# SCIENCE

## LESSON NOTES FOR P.7

**Lesson: 1 Definition of terms used: system / examples / Nutrition type**

**DIGESTIVE SYSTEM**

- Digestion is the process by which food is broken down into soluble particles that can be absorbed into the body.
- Digestion takes place in the alimentary canal which runs from the mouth to the anus.

**Structure of the alimentary canal**

The alimentary canal includes the following parts:-

- Mouth
- Oesophagus
- Stomach
- Duodenum
- Ileum
- Colon
- Rectum
- Anus

**TYPES OF DIGESTION**

- **Mechanical digestion**: is the breaking down of solid food into smaller particles by chewing. It takes place in the mouth.
- **Chemical digestion:** Is the breaking down of large particles of food into simpler molecules by the action of enzymes.

**Lesson 2**

**MOVEMENT OF FOOD IN THE DIGESTIVE SYSTEM IN THE MOUTH**

- The putting of food in the mouth is called “ingestion”
- The teeth help in guiding food to make it soft for swallowing.
- The tongue help to turn food and mix it with saliva.
- It also rolls into bolus.
- The salivary glands in the mouth produces a digestive juice called saliva that helps to soften cool and lubricate food.
- Saliva contains an enzyme called salivary amylase or ptyalin which acts on cooked starch to maltose.
- From the mouth, food moves down to the stomach through the esophagus by a process called peristalsis.

**IN THE STOMACH:**

- From the gullet, food enters the stomach through a ring of muscles called the cardiac sphincter.
- In the stomach food is briefly stored and channed.
- Stomach walls produce a digestive juice called the gastric juice.
- Gastric juice contains an acid called hydrochloric acid and two enzymes; pepsin and rennin.
- Pepsin acts on proteins and turns them into peptides.
- Rennin clots milk proteins.

- Digestion of proteins begins in the duodenum.
- Hydrochloric acid helps to kill germs and also provides a conducive environment for the working of pepsin.
- The walls of the stomach continues to move Channing food into chyme.
- From the stomach chime moves to the duodenum through a ring of muscles called the pyloric sphincter that opens at intervals.

**IN THE DUODENUM**

- Duodenum is the first part of the small intestines.
- In the duodenum, food is mixed with two digestive juices;- pancreatic juice and bile juice.
- Pancreatic juice is produced by the pancreas and pour into the duodenum through the pancreas and pours into the duodenum through the pancreatic duct.
- Bile juice is produced by the liver, stored in the gull bladder and pours into the duodenum through the bile duct.
- Pancreatic juice contains three enzymes namely:-
    - Amylase acts on stomach changing it to maltose.
    - Trypsin acts on proteins and peptides changing then into amino acids.
    - Lipase acts on emulsified fats into glycerols and fatty acids.
    - Bile juice helps to break down fats by emulsifying them.
    - Digestion of fats begins in the duodenum.
- Bile neutralize the acids in the food creating a condusive environment for amylase to act on stomach.

**IN THE ILEUM**

- The walls of the ileum produce a juice called succurs intericas.
- Succusintericus contain the following enzymes:-
    - Maltase changes maltose to glucose.
    - Sacras changes succose to glucose and fructose.
    - Lactase changes lactose to glucose and galactose.
    - Peptidase changes proteins and peptides into amino acids.
    - Lipase completes the breaking down of fats into glycerols and fatty acids.
- Digestion of food ends in the ileum and absorption takes place there:

**Adaptations of the ileum to absorption of food.**

- Fairly long giving a large surface area for absorption of food.
- Has numerous villi.
- Has a dense network of blood capillaries in each villas which carries away digested food.
- The villi have thin walls (epithelium) through which digested food can easily diffuse.
- N.B. Digested food from the ileum is carried to the liver through the hepatic portal vein.

**IN THE COLON**

- Water is absorbed from the undigested food.
- Undigested food (faeces) are briefly stored here before being passed to the rectum.

**IN THE RECTUM**

- It stores faeces which contains; roughages, mucus, dead germs and dead cells.

**THE ANUS**

- It is used for egestion.

**ENZYMES**

Enzymes are chemicals compounds that help to speed up digestion.

**Characteristics of enzymes.**

- They are easily destroyed by heat.
- They remain unchanged at the end of the reaction.
- They act on particular kinds of food.
- They are protein in nature.
- They act with a narrow medium of acidity or alkalinity.
- Each enzyme acts on a specific type of food.
-

**Conditions under which different enzymes act**

1. Acidic PH; Pepsin and Renin.
2. Alkaline PH: amylase, trypsin and lipase.

**THE LIVER.**

**Functions of the liver.**

- It produces bile.
- It stores iron, vitamin A and D.
- Fights poison in the body.
- Changes excess amino acids to glycogen and urea.
- Regulates blood sugar with the aid of insulin.
- Destroys worn out read blood cells.
- Produces heat in the body.
- Manufacture plasma proteins.

**Uses of food in the body.**

- Carbohydrates : Provides heat and energy in the body.
- Proteins : Used for growth and body repair.
- Vitamins : Helps in protecting the body against ill health.
- Mineral salts : Helps building strong bones and teeth.
  : Helps in the proper functioning of the nervous system.
- Fats : Help in the production of heat and energy.

