



PERSONAL PROTECTIVE EQUIPMENT'S

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Lab Safety & Operating System (PHAR 315)

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Outline

- ✓ Personal Protective Equipment's
- ✓ Eye & Face Protection
- ✓ Hand Protection
- ✓ Body Protection
- ✓ Respiratory Protection

Objectives

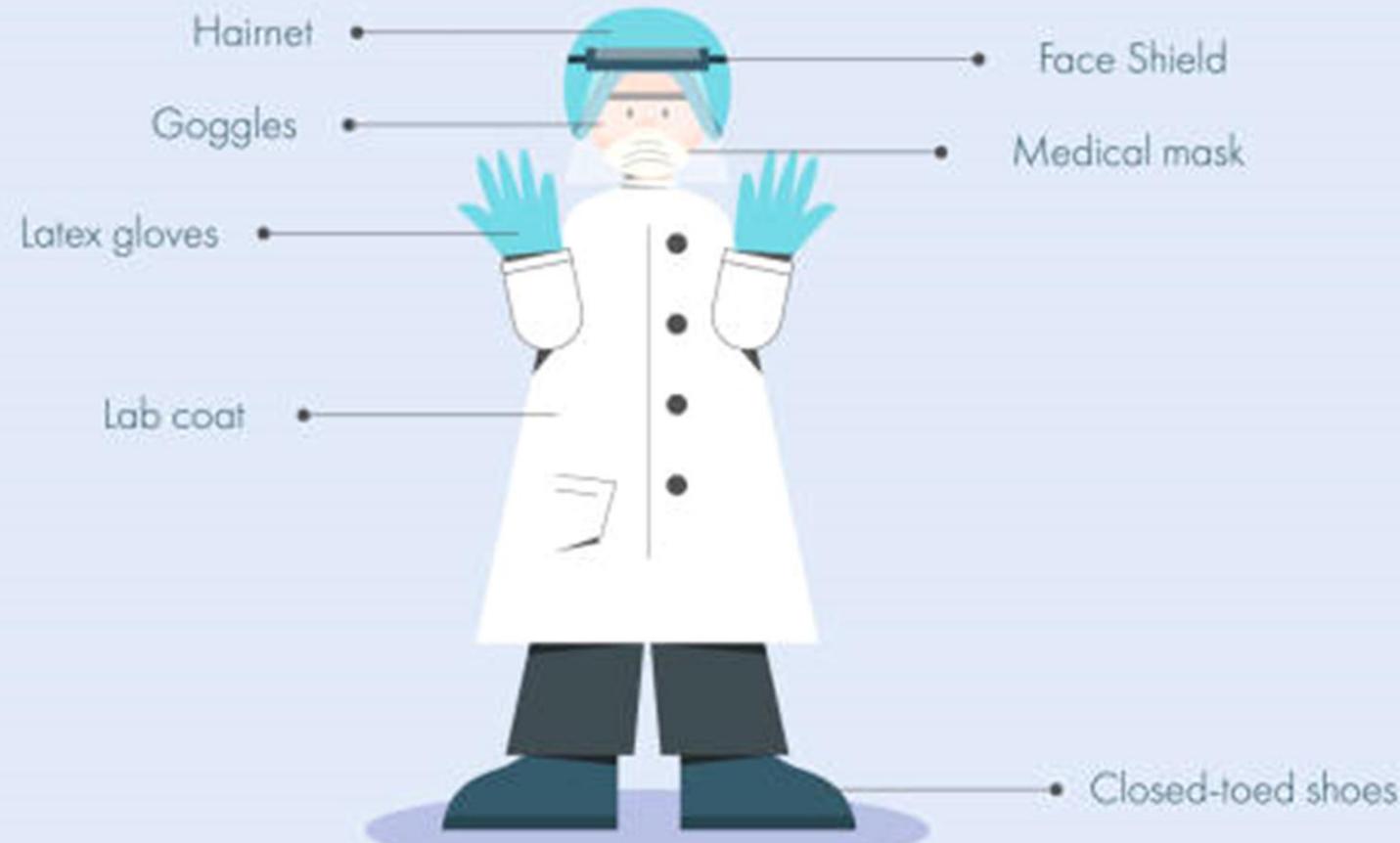
- Identify various types of Personal Protective Equipment (PPE).
- Demonstrate proper procedures for selecting the appropriate PPE.
- Show how to correctly wear PPE in a lab setting.
- Emphasize the importance of PPE in personnel safety and laboratory work integrity.



Personal Protective Equipment

- **Personal Protective Equipment**, commonly referred to as "PPE", is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.
- These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.
- Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

Laboratory Personal Protective Equipment (PPE)





Eye and Face Protection

- **Eye Protection** is achieved by wearing eyewear specifically designed to reduce the risk of exposure to chemical splashes, laser radiation, and/or flying debris. There are four primary types of eye protection of which each has its own limitations, including general safety glasses, laser safety glasses, and chemical splash goggles.
- **Full Face Protection** is achieved by wearing face shields.

Types of Eye Protection

Safety Glasses

- **Safety Glasses** provide eye protection from moderate effect and particles connected with grinding, sawing, scaling, broken glass, and minor chemical splashes, and so forth. Side defenders are required when there is a risk from flying items.
- In the case of safety glasses don't give sufficient insurance to procedures that include substantial synthetic utilize, such as, pouring or blending, splash goggles should be utilized.



Splash Goggles

- Including potential chemical splash hazards, utilization of concentrated corrosive material, and bulk chemical transfer splash goggles give satisfactory eye protection from numerous dangers.
- Goggles are available with clear or tinted lenses.

