Module 1

- **What are the main elements of an effective Health and safety program?**

- Management commitment and employee involvement
- Worksite analysis
- Hazard prevention and control
- Safety and Health Training

- **What is occupational health and safety?**

is the world's first International Standard for occupational health and safety to increase safety, reduce workplace risks, enhance health and well-being at work.

- **Why is occupational health and safety important?**

OHS is important in the workplace because it is essential to protect your employees from the unforeseen future, illnesses, injuries, emergencies, and other health and safety hazards.

- **Outline FIVE (5) reasons to account for the necessity of Health and safety programmes to any organization?**

- Protects all persons from injury, illness, disability or death;
- Prevents damage to organization's assets and the general environment;
- Prevents exposure to unnecessary company degradation;
- Prevents unexpected fires and accidents;
- Prevents unnecessary financial loss.

- **Who is responsible for providing a safe and healthy environment for employees at a workplace?**

The organization or the company which the individual is employed are the ones who are responsible for providing a safe and healthy environment for employees.

- **Identify one health and safety management system.**

OHS (occupational health and safety management system).

- **For what does PDCA stand?**

Plan Do Check Act.

- **Identify the Environmental Management standard**

is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.

The following questions are on the OSH Act 2004 for Trinidad and Tobago

- **In what year was this act first proclaimed and enacted?**

30th January, 2004.

- **In what year was this act amended?**

This act was amended in 2006.

- **What is the fine where none is expressly provided**

Where no specific penalty is provided, $20,000 fine

- **To what does welfare at work refer to?**

Employee welfare entails everything from services, facilities and benefits that are provided or done by an employer for the advantage or comfort of an employee.

- **When is a written Health and safety policy required by the employer?**

To prepare written safety & health policy if there are more than 25 employees.

To whom should the employer report accidents that occur at the workplace?

Reporting an accident at work Your employer must report serious work-related accidents, diseases and dangerous incidents to the **Occupational Safety and Health Agency.**

- **Discuss the time required to report accidents depending on the type of accident**

1. Death or critical injury immediate notification & written notice within 48 hrs.

2. Where safety or health of the public is at risk immediate notification & written notice within 48 hrs.

3. Non-critical injury - written report within 4 days.

4. Occupational illness - written notice within 48 hrs of being notified by a medical practitioner.

- **How long should registers and records other than health be kept?**

Registers and inspection records for at least 5 years.

- **What is the minimum of time that health records should be kept?**

Health records to be preserved for at least 25 yrs and submitted to the Agency on cessation of trade.

Module 2

- **What is a hazard?**

A hazard is a **source or a situation with the potential for harm** in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

- **5 Examples of hazards.**

1. Physical hazard: A physical hazard is an agent, factor or circumstance that can cause harm with or without contact. Examples are: Slippery floors, objects in walkways, unsafe or misused machinery, excessive noise, poor lighting, fire, etc.

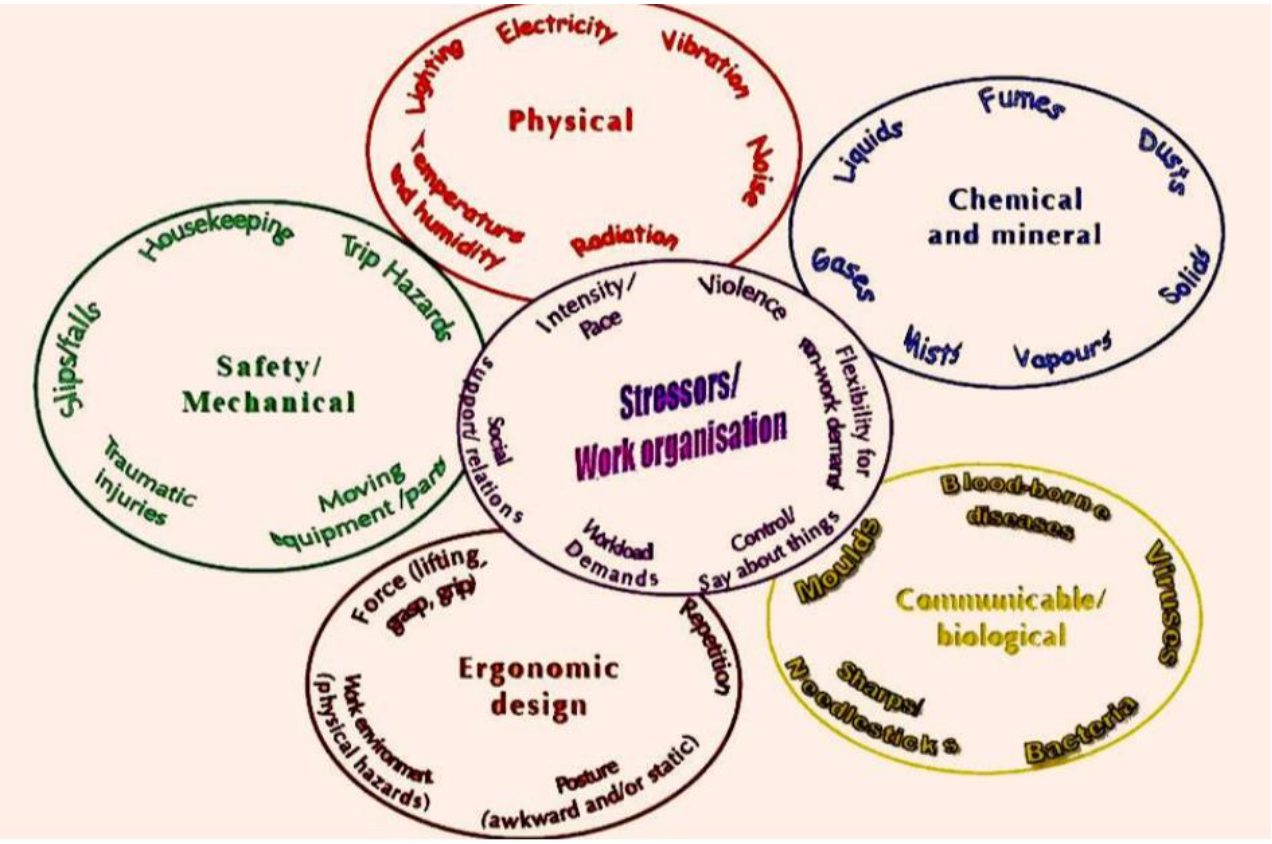
2. Chemical hazards: A chemical hazard is a type of occupational hazard caused by exposure to chemicals in the workplace. Exposure to chemicals in the workplace can cause acute or chronic detrimental health effects. Examples include: Gasses, dusts, fumes, vapors and liquids.