**DISORDERS AND DISEASES OF THE DIGESTIVE SYSTEM**.

Disorders: - Constipation

- Indigestion.
- Vomiting
- Intestinal obstruction.
- Diarrhea.

**Diseases, causes and control.**

- Dysentery: Cause : Bacteria and amoeba
  Spread : Through drinking contaminated water.

Control : Boil drinking water.

- Cholera: Cause : Vibro cholera / Bacteria.
  Spread : Drinking contaminated water.
  Control : Boil water for drinking.
  : Eat well cooked food.
- Peptic ulcers: Cause : Too much acids.
- Appendicitis: Cause : Accumulation of stones and undigested solids in the appendix.
- Typhoid: Cause : Bacteria.
  Spread : drinking contaminated water.

**DIFICIENCY DISEASES:**

These are diseases caused by lack of certain food values in the body.

1. **Marasmas:**
   - caused by lack of carbohydrates in the diet.

**Signs and symptoms.**

- Child is always hungry.
- Face looks like that of an old man.
- Eyes are very bright.
- Child is under weight.

**Prevention and cure of marasmus.**

- Eating food rich in carbohydrates e.g. Banana, posho, rice, wheat, millet, cassava etc.

2. **Kwashirkor**
   - Caused due to lack of proteins in the body.

**Signs and symptoms.**

- Swollen face (moon face)
- Swollen hands and feet.
- Swollen abdomen.
- Brown hair.

**Prevention:**

- Eating food rich in proteins e.g. meat, fish, banana, Groundnuts, soya beans etc.

3. **Scurvy**
   - caused by lack of vitamin C in the body.

**Signs:**

- Bleeding gums in the mouth.
- Wounds do not heal easily.

**Prevention:**

- Eat food rich in vitamin C e.g. citrus fruits like oranges, guavals, mangoes, lemons, green dark vegetables etc.

4. **Rickets.**

- Caused due to lack of vitamin D in the body.

**Signs:**

- Bones are soft and swollen.
- Bones are weak and ball shaped

**Prevention:**

- Exposure to sunshine.
- Eat food rich in vitamin D e.g. fish, margarine, milk etc.

5. **Night blindness**
   - Caused due to lack of vitamin A in the body.

**Signs.**

- Poor night vision.

**Prevention:**

- Eat foods rich in vitamin A e.g. red pepper, carrots, pawpaws, etc.

6. **Goitre:**
   - caused due to lack of iodine in the body.

**Signs:**

- Swelling of the neck.

**Prevention:**

- Eat food rich in iodine e.g. Iodinised salt, sea weed, sea water.

7. **Berineri:**
   - Caused due to lack of vitamin $B_1$

**Signs:**

- Perusal paralysis
- Water lodging of tissues.
- Heat failure.

**Prevention:**

- Eat food rich in vitamin $B_1$ e.g. whole grains of cereals, beans, ground nuts etc.

8. **Anaemia**
   - Caused due to lack of iron in the body.

**Signs:**

- Pale eye lids and palms.
- Gets tried very quickly.

**Prevention:**

- Eat food rich in iron e.g. liver, spinach, beans, fish etc.

9. **Pellagra:**
   - Caused due to lack of vitamin $B_2$

**Signs:**

- Skin disorders.
- Eye and mouth sores.
- Mental degeneration.

**TEETH**

**<u>Sets of teeth</u>**

- Milk (deciduous) teeth or temporary – usually 20 in number.

- Permanent teeth – usually 32 in number.

**Types of teeth**
- Incisors.
- Canines
- Premolars
- Molars.

**Functions of teeth**

**Incisors.**
- They cut food
- They are chisel shaped (sharp edged)
- They are eight in number.

**Canines.**
- They are tearing food.
- They are sharp and pointed
- They are four in number

**Pre-molars**
- They are crushing and chewing food.
- They have broad rough surface for grinding food.
- They are eight in number.

**Molars (wisdom teeth)**
- They are also for crushing, grinding and chewing food.
- They have broad rough surface.
- They are 12 in number.

**Dental formular of man**

$$\begin{Bmatrix} 2 & 1 & 2 & 3 \\ 2 & 1 & 2 & 3 \end{Bmatrix}$$

**DISEASES OF TEETH.**
- Dental curriers
- Gingivitis

**Care for teeth**
- Brush teeth every after a meal
- Do not drink very hot or very cold water.
- Avoid eating too much sweets.
- Avoid opening bottles with teeth.
- Food definition functions / reasons for eating food / preservation / ways / food security / food poisoning/ causes, signs and prevention.

**FOOD TABOOS**
- Is a cultural or religious belief that restricts a certain group of people from eating a certain food stuff.

**Examples of food taboos**
- Moslems are not allowed to eat pork.
- Seventh day Adventists are not allowed to eat port.
- Catholics are not allowed to eat meat on Fridays during lent.
- Hindus are not allowed to eat meat.

