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**Intellectual Output 1**



**HEALTH & SAFETY AT WORKPLACE:**

**PERSONAL PROTECTION**

**INTRODUCTION**

From this unit you will learn: what PPE and the cleanroom is and how to get ready before entering the chemical lab.

**DISCUSSION QUESTIONS**

What personal protection items can you name in English? Which ones have you ever used during DIY activities or laboratory classes? Can you recall any risky situations or accidents that could have been avoided? (How?)

**READING**

Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly. Even where engineering controls and safe systems of work have been applied, some hazards might remain. These include injuries to:

* the lungs, e.g. from breathing in contaminated air
* the head and feet, e.g. from falling materials
* the eyes, e.g. from flying particles or splashes of corrosive liquids
* the skin, e.g. from contact with corrosive materials
* the body, e.g. from extremes of heat or cold

Personal protection equipment (PPE) protects the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE). It is provided for employees free of charge and it should suit the users, considering their size, fit and weight. Undoubtedly, PPE should comply with official regulations. It is also the company’s responsibility to train you to use the equipment properly, e.g. how to remove gloves without contaminating your skin. You should also know how to detect and report any faults. If PPE is disposable, learn which bin you should dump it in. If PPE is reusable, it must be properly looked after and stored when not in use, e.g. in a dry, clean cupboard. Two important tips: never allow exemptions from wearing PPE for those jobs that ‘only take a few minutes' and immediately replace the damaged item.

### Complete the following paragraphs with the body parts:

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***WHOLE BODY, LUNGS, EYES, FEET & LEGS, FACE, HANDS & ARMS, NECK, EARS***

1. The most common risk factors while working are heat, chemical or metal splash, spray from pressure leaks or spray guns, contaminated dust, impact or penetration, excessive wear or entanglement of own clothing. If there’s a need to protect your WHOLE BODY put on conventional or disposable overalls, boiler suits, aprons, chemical suits. The choice of materials here includes flame-retardant, anti-static, chain mail, chemically impermeable, and high-visibility clothing. Don't forget other protection, like safety harnesses or life jackets as well as safety ropes.
2. Use safety spectacles, goggles, face screens, faceshields, visors to protect your EYES from chemical or metal splash, dust, projectiles, gas and vapour or radiation. Always make sure the equipment you have chosen has the right combination of impact/dust/splash/molten metal eye protection for the task.

### Wear industrial safety helmets, bump caps, hairnets and firefighters' helmets so as to minimize the HEAD injury caused by falling or flying objects. Remember about the risk of head bumping or hair getting tangled in machinery. There are also such dangers as chemical drips or splash. It’s worth noting that some safety helmets incorporate or can be fitted with specially-designed eye or hearing protection. Consider the climate zone or the temperature to avoid overheating.

### Don't forget NECK protection, e.g. scarves for use during welding or when there’s too much sun.

1. Harmful noise is a combination of sound level and exposure duration. Very high-pitch sounds are a hazard even with short duration. To protect your EARS use earplugs, earmuffs, semi-insert or canal caps. Choose the right protection for the type of work ahead, and make sure you know how to fit the equipment properly. Remember that protectors must reduce noise to an acceptable level, while allowing for safety and communication.

### Abrasions, blisters, cuts and punctures are types of HANDS & ARMS injuries. They may be caused by temperature extremes, mechanical impact, chemicals, electric shock, radiation, biological agents and prolonged immersion in water. The safety options are: gloves, gloves with a cuff, gauntlets and sleeving that covers part or all of the arm. Remember that some materials are quickly penetrated by chemicals – take care in selection. Barrier creams are unreliable and are no substitute for proper PPE. Wearing gloves for long periods can make the skin hot and sweaty, leading to skin problems. Using separate cotton inner gloves can help prevent this. Furthermore, it is important to avoid gloves when operating machines such as bench drills where the gloves might get caught.