3. Ergonomic hazards: Ergonomic hazards are physical conditions that may pose risk of injury to the musculoskeletal system, such as the muscles or ligaments of the lower back, tendons or nerves of the hands/wrists, or bones surrounding the knees, resulting in a musculoskeletal disorder. These include poor design of equipment, workstation design, (postural) or workflow, manual handling, repetitive movement, etc.

4. Biological hazards: Biological hazards are biological substances that pose threat to the health of living organisms, primarily humans. They include pathogenic microorganisms, viruses, toxins (from biological sources), spores, fungi and bio-active substances.

5. Environmental hazards: An environmental hazard is a substance, a state or an event which has the potential to threaten the surrounding natural environment / or adversely affect people's health, including pollution and natural disasters such as storms and earthquakes.

- **List 7 categories of hazard and**



Module 3

- **When transporting chemicals what symbols are used to illustrate the hazards of the substances transported**

The **GHS pictograms** are important elements for labeling containers, warehouses, workplaces, and vehicles transporting the chemicals. They are used in chemical product descriptions, hazard statements, and warning words to warn of danger, reduce environmental risks and save human lives.

- **Name the different forms that chemicals have**

Solids Such as Sodium Metals

Liquids like gasoline oils

Gases like Chlorine

- **What are chronic effects**

Chronic effects are **long-term effects** due to exposure to chemicals or substances often used in the workplace.

- **What are acute effects**

An acute effect is an **adverse reaction in humans or animals when exposed to a harmful or toxic substance**.

- **Give an example of a substance causing chronic effects and one causing acute effects.**

Substance “Benzene”

Acute Effects -

- Severe skin irritation.
- A painful burning sensation throughout the body.
- Chemical pneumonia.

Chronic Effects-

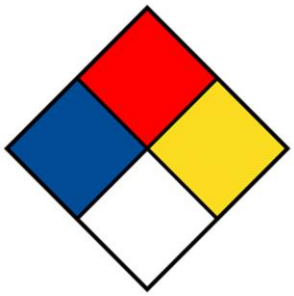
- Blood disease.
- Chromosome Damage.
- Low birth weight in babies.

- **what can happen on exposure to benzene**

If a person vomits because of swallowing foods or beverages containing benzene, the vomit could be sucked into the lungs and cause breathing problems and coughing. Direct exposure of the eyes, skin, or lungs to benzene can cause **tissue injury and irritation**.

- **NFPA stands for what?**

National Fire Protection Association.



NFPA DIAMOND

- **What do each of the colors represent?**

NFPA Label

1. Red flammable.
2. Blue health hazard.
3. White special hazards that are reactive to substances.
4. Yellow chemical instability.

- **What do the numbers 0-4 in the diamond illustrate?**

It illustrates the severity level of the hazard.

- **When transporting chemicals what symbols are used to illustrate the hazards of the substances transported.**

The GHS pictograms are important elements for labeling containers, warehouses, workplaces, and vehicles transporting the chemicals.

- **What does HAZWOPER stand for?**

Hazardous Waste Operations and Emergency Response.

- **What are the main routes of entry of chemical hazards to the body**?

- Ingestion
- Injection
- Inhalation
- Absorption

- **What is the most common means of entry of chemicals to the body?**

Inhalation is the most common means of entry of chemicals in the body.

- **What are the basic hazards of chemicals (4 types)?**

- Flammable Hazards
- Corrosive Hazards
- Carcinogens Hazards
- Environmental Hazards

- **Define a physical hazard for chemicals.**

Chemicals can pose the threat of burning one's skin if in contact with the individual.

- **What are health hazards?**

A potential source of danger to a person's health that has the ability to cause disorders, diseases or allergic reactions.

- **What is a Carcinogen?**

A substance capable of causing cancer in living tissue.

- **What is the main route of entry of volatile organic compounds (VOCs) into the human body?**

Inhalation is the main route of entry of volatile organic compounds (VOCs) into the human body.

- **For what do the following acronyms stand?**

  - GHS - Globally Harmonized System
  - NFPA - National Fire Protection Association
  - SDS - Safety Data Sheet
  - MSDS- Material Safety Data Sheet

- **How many sections are there in a SDS sheet?**

There are 16 sections in a SDS sheet.

- **If you are experiencing particular symptoms after using a chemical, which section of the sheet will be useful to check first?**

Section 4: First Aid Measures will be useful to check first.

- **What should a GHS compliant label have?**

A GHS compliant label contains six required elements to help aid in the identification of chemicals and their hazards:

- Product name or identifier
- Signal word
- Hazard statements
- Precautionary statements
- Supplier identification
- Pictograms

- **Who is responsible for generating a GHs compliant label?**

The Suppliers are responsible for generating a GHs compliant label.

- **How many hazard pictograms are there in the GHS system?**

There are 9 hazard pictograms in the GHS system.

- **List the names for each of the pictograms.**

- **Identify the different occupational exposure limits:**

- PEL
- TWA
- TLV
- STEL

The current PEL for OSHA standards are based on a 5 decibel exchange rate. OSHA's PEL for noise exposure is 90 decibels (dBA) for an 8-hour TWA

More recent exposure limits are provided below: General Industry: 29 CFR 1910.1000 Table Z-2 - 200 ppm TWA; Also, exposures shall not exceed 300 ppm (ceiling) .

TLVs are the maximum average airborne concentration of a hazardous material to which healthy adult workers can be exposed during an 8-hour workday and 40-hour workweek—over a working lifetime—without experiencing significant adverse health effects.

STEL in OSHA

OSHA short-term exposure limits (STELs) are the legal maximum average exposure for a 15-minute time period.

Module 4

- **What does SOP stand for?**

Standard Operating Procedure

- **What does PTW stand for?**

Permit To Work

- **Why is a PTW required?**

The purpose of a permit to work system is simply, to make high-risk tasks safer. In addition to a risk assessment and method statement, the permit to work is issued only to a particular person, at a specific time, authorizing them to carry out the work under strict controls

- **Examples of work that requires a PTW.**

Examples of high-risk jobs where a written 'permit to work' procedure may need to be used include hot work such as welding, vessel entry, cutting into pipework carrying hazardous substances, and work that requires electrical or mechanical isolation.

- **Who authorizes a PTW?**

They are usually issued by a manager or supervisor.

- **Define a confined space.**

A confined space is a space large enough that a person can enter and perform work but has limited or restricted means for entry and exit and is not designed for continuous occpancy. Examples: tanks, vessels, silos, storage bins, vaults & pits.