**Advantages of food taboos.**
- Certain people and tribes have plenty of food to eat.
- Certain animals may be preserved in game reserves.

**Disadvantages of food taboos.**
- Food taboos can result into nutritional diseases.
- Children may lack certain food values in the body.
- Pregnant women may become malnourished.

**MATTER AND ENERGY**

- Definition of matter.
- Properties of matter.
- States of matter.
- Mass / volume / density.

**ENERGY**
Energy is the ability to do work.

**Kinds / forms of energy.**
- Sound energy.
- Light energy.
- Electricity.
- Heat energy.
- Magnetism.

**ELECTRICITY**
- Electricity is a form of energy produced by the flow of electrons.
- Electron is the negatively charged particles of an atom.
- An atom is the smallest possible unit of matter that can take part in a chemical change.
- Atoms link together to form molecules.

**Types of Electricity / forms.**

There are two types of electricity i.e.
- Current electricity.
- Static electricity.

**Uses of electricity.**
Electricity is used in:
- Lighting.
- Cooking.
- Operating machines.
- Heating.
- Protection / security fences.

**Advantages of using electricity.**
- It is quick or fast to use.
- It is clean and smokeless.
- It is environmental friendly.
- It is easy to operate.

**Dangers / Disadvantages of using electricity**
- It can shock and kill.
- It can burn property.

**STATIC ELECTRICITY.**
- This is the type of electricity where electrons do not flow.
- Static electricity is produced by friction between insulators.
- Is an example of electricity in nature.

**Example of static electricity.**
- Lighting in nature.
- Rubbing insulator against each other.

**LIGHTNING AND THUNDER**
- Lightning is caused when clouds become heavily charged with static electricity by means of friction between negatively charged clouds and positively charged clouds.
- When positively charged clouds meet negatively charged clouds a huge spark passes between the two clouds.
- This spark / electrons may pass to the earth which we call lightning.
- During lightning the surrounding air becomes strongly heated, expands and contracts suddenly which causes a vibration that produces sound called thunder.
- The continuous noise due to echoes.
- Lightning is seen before thunder is heard because light travels faster than sound in air.

**Advantages of lightning in nature.**
- It converts atmospheric nitrogen into nitrates.

**Dangers caused by lightning.**
- It damages buildings.

- It can cause fires.

**Prevention of dangers caused by lightning**
- Install lightning conductors on tall buildings.
- Avoid standing under tall trees during a rain storm.
- Avoid swimming in open water during rain.
- Always put on rubber shoes.

**CURRENT ELECTRICITY**
Is the type of electricity where electrons flow through a conductor.

**Types of current.**
There are two types of current electricity:-
- Direct current electricity.
- Alternating curing electricity.

**Direct current electricity.**
This is the type of current electricity which flows in only one direction. i.e. from the source to the appliance. DC can be stored but can not be stepped up or down.

**Sources of direct current.**
- Dry cells.
- Simple / wet cells.
- Accumulators.

**Alternating current electricity.**
- Is the type of current electricity which flows in both directions i.e. forward and backward.
- It can be stepped up and down.

**Sources of alternating current electricity.**
1. **Hydro – electricity:**
- This is the electricity produced by the power of running water.
- At a power station, kinetic energy of moving water turns turbines which are connected to generators that produce electricity.
  - Hydro electricity can also be produced by tides along coasts.

2.**Thermal electricity:**
- Is the type of electricity produced by burning s fuel, coal or oil which contain stored chemical energy.

3. **Atomic electricity:**
- Is the type of electricity produced by burning atomic uranium mineral.

4. **Solar electricity:**
-Is the type of electricity got from the sun.

- It is got by using solar cells which trap heat and light from the sun that are sent to solar batteries to produce electricity.

5. **Geothermal electricity**

- Is the type of electricity produced by steam from hot springs.

**AN ELECTRIC CIRCUIT.**

- An electric circuit is a complete path through which an electric current flow.
- Current is the flow of electrons.

**A SIMPLE ELECTRIC CIRCUITS.**

**Parts of an electric circuit and their uses.**

**Ammeter** : Measures electric current in a circuit.
**Conductor** : Is a medium for conducting current from the source to appliance.
**Switch** : Completes and breaks the circuit at ones will.
**Fuse** : Is a safety device which breaks the circuit in case of too much current flow.
**Dry cell** : Stores chemical energy that is changed to electric energy when the circuit is complete.
**The bulb** : Produces light when the circuit is complete.

- The bulb has the ability to change electric energy to heat and light energy.

**N:B** In a simple circuit, current flow from the positive terminal to the negative terminal.

- Electrons flow from the negative terminal to the positive terminal.

**Symbols used in an electric circuit.**

Cell
Switch
Fuse
Light bulb
Resistor
Fuse
Ammeter
Voltmeter

**ENERGY CHANGES IN A CIRCUIT**

- When the circuit is complete, chemical energy in a dry cell is changed to electricity.
- In a bulb electricity is changed to heat and then heat to light energy.

**Types of circuit**

(a) **Parallel circuit:** Is one in which all positive terminals are connected by one conductor and all negative terminals are connected by one conductor.