1. Wet, hot and cold conditions, electrostatic build-up, slipping, cuts and punctures, falling objects, heavy loads, metal and chemical splash, vehicles may result in FEET & LEGS injuries. PPE includes: safety boots and shoes with protective toecaps and penetration-resistant, mid-sole wellington boots. There is also specific footwear, e.g. foundry boots and chainsaw boots. Appropriate footwear should be selected for the identified risks. For instance, a variety of sole patterns and materials help prevent slips in different conditions, including oil - or chemical-resistant solutions. The material might also be anti-static, electrically conductive or thermally insulating to match the challenges of the job.
2. LUNGS are at risk in oxygen-deficient atmospheres or in presence of dusts, gases and vapours. Respiratory protective equipment (RPE) includes filtering facepieces and respirators. More sophisticated options are power-assisted respirators which filter contaminants from workplace air. There are also types of breathing apparatus which give an independent supply of breathable air, e.g. fresh-air hose, compressed airline and self-contained breathing apparatus. In any case it is vital to fit the equipment properly - especially tight-fitting filtering facepieces, half and full masks. Also, the right type of respirator filter must be used as each is effective for only a limited range of substances. Always keep in mind filters have only a limited life. If there is a shortage of oxygen or any danger of losing consciousness due to a confined space or exposure to high levels of harmful fumes, use a breathing apparatus – never use a filtering cartridge.

**TEACHER’S INPUT**

A **cleanroom** or **clean room** is a facility ordinarily utilized as a part of specialized industrial production or scientific research, including the manufacture of pharmaceutical items, integrated circuits, LCD, OLED and microLED displays. Cleanrooms are designed to maintain extremely low levels of particulates, such as dust, airborne organisms, or vaporised particles. Cleanrooms typically have a cleanliness level quantified by the number of particles per cubic meter at a predetermined molecule measure. The ambient outdoor air in a typical urban area contains 35,000,000 particles for each cubic meter in the size range 0.5 μm and bigger in measurement, equivalent to an ISO 9 cleanroom, while by comparison an ISO 1 cleanroom permits no particles in that size range and just 12 particles for each cubic meter of 0.3 μm and smaller. ([Cleanroom - Wikipedia](https://en.wikipedia.org/wiki/Cleanroom)):

Cleanrooms are to provide not only the proper manufacturing conditions of sophisticated products but also employees’ safety. For instance, manufacturing microchips involves using numerous hazardous chemicals including arsenic, which results in long-term effects to health. The statistics proves high rates of cancer and respiratory illnesses among workers of chemical plants. Pregnant women are particularly at risk of miscarriages and birth defects. As in every laboratory, it is also important to know where the emergency safety stations are located in the cleanroom.

**FURTHER PRACTICE**

How to get ready before entering the cleanroom?

Watch [Basic Introduction to a Clean Room - YouTube](https://www.youtube.com/watch?v=ggG_smKxEBI&t=195s)

1. Put the sentences in the proper sequence of actions:

1F.Wash your hands for 30 seconds with unscented soap and water.

2A.Step onto the sticky mat to remove any extra dirt or dust off your shoes.

3D.Put on your shoe covers and then your hairnet.

4G.Put on the facemask - the pleated side out. Adjust it to cover the entire mouth and nose. Stretch the hairnet over your ears and over the straps of the facemask.

5E. Take your suit from the rack. Don’t let the upper part of the suit touch the ground. Put on the suit like snow pants: feet first then arms. Zip the suit up.

6B. Sit on the bench, facing the entrance. Put on the over-boot on one leg, swing this leg over the bench and place it on the other side. Repeat the process with the other leg. Important! - over-boots can touch only the cleanroom side of the bench.

7H. Put on a fresh pair of gloves. Don’t touch the fingers or palms of the gloves. Make sure the gloves are stretched over the suit sleeves.

8C. Put on eye protection.

II. Complete the gaps with the following phrases (there are 3 extra).

***RED, UNZIP, APRON, DISPOSE OF, ZIP, SHIELD, TIE, SPILLS, ELBOWS,***

***YELLOW, UNTIE, TUCKED-IN, WRIST, SHIFT, SWORD***

Before entering the chemical room put on an apron and tie the straps. Put on the yellow sleeves to protect from any spills. Put on the chemical gloves over your original gloves and make sure the yellow sleeves are tucked in. Put on your face shield to protect against splashes.

Having finished your shift, start by taking off your glasses. Next, sit down on the bench and remove your over-boots. Peel off the gloves by**putting your fingers inside the glove at the top of your wrist. Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second**. Remove your shoe covers, your hairnet and your face mask. Unzip your cleanroom suit and dispose of all the items safely.