- **What are the main hazards found in confined spaces?**

- Atmoshperic hazards
- Design or equipment hazards
- Engulment or entrapment
- Chemical exposure
- Noise

- **Hazardous atmospheres categories:**

- Flamable
- Toxic
- Irritant or corrossive
- Asphyxiating

- **Describe three (3) distinct examples to show how hazards are controlled in confined spaces and list the corresponding method of control according to the hierarchy of hazard control for each of the examples described.**

An engineering control commonly used in confined spaces is mechanical ventilation. The entry permit system is an example of an administrative control used in confined spaces. Personal protective equipment (such as respirators, gloves, hearing protection etc.) is commonly used in confined spaces as well.

- **How air quality maintained in confined spaces.**

Mechanical ventilation (e.g., blowers, fans) is usually necessary to maintain air quality. If mechanical ventilation is provided, there should be a warning system in place to immediately notify the worker in the event of a hazard or a failure in the ventilation equipment.

- **What is the oxygen levels are considered as hazardous in confined spaces?**

6-8% 8 minutes - fatal, 6 minutes - 50% fatal 4-5 minutes - possible recovery. Oxygen level above 21%. Causes flammable and combustible materials to burn violently when ignited.

- **Why is working in a confined space more hazardous than working in other workspaces?**

Working in a confined space is dangerous because of the risks from noxious fumes, reduced oxygen levels, or a risk of fire. Other dangers may include flooding/drowning or asphyxiation from some other source such as dust, grain or other contaminant.\

---

1) Confined spaces are often not well-ventilated. This means that there is less fresh air available, which can lead to a buildup of hazardous gases, fumes, and dust.

2) Confined spaces can be difficult to escape from. If there is an emergency, it may be difficult to get out of the space quickly.

3) Confined spaces can contain dangerous equipment. This equipment may not be properly guarded, which can lead to injuries.

4) Confined spaces can be dark and difficult to see in. This can make it difficult to identify hazards and to perform tasks safely.

Module 5

- **Distinguish between a slip and a trip and describe a hazard control method to prevent each one.**

A slip is when you lose your balance due to a wet or slippery surface. A trip is when you lose your balance due to an obstacle in your path.

Slips occur when a person's foot loses traction with the ground surface due to wearing inappropriate footwear or when walking on slippery floor surfaces such as those that are highly polished, wet or greasy or probably caused due to a foreign object like a sheet of paper.

Trips occur when a person unexpectedly catches their foot on an object or surface.

Using the method of elimination one can remove the wet substance from the floor to prevent people from slipping on it ,or one can remove the object to prevent people from tripping.

In the event it can't be removed the method of administration can be used to place signs by the hazard to warn people of the potential risk.

- **List three causes of slips.**

Three causes of slips include: wet floors, polished greasy floors and wearing the wrong footwear on specific surfaces.

- **List three causes of falls.**

Three causes of trips include: scattered equipment in an office, loose mat/rug and poor lighting in a room.

Same level falls
Roll with the fall
Mounting and dismounting equipment/ladders/scaffolin steps

- **List three housekeeping practices that reduce slips trips and falls.**

1. mopping or sweeping debris from floors.

2. removing obstacles from walkways and always keeping walkways free of clutter.

3. securing (tacking, taping) loose cables.

- **Give one type of control in each case to control slips trips and falls:**

– Engineering- Building a barrier surrounding a hole on a sidewalk

– Administrative- wet floor signs near leakage or spillage of liquids.

– Personal Protective equipment (PPE): hard hats and steel toe boots at construction sites

- **Briefly describe three safety precautions one should take when using extension ladders.**

1. When using extension ladders a precaution one can take is having a tethered harness on them in the event they fall off.
2. Keep the body inside the rails of the ladder.
3. Use both hands when climbing in the event one slips.

- **For a 28 feet extension ladder to be used to access a roof:**

I. State the minimum horizontal distance that it should be placed from the wall

II. Describe **two** <u>other</u> precautions that should be taken.

i. The minimum horizontal distance that it should be placed from the wall is 1/4 of the working length of the ladder.

ii. Face the ladder when climbing up or descending.

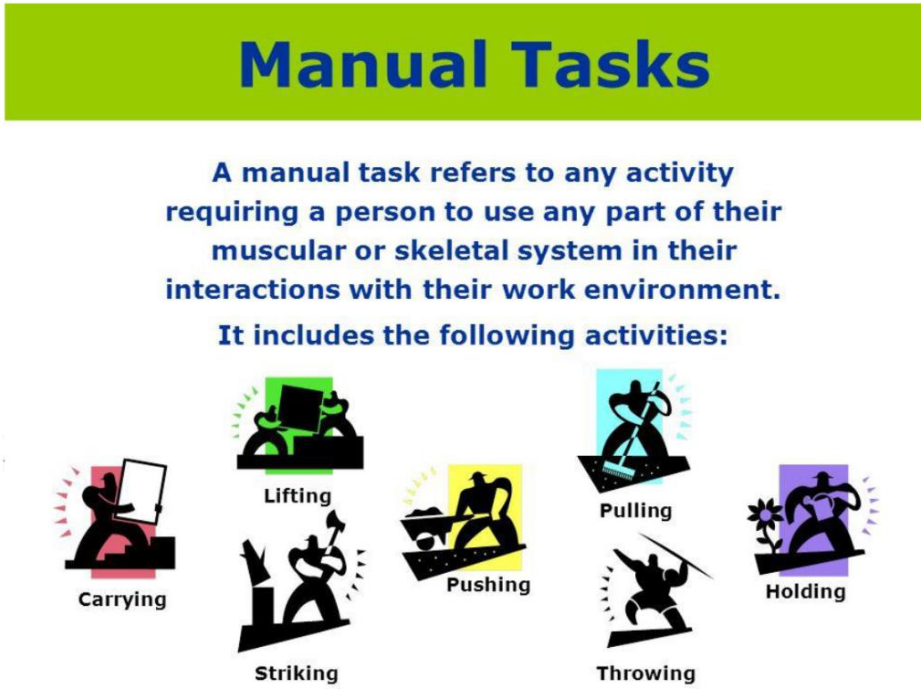
Carry tools in a tool belt or raise tools up using a hand line. Never carry tools in your hands while climbing up/down a ladder.

- **Describe three general requirements for scaffolds**

OSHA requires that scaffold platforms should be fully planked or decked and have proper guardrails, midrails, and toe boards along its open sides. It should be regularly cleaned and properly cleaned to prevent accidents caused by slipping off. ties, and braces are used to provide additional support for workers when using scaffoldings to prevent tipping.