(b) **Series circuits:** Is one in which the positive A terminal of one cell is connected to the negative terminal of another cell to form a battery.

**SHORT CIRCUIT**

Is an electric path with low resistance taken by current.

**Caused of short circuits:**
- Use of naked wire when installing a circuit.
- Pouring water in electric appliances.
- Poor wiring.

**Dangers of short circuits.**
- Short circuits may cause fire that may destroy property.
- Short circuits lead to destruction of electrical equipment.

**How to prevent short circuits.**
- Installation / wiring in a house should only be done by experts.
- Use insulated wires.
- Electric appliances should be repaired by experts.

**Insulators / conductors**
- Uses, examples of insulators/conductors

**ELECTRIC CELLS.**
- Is advice that stores and produces electricity.
- There are two types of electric cells:
  (a) Primary cells.
  (b) Secondary cells.

**Primary cells**
These are cells that can not be recharged once they are used up.

**Examples of primary cells.**
- Simple cell or wet cell.
- Dry cell.

**Parts of simple cell.**
1. Copper rod :It acts as the positive terminal (Anode)
2. Zinc plate : It acts as the negative terminal (cathode)
3. Dilute sulphric acid : Acts as an electrolyte.

- An electrolyte is a liquid that allows electricity to pass through e.g. lemon juice, salt solution, sulphric acid, water etc.
- A simple cell is not efficient because of two factors.
  (a) Polarization.
  (b) Local action.
- Polarization is when bubbled of hydrogen gas cover the copper rod stopping the flow of electrons.
- Is when bubbles of hydrogen are seen coming off the Zinc place.

**Disadvantages of simple cells.**

- It is bulky.
- Can only be used in upright position.
- Produces electricity for a short time.

**Parts of a dry cell and their functions.**

**Brass cap** **:**Is the conduct for the positive terminal.
Pitch or top seal : Prevent ammonium chloride jelly from drying up.
Ammonium chloride paste: Helps in the transfer of electrons.
Electrolyte : Reduces the internal resistance of the cell.
: Absorbs hydrogen.
Manganses oxide : Prevents a build up of hydrogen gas around the carbon rod.
: It is a depolaring agent.
: Depolarization leads to leaking of cells when exhausted.
Carbon rod : Is a non metallic conductor of electricity found in a cell.
: It is made from graphite.
Zinc can : It acts as the negative terminal.

**SECONDARY CELLS**

These are cells which can be recharged once exhausted.

**Examples of secondary cells.**
- Lead accumulators.
- Telephone batteries
- Nickle cadmium alkaline.

**AN ELECTRIC BULB**

Is an electric appliance that changes electricity to heat and light energy?

**Parts of and electric bulb.**

Brass cap : Enables the bulb to be fixed in the lump holder.
Sealing tube : Enables air to be removed from the bulb and this prevents the filament from combining with oxygen.

**Coiled filament.**
- Is made up of tungsten which has a high melting point.
- Tungsten is got from a mineral called wolfram.
- The filament is coiled to increase resistance.
- The filament changes electrical energy to heat and then light energy.

**Glass envelope** : Holds a mixture of two gases Argon and nitrogen.
- These prevent he evaporating of tungsten.

**THE TORCH**

A torch uses dry cells. In most cases, the dry cells are placed in series.

**Parts of the torch.**

- **The switch** - breaks and completes the circuit.
- **The bulb** - changes electric energy into heat and heat to light energy.
- **The dry cell** - Changes the stored chemical energy to electric energy.
- **The reflector** - Reflector directs light into a diverging beam..
- **The cover and springs**- Completes the circuit and also keeps the dry cells tightly closed.

**Reasons why a torch may fail to work.**

- When the dry cells are wrongly arranged.
- When the dry cells are used up.
- When the bulb is blown.
- When some parts of the torch are rusted.
- When the used bulb has higher voltage than the used torch.

**Circulation of voltage.**

- One dry cell has a voltage of 1.5V.
- To calculate the voltage of an electric appliance, you multiply the number of dry cells by 1.5V.

**Plugs and sockets.**

There are two types of plugs i.e. a two pin plug and a three pin plug.

**Three pin plug.**

Three pin plugs are used in flat irons, cookers, water heaters, coils, hot plates, electric kettles etc.

**Wiring a three pin plug / cable / grid.**

- Neutral wire, coloured black or blue takes back current to the source.
- Live wires usually red or brown brings current for the source.
- Earth wire green or yellow minimizes any electric leakage or excess current and also prevents us from being shocked. (Use diagrams to illustrate)

**Devices connected to electricity.**

**Generator:**

- A generator produces electricity by changing mechanical energy in form of kinetic energy to electrical energy.
- This is done by rotating coils of wire in a strong magnetic field.

**How to make a generator produce more electricity by:**

- Increasing the number of turns in the coil.
- Increase the magnetic field.
- Increasing the speed of rotation.

**Dynamos**

- A dynamos produces electricity by converting mechanical energy in the form of kinetic energy into electric energy.
- An example of a dynamo is found on a bicycle and bigger ones are on vehicles.