Laser Googles

- The lens of the eyewear is a filter/absorber designed to reduce light transmittance of a specific wavelength. The lens can filter out (or absorb) a specific wavelength while maintaining adequate light transmission for other wavelengths.
- A single pair of safety glasses is not available for protection from all LASER outputs. The type of eye protection required is dependent on the spectral frequency or specific wavelength of the laser source.

Face Protection



Face Shields

- When utilized in combination with safety glasses or splash goggles, face shields provide additional protection to the eyes and face.
- Face shields comprise of a flexible headgear and face shield of tinted or clear lenses or a mesh wire screen. When the whole face needs assurance, they ought to be utilized as a part of operations and worn to shield the eyes and face from flying particles, metal sparks, and chemical/biological splashes.

Safety glasses	Splash goggles	Laser goggles	Face shields
<p>Safety glasses provide eye protection from moderate impact and particles associated with grinding, sawing, scaling, broken glass, and minor chemical splashes, etc.</p> 	<p>Splash goggles provide adequate eye protection from many hazards, including potential chemical splash hazards, use of concentrated corrosive material, and bulk chemical transfer.</p> 	<p>The lens of the eyewear is a filter/absorber designed to reduce light transmittance of a specific wavelength. The lens can filter out a specific wavelength while maintaining adequate light transmission for other wavelengths.</p> 	<p>Face shields provide additional protection to the eyes and face when used in combination with safety glasses or splash goggles. Face shields consist of an adjustable headgear and face shield of tinted or clear lenses or a mesh wire screen.</p> 

Hand Protection

- Appropriate selection of gloves is essential to protecting hands. Chemically protective gloves are one of the most important tools to minimize dermal exposures to chemicals in laboratories. Gloves should only be used under the specific conditions for which they are designed, as no glove is impervious to all chemicals.
- It is also important to note that gloves degrade over time, so they should be replaced as necessary to ensure adequate protection.



Hand Protection

Most accidents involving hands and arms can be classified under four main hazard categories:

- Chemicals
- Cuts
- Heat
- Cold

Latex gloves	Resistant to ketones, alcohols, caustics, and organic acids.	
Nitrile gloves	Resistant to alcohols, caustics, organic acids, and some ketones.	
Cryogenic gloves	Cryogenic gloves are used to protect hands from extremely cold temperatures.	
PVA Gloves	Resistant to chlorinated solvents, petroleum solvents, and aromatics.	
Cut-resistant gloves	Cut resistant gloves are gloves designed to protect the wearer's hands from cuts while working with sharp tools.	
Heat-resistant gloves	Working with metal and glass forming and hot surfaces requires gloves that offer the highest level of protection against the multiple hazards of a high-heat workplace.	

Glove Removal Precautions

Removing disposable gloves depends on simple rules:

Firstly, grab the cuff of the left glove with the gloved right hand and remove the left glove. After that, while holding the removed left glove with the gloved right hand, insert a finger under the cuff of the right glove and gently invert the right glove over the glove in the palm of your hand and dispose of them properly. Finally, wash your hands with soap and water.





Body Protection

Lab Coat

- Provide protection of skin and personal clothing from incidental contact and small splashes.
- Prevent the spread of contamination outside the lab (provided they are not worn outside the lab).
- Provide a removable barrier in the event of an incident involving a spill or splash of hazardous substances.

Types of Body Protection

Type

- Traditional (cotton/cotton-polyester blend - protects skin and clothing from dirt, inks, non-hazardous chemicals).

Use

- General use; chemical, biological, radiation, and physical hazards.



Body Protection

Type

- Flame resistant (e.g. Nomex or other flame-resistant cotton - resists ignition).

Use

- Working with water or air reactive chemicals, large volumes of organic solvents, and potentially explosive chemicals.



Body Protection

Type

- Barrier (predominantly polyester — offers splash protection, not flame resistant).

Use

- Working with infectious materials.





Respiratory Protection

- A **respirator** is a device designed to protect the wearer from inhalation of harmful substances.

When chosen correctly and used properly, respirators can protect the wearer from:

- Fumes and smokes (welding fume)
- Harmful dusts (lead, silica, and other heavy metals)
- Gases and vapors (chemical exposures)
- Oxygen deficiency (oxidation, displacement, and consumption)
- Biological hazards (tuberculosis, whooping cough, flu viruses)



Respiratory Protection

Users must inspect their respirators before and after use. Respirator inspections must include checking that:

- Sealing surface are clean and free of cracks and holes.
- Rubber and elastic parts have good pliability and no signs of deterioration.
- Inhalation and exhalation valves are clean and seated properly.
- If full face, face shield is cleaned and clear (no smudges, scratches, or other damage that may impede visibility).

Type

Surgical Masks: Protect against large droplets and splashes.

Use

Working with live animals; working with infectious material .



Type

N-95 Masks: Protects against dust, fumes, mists, microorganisms.

Use

Working with live animals or infectious materials.



Type

Half-Mask Respirators: Purifies air: protects against a variety of particulates, vapors, dust, mists, fumes.

Use

Working with live animals or infectious materials with known airborne transmissible disease; dusty environments; chemical vapors.



Type

Full-Face Respirators: Same as half-mask, with greater protection factor; eye, mucus membranes, and face protection.

Use

Working with live animals or infectious materials with known airborne transmissible disease; dusty environments; chemical vapors.



References



Sveinbjornsson, B. R., & Gizurarson, S. (2022). Handbook for Laboratory Safety. 1st. Elsevier.