Module 6

MANUAL HANDLING TASKS

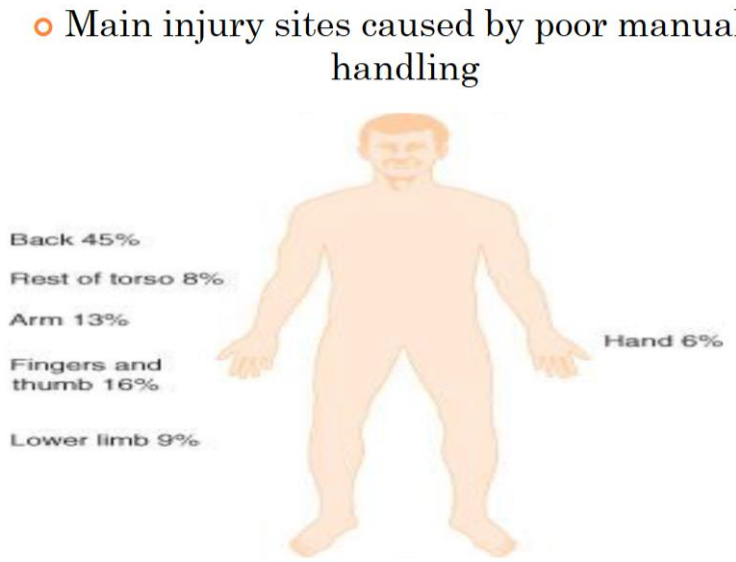


HAZARDS FROM POOR MANUAL HANDLING
Main Hazards are ergonomic hazards

MAIN INJURY SITES FROM POOR MANUAL HANDLING

Main injury sites from poor manual handling of loads include:

- Back
- Rest of torso
- Fingers and thumb
- Hands
- Lower limb



Assessment of manual handling risks:

Known as L I T E

The Load
The Individual
The Task
The Environment

Load - Lighten, reduce in size, provide handles, eliminate sharp edges.

Individual - Address individual factors, train, provide PPE and clothing.

Task - Redesign tasks, reduce manual handling tasks, mechanise, team lift, rotation.

Environment - Improve floor conditions, temperature, lighting, space.

Methods used

- Mechanical assistance
- Ergonomic approach
- Involving the workforce
- Training

Mechanical assistance

- Levers
- Hoists
- Trolley or truck
- Chutes
- Hooks
- Suction pads

Conveyor Belt /Rollers

Ergonomic Approach-Proper lifting technique

- Stop and think
- Place the feet
- Adopt a good posture
- Get a firm grip
- Don’t jerk.
- Move your feet not your back
- Keep close to the load
- Put down, then adjust

Ergonomic Approach Illustrated-Proper lifting technique

1. Check suitable clothing and assess load. Heaviest side to body.
2. Place feet apart – bend knees.
3. Firm grip – close to body Slight bending of back, hips and knees at start.
4. Lift smoothly to knee level and then waist level. No further bending of back.
5. With clear visibility move forward without twisting. Keep load close to the waist. Turn by moving feet. Keep head up. Do not look at load.
6. Set load down at waist level or to knee level and then on the floor.

MINIMISING HAZARDS FROM POOR MANUAL HANDLING

Ergonomic Approach

- Adopt a good posture
- Poor posture
- Greatly increases likelihood of a manual
- handling injury
- Many construction tasks can cause poor posture
- laying a floor
- Ideal position for manual handling is
- waist height whilst standing

Ergonomic Approach:

What to avoid doing when doing manually handling activities:

- Avoid Awkward movements
- Avoid stretching
- Avoid bending at the waist
- Avoid twisting
- Avoid lifting whilst seated
- Avoid sudden movement
- Avoid jerky movements

These can lead to cumulative strain

Module 7

- **Describe the electrical injuries: electrocution, electrical shock, burns and falls.**

Electric shock is a physiological reaction to electric current passing through the body.

Electric shock

A voltage as low as 50 volts applied between two parts of the human body causes a current to flow that can block the electrical signals between the brain and the muscles. This may have a number of effects including:

Stopping the heart beating properly

Preventing the person from breathing

Electrocution is death caused by electric shock. It is a serious medical emergency that requires immediate medical attention.

Causing muscle spasms

The exact effect is dependent upon a large number of things including the size of the voltage, which parts of the body are involved, how damp the person is, and the length of time the current flows.

Electric shocks from static electricity such as those experienced when getting out of a car or walking across a man-made carpet can be at more than 10,000 volts, but the current flows for such a short time that there is no dangerous effect on a person. However, static electricity can cause a fire or explosion where there is an explosive atmosphere (such as in a paint spray booth).

Electrical burns

When an electrical current passes through the human body it heats the tissue along the length of the current flow. This can result in deep burns that often require major surgery and are permanently disabling. Burns are more common with higher voltages but may occur from domestic electricity supplies if the current flows for more than a few fractions of a second.

Loss of muscle control

People who receive an electric shock often get painful muscle spasms that can be strong enough to break bones or dislocate joints. This loss of muscle control often means the person cannot 'let go' or escape the electric shock. The person may fall if they are working at height or be thrown into nearby machinery and structures.

Thermal burns

Overloaded, faulty, incorrectly maintained, or shorted electrical equipment can get very hot, and some electrical equipment gets hot in normal operation. Even low voltage batteries (such as those in motor vehicles) can get hot and may explode if they are shorted out.

People can receive thermal burns if they get too near hot surfaces or if they are near an electrical explosion. Other injuries may result if the person pulls quickly away from hot surfaces whilst working at height or if they then accidentally touch nearby machinery.

A single low voltage torch battery can generate a spark powerful enough to cause a fire or explosion in an explosive atmosphere such as in a paint spray booth, near fuel tanks, in sumps, or many places where aerosols, vapours, mists, gases, or dusts exist.

- **In what unit is Electrical current measured?**

An ampere (AM-pir), or amp, is the international unit used for measuring current.

- **Who is the person responsible for placing and removing a lock and tag?**

ONLY the authorized individual who placed the lock and tag onto the system is the one who is permitted to remove them. This procedure helps make sure the system cannot be started up without the authorized individual's knowledge.

- **Give an example of a conductor**

Copper

- **Give and example of an insulator**

Rubber

- **Which of the following has a higher resistance to electricity a conductor or an insulator?**

insulators

- **Name one primary injury from exposure to an electrical hazard**

Electric shock or electrical burns.

- **Name one secondary injury from exposure to an electrical hazard**

involuntary muscle reaction from the electric shock can cause bruises, bone fractures

- **List three factors that affect the severity of an electrical shock**

The severity of the injuries depends upon the type of current, the voltage, and the resistance.

- **List three methods of hazard control for electrical hazards**

Avoid wet working conditions and other dangers.

Use proper wiring and connectors.

Wear correct PPE.

- **List two over current protection devices**

Examples of overcurrent protection devices are many: fuses, electromechanical circuit breakers, and solid state power switches.