- Those in vehicles help in charging the batteries.

**Electric motors.**
- Electric motors change electric energy to produce mechanical energy.
- Motors are used to start engines of cars, they move buses, trains, trams, lifts, fans, vacuum cleaners, egg beaters, electric sewing machines, radio cassettes etc.

**Transformers**

There are two types of transformers.

(a) Step up transformers – steps electricity going to industries.

(b) Step down transformers – steps up down electricity going to domestic houses.

**MEASUREMENT OF POWER / ELECTRICITY** – meter box, phases, voltage, ammeter.

**Problem faced by UMEME**
- Vandalism of property e.g. stealing cables.
- Non payment of electric bills.
- Corruption with in the management.
- Power theft / variation of water level at the dam.

**FORMS OF ENERGY**

**MAGNETISM**

Definition of magnetism and a magnet.

**Magnet**
- This is a piece of metal which can attract magnetic substances.
- Substance which are attracted by a magnet are called magnetic substances.
- They include:- - Nickel
  - Iron
  - Cobalt

**Non magnetic materials:-**
- These are substances that can not be attracted by a magnet.

Examples of such include:-
- Glass
- Plastic
- Rubber
- Alminium
- Copper
- Wood etc.

**Magnetism:**
- This is a force in magnets that attracts magnetic materials.
- **Alloys** are metals made by mixing two or more metals.

**Examples of alloys**
- Alnico – Alminium and Nickel
- Brass – Copper and Zinc
- Bronze – Copper and tin.
- Steel – Carbon and Iron
- Solder – zinc and lead

**TYPES OF MAGNETS**

There are two types of magnets, namely.

- Natural magnets
- Artificial magnets.

**Natural magnets:** These are magnets that exist on their own in nature without man making them.

- They are:- - Lodestone (magnetite)
  - Earth

**Artificial magnet:** These are magnets made by man. They are named according to their shapes.

These include: - Horse shoe magnet
- Bar magnet
- Ring magnet
- Needle magnet
- Cylindrical magnet.
- Electro magnets. How to make them / increase the strength.
- Advantages and disadvantages.

**Types of artificial magnets.**

- These are temporary and permanent.
- Permanent magnets retain their magnetism for a longtime while temporary magnets lose their magnetism easily e.g. an electro magnet.
- Disadvantages and disadvantages of temporary magnets.

**PROPERTIES OF MAGNETS.**

1. When a magnet is freely suspended, it faces in the North South direction (Illustration)
2. Magnets are strongest at the poles (Illustration)
3. Like poles of magnets repel.
4. Unlike poles of magnet attract each other.
5. Magnetic lines of force run for North pole to South pole.
6. When a magnet is broken into pieces, each piece becomes and independent magnet.
7. Magnestism can pass through a non magnetic material.
8. A magnet has two poles.

**Terms used in Magnetism**

- Poles of magnets: These are the ends of a magnet.
- Magnetic field: This is an area around a magnet.
- Where the force of magnetism is formed.
- Magnetic lines of force: These are lines around a magnet through which magnetism runs from North to South pole.
- Illustration

**Ways of making Magnets:**

(i) Single touch / single stroke method.
(ii) Double touch / double stroke method (Divided)
(iii) Induction method.
(iv) Electrical method.

**Note:** All methods above should be accompanied with an illustration.

**Ways of destroying magnetic (demagnetization)**

(i) By strong heating.
(ii) By hammering / hitting.
(iii) By leaving the magnet in an East – West direction for a very long time.
(iv) Leaving magnets in water to rust.
(v) Keeping magnets without iron keepers.
(vi) Keeping magnets with similar poles together for a long time.
(vii) Passing it through A.C voltage several times.

**Ways of protecting magnets against demagnetization.**

(i) By painting them to prevent them from rusting.
(ii) Keeping them in iron keepers.
(iii) Storing them while facing in the North – South direction.
(iv) Storing them with unlike poles together.
(v) Protecting them against strong heat.

**Uses of magnets.**

They are used in compasses to show directions.
They are used in telegraph and telephone receivers to amplify sound.
They are used in generators to produce electricity.
They are used in industries to pick heavy metallic magnetic objects.
They are used in electric bells.
They are used in hospitals to remove magnetic materials from the eye and wounds.
They are used on fridge doors.

**ENERGY RESOURCES IN THE ENVIRONMENT.**

**Definition of energy resources.**

- These are materials or substances which provide useful energy to man

**Definition of resource.**

- This is anything in the environment which man uses to satisfy his needs.

**Examples of energy resources.**

- Water, sun, wind, fossil, animals, plants and uranium.

**Types of energy resources.**

(i) Renewable resources.
(ii) Non renewable resources.
(iii) Common resources
(iv) Exhaustible / non exhaustible resources.

**Renewable energy resources.**

- These are energy resources which can be replaced once they are used up.
- They are:- - Sun.
  - Wind

- Running water
- Plants
- Animals.

**Non renewable energy resources.**

These are r4sourcesd which cannot be replaced once they are used up.

