; generally, cause more discomfort than damage

- Examples: household detergents, pepper spray

Hand Protection

Material	Effective for:	Not effective for:
Butyl	Aldehydes, ketones, esters, gases and water vapors, acids, bases	Aliphatic/aromatic hydrocarbons, halogenated solvents
Nitrile	Aliphatic solvents, some acids and bases, many alcohols	Ketones, strong oxidizers, chlorinated solvents
Neoprene	Acids, some alcohols and organic acids	Aromatic hydrocarbons and many chlorinated solvents
PVC	Acids, bases, salts, some alcohols	Organic solvents, aldehydes and esters
Viton	Chlorinated and aromatic solvents, gas and water vapors, benzene	Ketones and esters



Other PPE

PPE should protect wrists, ankles, face, and neck.

Standard Protection:

- Full-length pants or skirts below the knee
- Closed-toe shoes



Lab Coats: Additional protective layer, should be cotton and fall below knees



Steel Toes: Protect from impact of a falling heavy object

^{vii} Common Mistakes

1. Poor assessment
 - a) PPE is unsuitable for presented hazards
2. Lack of training
 - a) Incorrect use
 - b) Incorrect disposal
 - c) Failure to maintain
3. Lack of accountability
 - a) Enforce among your peers
4. Comfort over safety
 - a) Must still use PPE even if it's uncomfortable
5. Failure to update or adapt
 - a) New equipment/procedures/chemicals used means revisiting PPE

Scenario 1: Gas Cylinders

- Can pose several hazards including...

1. High Pressure

- Compressed gases are under pressure

2. Chemical Hazards

- Gases may be flammable (hydrogen), toxic (carbon monoxide), oxidizing (oxygen), corrosive (hydrogen chloride), inert (nitrogen)

3. Physical Hazards

- Heavy and often awkward to move

- Example:

Size 1A Nitrogen Cylinder

- 2,490 psig at 70°F
- 151 lbs

Cylinder Specifications

Cylinder Size	Valve Outlet CGA No.	Pressure psig @ 70°F	Pressure kPa @ 21.1°C	Approximate Ship Weight	
				lb	kg
1U	677	6,000	41,369	359	163
1H	680	3,500	24,132	233	106
1L	580	2,640	18,202	170	77
1A	580	2,490	17,167	151	68

Scenario 1: Gas Cylinders

- When moving cylinders, be sure to...
 - Safety glasses and wear steel toes
 - Use a cylinder cart with a chain to transport
 - Keep cylinder caps on (no regulator on)
- When connecting or using, be sure to...
 - Wear safety glasses
 - Safety goggles for impact protection
 - Wear gloves



Scenario 2: Ethylene Glycol (EG)

Consult SDS to determine hazards.



www.sigmaaldrich.com

Version 6.15
Revision Date 03/03/2026
Print Date 09/09/2026

• SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Ethylene glycol

Product Number : 324558
Catalogue No. : 626647
Brand : Sigma-Aldrich
Index-No. : 603-027-00-1
CAS-No. : 107-21-1

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Acute toxicity (Oral) : Category 4

Specific target organ toxicity - repeated exposure (Oral) : Category 2 (Kidney)

Sigma-Aldrich - 324558

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The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada



Other hazards

None known.

GHS label elements

Hazard pictograms :  

Signal word : Warning

Hazard statements : H302 Harmful if swallowed.
H373 May cause damage to organs (Kidney) through prolonged or repeated exposure if swallowed.

Scenario 2: Ethylene Glycol (EG)

- Must look at glove compatibility: [Glove Compatibility Chart](#)
 - Nitrile is the most common glove and it works here.

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
62. Ethylene Glycol	▲	>480	E	E	>360	E	E	>480	E	F	120	VG	E	>360	E	E	>360	E	E	>480	E	—	—	—	—	—	—

- Should we even wear gloves when handling EG?

Hand protection

Material	: Nitrile rubber
Break through time	: 480 min
Glove thickness	: 0.11 mm
Protective index	: Full contact
Manufacturer	: KCL 741 Dermatrill® L

- Know your process/procedure, and know how to choose the correct PPE for your circumstance



Scenario 2: Ethylene Glycol (EG)

- Potential hazards
 - Harmful if swallowed
 - May cause kidney damage through prolonged or repeated oral exposure
 - Avoid breathing vapors, mist, or aerosols
 - Combustible liquid
- Always use minimum PPE, include lab coat for protection against splashes and vapors
 - Proper gloves
- Use in a fume hood to prevent vapor inhalation



Scenario 3: Acids or Bases

- Hazardous to eyes (especially bases)
- Use splash protection with substances that have pH below 2.5 or above 10
 - **pH ≥ 11.5 or ≤ 2 is considered Serious Eye Damage Category 1 [OSHA](#)**
- Wear appropriate PPE
 - Safety goggles or Face shield
 - Appropriate gloves
 - Lab coat



PPE in Everyday Life

Different setting. Same principle.

 1. MOWING THE LAWN	 2. DIY / DRILLING / WOODWORKING	 3. USING HOUSEHOLD CLEANING CHEMICALS	 4. HOUSEHOLD WASTE MANAGEMENT	 5. BIKING / RECREATIONAL ACTIVITIES
				
HAZARDS - Flying rocks/debris - Loud noise 	HAZARDS - Flying particles - Dust - Noise 	HAZARDS - Chemical splashes - Skin/eye contact 	HAZARDS - Broken glass, sharp objects - Leaking/contaminated waste 	HAZARDS - Falls and impact - Collisions 
PPE  Safety GlassesHearing ProtectionClosed-toe Shoes	PPE  Safety GlassesHearing ProtectionRespiratory Protection*	PPE  Appropriate GlovesEye Protection (when splash risk exists)	PPE  Protective GlovesClosed-toe Shoes	PPE  HelmetActivity-appropriate Protective Gear

*Use when dust or particles are generated.



IDENTIFY THE **HAZARD** → CHOOSE THE RIGHT **PPE** → USE IT CORRECTLY
PPE helps protect you—at home, in the garage, outdoors, and everywhere in between.



Recap

- PPE is the last line of defense
- Minimum PPE while in the lab includes safety glasses, gloves, long sleeves, long pants, closed-toe shoes
- Hazards should be assessed beforehand to determine proper PPE
- EHS provides safety trainings via Canvas
- Don't hesitate to remind peers in the lab to wear proper PPE
- Better to be safe than sorry!

the Wonderful company™



Thank you for listening!

Questions?

Contact:

✉ wise@ku.edu

📍 wise.ku.edu

All safety presentations are available at <https://wise.ku.edu/2026-presentations>

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