- **For what do the following stand**

a. LOTO- Lock Out Tag Out

What is LOTO? Answer -- LOTO (Lock Out Tag Out) is the physical restraint of all hazardous energy sources that supply power to a piece of equipment, machinery or system.

b. GFCI- ground-fault circuit interrupter

The ground-fault circuit interrupter, or GFCI, is a fast-acting circuit breaker designed to shut off electric power in the event of a ground-fault within as little as 1/40 of a second.

c. AMP- ampere

An ampere is the unit used to measure electric current. Current is a count of the number of electrons flowing through a circuit. One amp is the amount of current produced by a force of one volt acting through the resistance of one ohm.

- **Outline the procedure for LOTO.**

The LOTO procedure also requires that each worker fills out a tag that is hung from their lock, including their name and a description of the work they are doing.

- **Why is LOTO important?**

Proper lockout/tagout (LOTO) practices and procedures safeguard workers from hazardous energy releases.

- **What is over fusing?**

This issue occurs when a breaker is too big, which prevents electricity from being safely carried because the breaker won't trip when it's overloaded. When this happens, the wires can overheat and possibly lead to an electrical fire.

- **What does the picture below indicate?**

A circuit breaker

Module 8

Combustion or burning, in which substances combine chemically with oxygen from the air and typically give out bright light, heat, and smoke

The combustion process occurs in two modes:

- The flaming
- The none flaming, smouldering or glowing embers.

For the flaming mode it is necessary for solid and liquid fuels to be vaporized. The solid fuel vapours are thermally driven off, or distilled and the liquid fuel vapours evaporated. It is this volatile vapour from the solid or liquid fuels that we see actually burning in the flaming mode. This gas or vapour production, emitted from the fuel is referred to as pyrolysis. Once a flame has

- **Examples of fixed fire suppression system:**

Sprinkler systems, Fire pumps and Fixed chemical extinguishing systems.

- **What is a fixed fire suppression system?**

Fixed fire extinguishing/suppression systems are commonly used to protect areas containing valuable or critical equipment such as data processing rooms, telecommunication switches, and process control rooms.

- **Examples of portable fire suppression system**

A portable fire extinguisher:
Water extinguishers
Carbon Dioxide (CO_2) extinguishers

Dry Chemical extinguishers

- ## Examples of fire detection systems

Examples would be devices such as pull stations, heat detectors, duct detectors, and smoke detectors. Heat and smoke detectors have different categories of both kinds.

Some categories are photoelectric & ionization.

- ## What are the 4 types of fire detection systems?

Main Types of Fire Detectors:

Heat Detector.
Ionization Smoke Detector.
Photoelectric Smoke Detector.
Ionization and Photoelectric Smoke Detector.

- ## How often should fire extinguishers be serviced?

Once per year

- ## Describe the acronym used to illustrate how to extinguish a fire?

It's easy to remember how to use a fire extinguisher if you can remember the acronym PASS, which stands for Pull (pull the pin), Aim, Squeeze, and Sweep.

- ## Describe the acronym used to illustrate how to respond in the event of a fire

Upon the detection of smoke and/or fire, follow the R-A-C-E

1. Rescue - Rescue/Remove person(s) from the immediate fire scene/room.

2. Alert - Alert personnel by activating the nearest fire alarm pull station then call the Control Center to report the exact location of the fire.

3. Confine - Confine fire and smoke by closing all doors in the area.

4. Extinguish - Extinguish a small fire by using a portable fire extinguisher or use to escape from a large fire. Evacuate the building immediately and, once outside, report to your supervisor.

- **List five things that should be placed on an evacuation route map**

1. Exits and handicapped accessible routes.
2. Exit routs and alternatives.
3. Location of fire extinguishers and other emergency equipment such as AEDs, PPE, first aid, and oxygen tanks.
4. Employee location, "you are here"
5. Fire alarm locations.
6. Emergency evacuation assembly areas.

- **When you should remove extinguishers from service?**

1. Extinguishers with the following conditions are should be removed from service:
2. When the cylinder or shell threads are damaged
3. Where there is a corrosion that has caused pitting, including corrosion under removable name plate assembles
4. When the extinguisher has been burned in a fire

- **Identify the conditions under which a Portable Extinguisher should NOT be used**

Never fight a fire if:

1. You do not know what material is burning.
2. You do not know what type of fire extinguisher to use.
3. You do not know how to use the fire extinguisher.
4. The fire is spreading beyond the spot where it started.
5. Your instincts tell you not to.

If you are not confident about your ability to handle the situation (even if you are trained in fire fighting), or if you do not have the correct type of fire extinguisher, do not fight the fire. Pull the fire alarm, evacuate the area, and then call the fire department.

- **What does the red square on the NFPA diamond represent**

Flammability Hazard

- **What type of fire extinguishers are coloured silver?**

Air-pressurized water extinguishers for Class A fires:

- **Explain why when water is used to extinguish a gasoline spill that is alight, it only spreads it but does not put it out?**

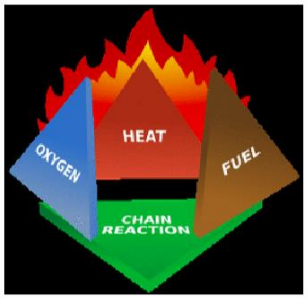
As water is heavier than petrol therefore slips down permitting the petrol to rise to the surface and continue to burn. Besides, the existing temperature is so high that the water poured on the fire evaporates even before it can extinguisher the fire.

- **Define a fire**

Fire is the visible effect of the process of combustion – a special type of chemical reaction. It occurs between oxygen in the air and some sort of fuel. The products from the chemical reaction are completely different from the starting material.

- **Name the elements of the fire Triangle**

FIRE TRIANGLE



FIRE TETRAHEDRON

For many years the concept of fire was symbolized by the Triangle of Combustion and represented, fuel, heat, and oxygen. Further fire research determined that a fourth element, a chemical chain reaction, was a necessary component of fire. The fire triangle was changed to a fire tetrahedron to reflect this fourth element. A tetrahedron can be described as a pyramid which is a solid having four plane faces. Essentially all four elements must be present for fire to occur, fuel, heat, oxygen, and a chemical chain reaction. Removal of any one of these essential elements will result in the fire being extinguished.

- **Name and describe according to the American system of classification, the major categories of fires, stating the types of extinguishers used in each case.**

Class A: Fires involving ordinary combustible materials, such as paper, wood, and textile fibers. A cooling, blanketing, or wetting extinguishing agent is needed.

Class B: Fires involving flammable liquids, gases and greases, including gasoline, thinners, oil-based paints and greases. Extinguishers for this type of fire include carbon dioxide, dry chemical* and halogenated agent types.

Class C: Fires involving energized electrical equipment, where a non-conducting gaseous clean agent or smothering agent is needed. The most common type of extinguisher for this class is a carbon dioxide extinguisher.