They are:- - Fossil fuels
- Uranium

**ENERGY RESOURCES FROM THE SUN**

- The sun is the main source of energy.
- The sun produces solar energy which is used to produce electricity.
- It also produces heat and light energy
- Solar energy is used in the heating and lighting of houses.

**ENERGY RESOURCES FROM WATER**

- We get hydro electricity from running water.
- This is very common at water falls. The force of water turns turbines connected to generators which help to produce hydro electricity.
- There is also hydro electricity got from tidal power at the coast of oceans and seas.

**ENERGY RESOURCES FROM MINERALS.**

- The minerals known for the production of energy include:- coal, crude oil (petroleum), natural gas and uranium.
- The electricity got from fossil fuels i.e. crude oil, coal and natural gas is called **thermal electricity**.
- Uranium produce nuclear and atomic power of energy.
- Both thermal and nuclear power are used in the running of machines, lighting of houses and heating of houses.
- From petroleum we get fuels like diesel, petrol, aviation fuel and paraffin.

**Natural gas:** This is mined from areas where petroleum is found. The gas is mainly used for lighting and heating.

- It can be used for: cooking and running power stations.

**Coal:** This is a hard black material found below the ground.

- It is a solid fossil fuel formed from the remains of living things.
- Coal can be burnt to supply heat in power stations.

**Energy resource from plants**

- Energy sources from plants include:- wood fuel, bio gas food etc.

**Wood fuel**

- From wood we get fire wood, charcoal and sawdust. They are used in the production of heat and light.

**Conservation of wood.**

- Conservation of wood means using of wood sparingly without wasting it. Talking about wood conservation means its management and sustainable use.
- Wood supply can be conserved by: afforestation, re-afforestation, agro forestry etc.

**Wood fuel conservation**

This can be through:-

- Using energy – saving stoves: These use little fuel materials like charcoal and firewood.
- They also keep heat for a very long time.
- Using saw dust.
- Coffee husks.

**Food from plant energy**

- The plants manufacture starch through photosynthesis.
- The starch is eaten by animals to gain energy.
- The feeding relationship in living things is called a food chain..
- An example of a food chain how livings get energy is:- plant – man

**BIOGAS:**

- We get biogas from leftovers and wastes from the foods we eat. Animal wastes can also be used to get biogas.
- The wastes and plant remains from which we get biogas include:- banana peeling, potato peeling, cow dung, chicken waste, pig waste etc.

**How Biogas is made**

- Biogas is made from as special gas called **methane gas.**
- The methane is produced in an air tight hole (pit) called a biogas digester.
- The waster in the digester ferment and decompose with the aid of bacteria.
- The bacteria do not use surface oxygen and therefore use a type of respiration called **Anaerobic respiration.**
- The decomposition that occurs in the digester is also called **anaerobic decomposition.**
- The biogas is collected in a biogas tube where it is taken out of use.
- Inlet value is used for pouring in new plant and animal matter.
- The liquid residue that remains after the collection of biogas is called effluent while the solid one is called the slurry (sludge)

**STRUCTURE OF THE BIOGAS DIGESTER.**

**ENERGY RESOURCE FROM ANIMALS**

- Animals get energy by eating plants.
- Energy from animals can become available to people in the following ways:-
- People eat animals as food to release energy stored in the muscles.

- Animals are used to perform tasks like transport, ploughing and pulling of loads.
- Animal wastes can be used to produce biogas.

**ENERGY RESOURCES FROM WIND**
- Air (oxygen) is used in respiration to support life and burning.
- Carbondioxide is used to put out fire.
- It is also used by plants to manufacture food.
- The energy of air is used to drive out vapour from clothes to make them dry.
- Wind energy helps to drive boats and dhows in their sails.
- Wind energy runs wind mills to generate electricity, to grind corn or maize and pump underground water.

**POPULATION AND HEALTH**

**Population and health concerns.**

Population refers to the number of people living in an area.

**Health:**Refers to the general, physical, metal and economic wellbeing of a person.

**Health concerns** refers to the health problems affecting the population of an area.
- Health concerns include;
- Poor sanitation.
- Anti solidbehaviour.
- Poor water supply.
- Inadequate food supply / food insecurity..

1. **Poor sanitation**
   - Poor sanitation refers to dirtiness of the surrounding.
   - It also means poor disposal of human wastes and other wastes.

**Causes of poor sanitation.**
- Poor disposal of rubbish.
- Poor disposal of faeces.
- Sharing a house with animals.
- Poor drainage in a home.
- Blockage and bursting of the sewerage system.
- Over crowing in a home.

**How to control poor sanitation in a home.**
- Families should have latrines and toilets for proper disposal of faeces.
- Water sources must be protected from contamination.
- Sewage must be properly treated and disposed off.
- Rubbish (refuse) should be properly disposed off by burning or burying it.
- Bushes around the home must be slashed regularly.
- Stagnant water around the home should always be drained.
- Animals should be kept in a spate house from that of humans.

**Effects of poor sanitation**

- Easy spread of diarrheal diseases.
- Multiplication of vectors and germs.
- Easy contamination of water sources.
- Multiplication of worms.