Class D: Fires involving combustible metals such as magnesium, sodium, potassium, titanium, and aluminum. Special dry powder* extinguishing agents are required for this class of fire, and must be tailored to the specific hazardous metal.

Class K: Fires involving commercial cooking appliances with vegetable oils, animal oils, or fats at high temperatures. A wet potassium acetate, low pH- based agent is used for this class of fire it is. suited for extinguishing and suppressing these extremely hot fires that have the ability to reflash.

- **Identify the different symbols and colours used to differentiate each of the fire classes**

CLASS OF FIRE	TYPE OF FIRE	APPROVED FIRE EXTINGUISHER
 A Ordinary Combustibles	Wood, paper, cloth	Type A; Type A-B
 B Flammable Liquids	Gasoline, paints, oils, grease	Type A-B; Type B-C; Type A-B-C
 C Live Electrical Equipment	Electrical wiring, fuse box	Type B-C; Type A-B-C
D Combustible Metal	Metals	Bucket of Sand
 K Commercial Cooking Equipment	Commercial cooking oil appliances	*Wet Chemical

*Class K extinguishers may require specific training, including when they should be used or not used. For example, the extinguishing agents in many Class K extinguishers are electrically conductive and should only be used after electrical power to the kitchen appliance has been shut off.

- **According to the US system, to which class of fire does cooking fats and oils belong?**

Answer: Class k

- **Identify the type of extinguishers that can be used on electrical fires and list the ones that cannot be used.**

Dry powder extinguishers, which have a blue label, are said to be OK to use on electrical fires involving equipment under 1000v, though CO2 extinguishers are still advised.

- **How does a carbon dioxide extinguisher differ from a dry chemical extinguisher?**

1. Dry chemical fire extinguisher: Dry chemical extinguishers extinguish the fire by interrupting the chemical reaction of the fire triangle. They're most effective on Class A, B and C fires.

2. CO2 fire extinguisher: Carbon dioxide extinguishers take away the oxygen element of the fire triangle.

- **What is the best extinguishing material to use on a fire caused from flammable liquids**

Foam fire extinguishers can be used on Class A and B fires.

- **List three things needed for a fire to burn**

Oxygen, heat, and fuel are frequently referred to as the "fire triangle".

- **Using the fire triangle principle explain how you could extinguish a fire.**

All fires can be extinguished by cooling, smothering, starving or by interrupting the combustion process to extinguish the fire.

- **Which of the sides of the triangle is removed on cooling the fire? What can you use to cool a fire?**

Removing oxygen
Oxygen can effectively sustain a fire, and so it's important that it's removed from the triangle to prevent the spread of a fire. Its removal can be achieved by using either a carbon dioxide or a foam fire extinguisher.

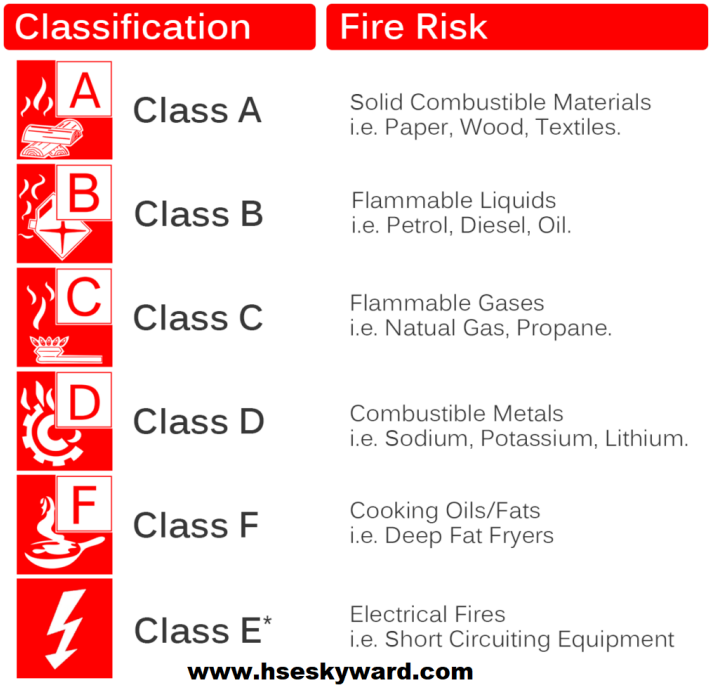
- **Which of the sides of the triangle is removed on smothering the fire? What can you use to smother a fire?**

carbon dioxide or a foam fire extinguisher. For cooking or kitchen fires, a fire blanket will aid in the suffocation of the fire.

- **Which of the sides of the triangle is removed on starving the fire?**

Starving: limiting fuel by removing potential fuel from the vicinity of the fire, removing the fire from the mass of combustible materials or by dividing the burning material into smaller fires that can be extinguished more easily.

- **What are the names of the European classes and which types of fire does each class represent?**



Module 9

- ## What is a risk assessment?

A Risk Assessment is an assessment of the severity of hazard present and their potential outcomes

The assessment is considered in conjunction with other factors including the following:

❖ the level of exposure
❖ the numbers of persons exposed and
❖ the risk(probability) of that hazard being realised

A risk assessment team may include:
❖ Employer
❖ Managers
❖ Supervisors
❖ Employees
❖ Members of a safety Committee
❖ Safety Advisor

- ## What is the main objective of a risk assessment?

Objective of a Risk Assessment :

❖ is prevention of workplace injuries and ill-health.

- ## When is a risk assessment required?

There may be many reasons a risk assessment is needed, including: Before new processes or activities are introduced. Before changes are introduced to existing processes or activities, including when products, machinery, tools, equipment change or new information concerning harm becomes available.

- ## How often should a risk assessment be conducted?

The rule of thumb is that you should schedule a risk assessment for at least once a year. This way, you know when it has to be done, when it was last carried out, and when it will be updated.

- ## Describe the five basic steps in conducting a risk assessment

Five steps to risk assessment:

Step 1: Identify the hazards

Step 2: Decide who might be harmed and how

Step 3: Evaluate the risks and decide on precautions

Step 4: Record your findings and implement them

Step 5: Review your assessment and update if necessary

- **Discuss the factors that influence the prioritizing of risk control measures**

Risk prioritization depends upon:

❖ The risk rating -High, Medium, Low
❖ Time required to effect control.
❖ Number of employees exposed
❖ Available resources
❖ Legal requirements

Suggested time scale:
High: within a day; Medium: within a week; Low: within a month

- **What is the recommended time frame for addressing a high risk?**

Within a day

- **Methods when evaluating the Risk level**

Two main methods:

1. Qualitative Risk Assessment-based purely on personal judgement & is normally defined as HIGH, MEDIUM, or LOW.

2. Quantitative Risk Assessment-measure the risk by relating the probability of risk occurring to possible severity of outcome & then giving the risk a numerical value. Likelihood x Severity

- **Outline the requirements for reviewing a risk assessment?**

Whenever there to any significant changes to workplace processes or design.
Whenever new machinery, substances or procedures are introduced.
Whenever there is an injury or incident as a result of hazard exposure.