2. **Anti social behavior.**

These are bad habits not needed (acceptable) in a particular society.

Examples of anti social behavior include:-

- Lying
- Stealing
- Fighting
- Bulling
- Murder
- Arson
- Smoking
- Alcoholism
- Drug abuse
- Abortion
- Raping
- Child prostitution.

- Poor disposal of wastes.
- Lack of funds to construct clean water sources.

**Causes of antisocial behavior.**

- Over strictness by parents or teachers.
- Unfulfilled expectations.
- Pampering of children.
- Failure to enforce rules in a community.
- Inconsistence.
- Poor family background.
- Ignorance of society rules or laws.
- Peer influence.

**How to control antisocial behavior.**

- Pushing children for wrong behavior.
- Rewarding for good behavior.
- Equal treatment among children.
- Encouraging elders to set good examples to children.
- Through guidance and counseling.
- Keeping children through developmental activities during their free time.

3. **Poor water supply.**

This refers to inadequate water supply or un clear water

**Causes of poor water supply.**

- Drought.
- Floods
- Wars
- Over population
- Siltation .

**How to overcome poor water supply.**

- Government should provide clean safe water.
- Proper disposal of wastes to avoid water contamination.
- Encourage people to boil or treat water before using it.
- Educating people about the importance of protecting water sources.
- Protecting of wetlands and water catchment areas.

**Effects of poor water supply.**

- It leads to easy spread of water associated diseases like:-
  Water borne
  Water contact
  Water vector / habitat
  Water cleared.
- Famine
- Poor sanitation
- Low industrialization.

4. **Inadequate food supply (Inadequate food security)**

This is a condition when the food available can't meet the nutritional requirements of people in an area.

**Causes of inadequate food.**

- High population increase.
- Laziness.
- Ignorance of good farming methods.
- Low level of technology.
- Drought
- Floods
- Wars
- Poor soils
- Poor attitude towards farming.
- Pests.
- Diseases.

**Solutions to inadequate food supply.**

- People should practice family planning.
- Providing loans to people to carry out agriculture.
- Giving irrigation facilities to people.
- Avoid draining wetlands to control floods.

- Growing crops which are resistant to pests and diseases.
- Introduce agriculture in schools to enable children develop interest in farming.
- Seeking advice on good farming methods from agricultural officers.

**ACTIVITIES THAT PROMOTE HEALTH IN A COMMUNITY**

**Care for homes**

This can be done through:-
- Proper disposal of wastes.
- Draining stagnant water
- Providing good nutrition.
- Treating of the sick.
- Supply of clean water.

**Having a family budget.**

A family budget is an advance plan of how the expected family income is to be utilized.

**Importance of budgeting in a home**
- It gives proper planning for the family income.
- It helps to cater for priorities first.
- It reduces over and under expenditure.
- It reduces debts.
- It reduces quarrels in a home over money.

**Systems of budgeting in a family.**

1. **The handout system**

   This is a system where one member of the family controls the family income and pays it on demand.

**Disadvantages.**
- Controller of the money cannot use money effectively.
- Other peoples needs may not be catered for.
- Some family members never understand the true financial stand of the family.
- Some family needs may be neglected.

2. **The allowance system**

- This is a system where the money earning member of the family gives one member e.g. wife an allowance and keeps the balance.
  - The wife plans according to the money available.

**Disadvantages.**
- The wage earner may not provide enough money to cover all expenses.
- The house wife may skip essential items and stretches the budget for her own use.
- Certain items needed by the family may be neglected.

3. **Joint control system**

This is where both husband and wife earn money and divide up the house hold expenses e.g. transport, fees food etc.

- This system works well when they both have a stable income otherwise it can lead to quarrels.

4. **Family budgeting system.**

In this case all needs of the family are examined by the whole family.

**Advantages**

- Priorities are worked out according to resources.
- There is less likely hood of one member being selfish.
- All needs of a family can be taken care of.
- It creates less suspicion and leads to harmony and honesty in a home.

**Components of budgeting**

- Planning.
- Priorities for the family.
- Evaluation.

**Health survey**

This is a way of gathering information about the health status of a family or community.

**Information gathered during a health survey.**

- Kind of food people eat.
- Kind of houses people use.
- The health facilities in the area.
- Sanitation in the area.
- Immunization coverage.
- Food security in the area.

**Importance of healthy surveys.**

- They help in planning by finding out what health facilities are in the area.
- They help to find out the sanitation and latrine coverage in an area.
- They help to find out the immunization coverage of the population in an area.
- They help to find out if people have safe water in that area.
- They help to find out information on food security in an area.

**Health education.**

- This is knowledge which deals with the health concerns and general being of individuals families and communities.
- Health education is very important because it helps people, families and communities to address health concerns.

**Importance of health education.**

- It helps one to value the importance of good health.
- It helps people to maintain good health through personal, family and community hygiene.
- It helps people in preventing the spread of simple diseases which would affect society.
- It helps people to be easily mobilized incase of disease out break e.g. cholera .
- It reduces poor traditional beliefs about diseases.

**Information on population.**

Kind of information gathered about population.