Monitoring and Review

Risk assessments and controls should be reviewed periodically:

High: Annually
Medium: Every three years
Low: Every five years

Also needed when conditions change -processes, machinery, workforce and following an accident.

- **Name two instances that would require a review of a risk assessment**

Relevant risk assessments should be reviewed following an accident, incident or ill-health event in order to verify if the control measures and level of evaluated risk where appropriate or require amendment.

- **Define an emergency**

An unforeseen situation that threatens your employees, customers, or the public, disrupts or shuts down your operations, or causes physical or environmental damage.

- **List types of emergencies**

1. Earthquakes
2. Hurricanes
3. Tornadoes
4. Energy/utility outages
5. Fire hazardsHazardous materials releases
6. Terrorism.

- **What are the 5 roles in emergency response?**

1. Prevention
2. Mitigation
3. preparedness
4. response
5. recovery

Module 10

- **Define Air pollution**

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.

- **State how a substance can become an air pollutant (2 ways)**

Air pollution occurs when certain gases and particles build up in the atmosphere to such levels that they can cause harm to our health, causing breathing and respiratory problems, and even resulting in premature death, as well as damaging the environment around us.

- **There are four main types of air pollution**

sources:

1. mobile sources – such as cars, buses, planes, trucks, and trains
2. stationary sources – such as power plants, oil refineries, industrial facilities, and factories
3. area sources – such as agricultural areas, cities, and wood burning fireplaces, Mining
4. natural sources – such as wind-blown dust, wildfires, and volcanoes,pollen

- **Distinguish between a primary and secondary air pollutant.**

Air pollutants may be categorised as primary or secondary. Primary pollutants are directly emitted to the atmosphere.

Secondary pollutants are formed in the atmosphere from precursor gases through chemical reactions and microphysical processes.

- **List the greenhouse gases and their sources.**

GREEN HOUSE GASES (GHG)

1. Carbon dioxide
2. Nitrous oxides
3. Methane (rom livestock production-ruminant and decay of organic waste from natural areas)
4. Chlorofluorocarbons and other halocarbons
5. Water vapour
6. Tropospheric ozone.

synthetic. They include:

1. chlorofluorocarbons (CFCs)
2. Hydrofluorocarbons (HFCs)
3. Perfluorocarbons (PFCs)
4. Sulfur hexafluoride (SF6).

Atmospheric concentrations of both the natural and man-made gases have been rising over the last few centuries due to the industrial revolution.

- **Describe the enhanced greenhouse gas effect**

Green house effects:

1. possible global warming
2. Climate change
3. Rising sea levels
4. Droughts
5. Floods
6. Loss of land especially for island states
7. Loss of habitat
8. Loss of organisms

- **List the acid rain producers and their sources**

Power plants release the majority of sulfur dioxide and much of the nitrogen oxides when they burn fossil fuels, such as coal, to produce electricity. In addition, the exhaust from cars, trucks, and buses releases nitrogen oxides and sulfur dioxide into the air. These pollutants cause acid rain.

- **Briefly describe how acid rain is formed.**

Compounds like sulfur dioxide and nitrogen oxides are produced by anthropogenic sources (mainly burning fossil fuels) or natural sources (volcanic emissions). These gases rise into the atmosphere, where they mix and react with water vapor, oxygen, and other chemical substances, leading to the creation of acid rain.

- **Describe the effects of acid rain on the environment**

Acid rain leaches aluminum from the soil. That aluminum may be harmful to plants as well as animals. Acid rain also removes minerals and nutrients from the soil that trees need to grow**.**

- **List the ozone depleting substances and their sources**

Ozone depleting pollutants:

1. Chlorofluorocarbons –CFCs

Sources (propellants in aerosol cans, and solvents)

2. Nitrous oxides

Sources (during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste;)

3. Carbon tetrachloride (CCl_4)

Sources (does not occur naturally, but has been released into the environment by human activities.)

4. Methyl chloroform (CH_3CCl_3)

Sources (industrial releases from its use as a cleaning agent and solvent)

- **Discuss the impacts of ozone depletion**

Effects on people

1. increase in the incidence of skin cancer,

2. increase in the incidence cataracts

In Plants
causes the stomata to close reduces the intake of gases for photosynthesis and therefore reduce photosynthesis, etc.

- **Where is the ozone layer located in the earth's atmosphere?**

Located in the stratosphere.

- **What global Management strategy was employed to reduce the production of Ozone depleting substances**

The Montreal Protocol, finalized in 1987, is a global agreement to protect the stratospheric ozone layer by phasing out the production and consumption of ozone-depleting substances (ODS).

- **Primary air Pollutants**

1. Carbon Monoxide
2. Sulphur oxides
3. Nitrogen oxides
4. Particulate Matter

Module 11

- **Define water polution**

Any chemical, biological, or physical change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired usage.

- **MAIN SOURCES OF WATER POLLUTANTS**

NATURAL

1. Floods
2. Volcanic Activitiy
3. Animal wastes,
4. Algae

HUMAN

1. Power Generation
2. Factories
3. Oil Production
4. Mining
5. Construction
6. Agriculture
7. Transportation
8. Improperly disposed sewage

- Some Natural sources of water contaminants and one (1) pollutant associated with each of the sources listed.

Floods -: Floodwater is sometimes contaminated with sewage, animal waste and other contaminants.

Volcanic Activitiy -: ash can contaminate vegetation, surface water, soils and groundwater with heavy metals like copper, cadmium and arsenic and non-metal contaminants like fluorine.

Animal wastes -: Animal waste from animal feeding operations may contain:

1. Pathogens such as E. coli
2. Hormones
3. Antibiotics
4. Chemicals such as nitrates, phosphorus, and ammonia
5. Heavy metals such as zinc and copper

- **Agriculture is one human source of pollution. Name three (3) water pollutants form agriculture**

Fertilizers, pesticides, bacteria from livestock.

- **Types and composition of water pollutants by source**

HUMAN SOURCES:
Factories industry liquid wastes are called effluents pollutants such as acids ,bases, metals, organic chemicals, salts.

- **Types and composition of water pollutants by source**

HUMAN SOURCES:

1. Power plants
2. Hot water-thermal pollution
3. Mining:surface mining toxicS
4. ACIDS
5. Sediment

Types and composition of pollutants

1. infectious agents -: Bacteria and viruses, protozoa, parasitic worms.

2. oxygen demanding wastes -: Organic waste that needs oxygen usually from animal waste, paper mills and food processing, inorganic chemicals that require oxygen

3. inorganic chemicals(metals nonmetallic salts, acids & bases) -: Acids and toxic chemicals often from runoff industries and household cleaners:

- mercury
- lead
- cadmium
- nickel

4. organic chemicals -: sulphur

5. plant nutrients

6. Sediment

7. thermal pollution -: (Mostly from power plants) is dumping water into a river, lake, or sea that is either much warmer or much colder than normal. oxygen levels in water decreases as temperatures increase.

- **Distinguish between point sources and non-point sources**

Point source pollution is any single identifiable source of pollution from which pollutants are discharged. (Such as; a pipe, ditch, water channel, factories, power plants, vessels etc.)

Non-point Source is caused by broadly distributed and disconnected sources of pollution.(such as; Agriculture fields, leaks, sediment erosion etc)

- **What is meant by effluent?**

Something that flows out like an outflowing branch of a main stream or lake. Waste material (such as smoke, liquid industrial refuse, or sewage) discharged into the environment especially when serving as a pollutant.

- **Discuss the treatment options available for liquid contaminants**

1. With high sediment load

Loading which will give a high turbitiy reading- remove the sediments before sending into the waste stream by:

1) Allowing sediments to settle in settling ponds and then disposing.

2) Adding chemicals to precipitate and coagulate sediment and then filtering out water.

2. With thermal pollution

The solutions to thermal discharge into water bodies are as follows:

1. Cooling Ponds. Cooling ponds or reservoirs are the simplest methods of controlling
2. thermal discharges
3. Cooling Towers.
4. Artificial Lake.
5. Water Recycling.

- **Distinguish between bioaccumulation and Biomagnification giving an example in each case**

Bioaccumulation refers to the buildup of a substance, such as a toxic chemical, in various tissues of a living organism. The buildup of human hormones in fish that live in a polluted river is a classic example of bioaccumulation.

Biomagnification refers to the concentration of impurities as animals are eaten and the impurity is passed through food chains. The buildup of mercury inside tuna as a result of low levels of mercury accumulating in other organisms as the toxin travel up the food chain is a classic example of biomagnification.

- **Fertilizers are beneficial to plants but harmful to the aquatic environment.**

Discuss:

- What is Eutrophication?

Excessive richness of nutrients in a lake or other body of water, frequently due to run-off from the land, which causes a dense growth of plant life.

- What causes Eutrophication?

An overabundance of nutrients—primarily nitrogen and phosphorus—in water starts a process called eutrophication. Algae feed on the nutrients, growing, spreading, and turning the water green.

- What are the effects of Eutrophication on the aquatic environment?

Effects on water:

- Decrease of photosynthesis of plants at lower depths
- Dying algae then drops dissolved oxygen levels as oxygen is used up in decomposition
- Fish kills

- Bad odor

- Sediments are considered as a source of pollution to the aquatic environment but beneficial on land. Discuss

Module 12

- ## Define land Pollution

Land pollution refers to the destruction or a decline in quality of the earth's surface as a result of human actions. This could include anything from mining to agriculture to building, and consequences may be intentional or unintentional. Land pollution includes legacy pollution, illegal dumping and litter.

- ## List 4 causes of land pollution

1. Litter and Waste. Litter.
2. Urbanization and Construction. .
3. Mining and Extraction. .
4. Agriculture.

- Describe how land pollution can contribute to the following types of pollution:

1. air pollution-: The waste that does not degrade in the soil, called non-biodegradable waste, is then burned, which causes air pollution because of the toxic substances that are emitted into the air

2. water pollution-: Land pollution often contributes to water pollution as nutrients and substances from polluted sites seep into the groundwater or run off into lakes and rivers before reaching the oceans.

3. noise pollution-: Some of its major causes are the vehicles, aircraft, industrial machines used for disposing, crushing and transporting of the waste can be substantially noisey.

- **what can be done at landfills to reduce the following types of pollution:**

1. air pollution-: recycle – recycling and reusing materials instead of sending them to the landfill helps reduce emissions of greenhouse gases. compost – composting organic waste instead of sending it to the landfill helps reduce methane emissions.

- **Catergories of watse**

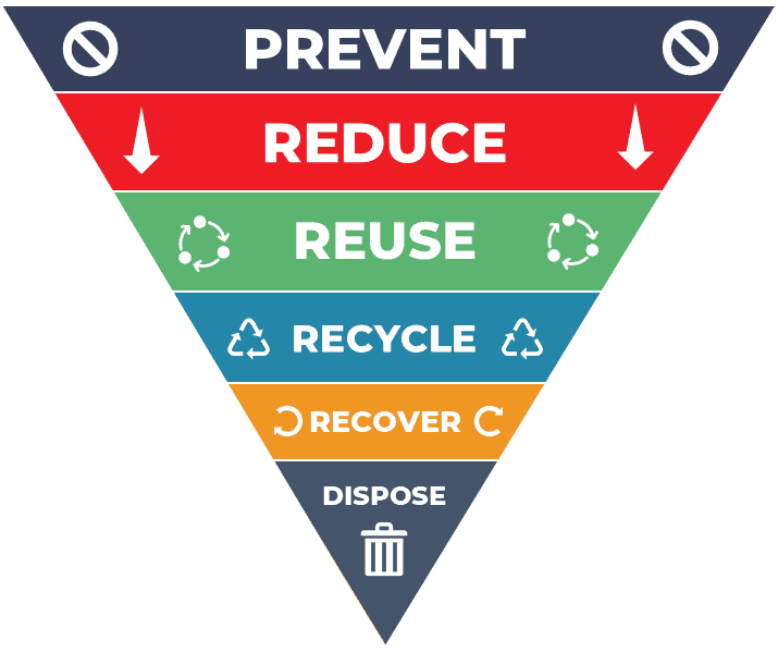
1. Municipal (Domestic waste better known as household waste)
2. Hazardous
3. Industrial
4. Medical
5. Universal
6. Construction and Demolition
7. Radioactive
8. Mining
9. Agricutural

- **Describe the hierarchy for waste management .**

  The waste management hierarchy is a set of guidelines that prioritizes waste prevention and recycling over waste disposal. The waste management hierarchy is based on the principle that it is better to prevent waste from being created in the first place, rather than to deal with it after it has been created.

Waste Management Hierarchy

1. Avoidance
2. Reduction of Wastes
3. Reuse
4. Recycle
5. Energy Recovery
6. Treatment
7. Disposal



Module 13

Noise pollution