- Demography.
- Housing information
- Immunization
- Available health services.
- Food security.

**DEMOGRAPHY**

- This is the study of the population
- It takes into account the number of births, deaths , marriages and common diseases in a place at a given time, factors that cause changes in the population e.g. migrations, wars, job opportunity etc.

**Importance of demography**

- It helps the government to know population of various areas.
- Helps government determine the population structure.
- Helps government to know the birth and death and death rates.
- It helps government to plan for its population.

**HOUSING INFORMATION**

- The information gathered includes; type of homes, their size, ventilation, Number of people who live in them and their strength.
- This helps to know the quality of life people live in an area.

**IMMUNISATION**

The information gathered include the number of children immunized, the ages of the children and the diseases immunized against.

**Available health services**

Information gathered include;

- The number of dispensaries, health centres and hospitals in an area.
- Public and private health centres.
- Services offered in the health centres or hospitals e.g. X-ray, family planning, counseling and guidance, antenatal and postnatal care services.
- The number of doctors, nurses, lab technicians, traditional birth attendants etc working in a health centre.

**SEXUALLY TRANSMITTED DISEASES**

- These are diseases that are spread through sexual contact with an infected sexual partner.

- Also known as sexually transmitted infections or venereal diseases.

**Examples of sexually transmitted diseases.**

- AIDS
- Syphilis
- Gonorrhea
- Trichomoniasis
- Urethritis
- Candida
- Genital herpes
- Genital warts
- Pelvic inflammatory disease (PID
- Lymphogranulomavenereum

**Causes of sexually transmitted diseases.**

- Bacteria - Viruses - Protozoa - fungi.

**AIDS**

AIDS in full stands for Acquired Immune Deficiency Syndrome.

Acquired – Means got from somewhere outside the body.
Immune – Protected against, free or safe from
Deficiency - Lack of or shortage of
Syndrome - Collection of various signs and symptoms of diseases.

**Cause of AIDS**

- It is caused by a retrovirus known as HIV which stands for human immunodeficiency virus.

**How HIV/AIDS is transmitted.**

- Through unprotected sexual contact.
- Through blood transfusion.
- Through sharing sharp cutting instruments with an infected person.
- From infected mother to babies during pregnancy and at birth.

**Signs and symptoms of HIV / AIDS**

**<u>Signs.</u>**

- Herpes zoster – Commonly known as “Kisipi” which inflames the skin making it appear as a scald.
- Chronic diarrhoea.
- Severe loss of body weight.
- Skin cancer which is called Kaposis sarcoma.
- It causes itching that leads to scratching that leaves black sports (scars) on the skin.
- Swollen lymph glands especially those of the neck and armpits.
- Oral thrust whereby the tongue, gum, lips and inside of the mouth and the alimentary canal have sores which turn whitish pink.
- Chronic cough.
- Excessive sweating at times.

**Symptoms**

- General body weakness.
- Persistent fever.

- Tiredness without any proper cause.

## EFFECTS OF AIDS TO THE INDIVIDUAL, FAMILY AND COMMUNITY.

### Individual
- A person infected with AIDS suffers pain because of the disease.
- The person gets worried since the disease has no cure.
- Infected persons may lose their jobs as they become too weak to work.
- People with AIDS are often stigmatized or isolated.

### Family
- The family spends a lot of money on care and treatment.
- There is loss of family labour.
- The children become orphaned.
- It may result into divorce.

### Community
- Productive labour is lost.
- It can lead to depopulation.
- A lot of income is spent on treatment and prevention.

## PREVENTION AND CONTROL OF AIDS.
- Having one faithful sexual partner.
- Abstaining from sex.
- Using condoms when playing sex.
- Using sterilized medical instruments.
- Avoid practices which involve risks of getting AIDS e.g. circumcision, tattooing with unsterilized instruments.
- By providing antiretroviral drugs to pregnant women to prevent the unborn baby from being infected.
- Infected mothers are not allowed to breast their babies.

## PEOPLE AT RISK OF GETTING HIV/AIDS.
- People between 15 – 45 years. This group is most sexually active.
- Prostitutes.
- Long distance truck drivers.
- Bar maids.
- People who inherit widows or widowers.
- Rapists
- Medical workers
- Soldiers who were away at war

## MANAGEMENT AND CARE OF PEOPLE WITH AIDS / HIV
- Counselling:- Is a special form of communication through which a person is helped to control his or her feelings, attitudes and behaviours during the time of sickness.
- They should be fed well on a balanced diet.
- They should give up bad habits like smoking and alcoholism.

- They should treat any opportunistic disease that attacks the body.
- They should stop doing hard work which tires their body.
- Should not have unprotected sex.

**REASONS FOR COUNSELLING PEOPLE WITH AIDS.**
- To prevent them from committing suicide.
- To stop people from spreading the disease to other people.
- To help people stop worrying and live a normal life.
- To encourage people have proper planning for their life.

**Types of counseling.**
(i) **Pre – HIV antibody test counseling:-** It involves talking to people before taking an HIV/AIDS test.
(ii) **Post – HIV antibody test counseling**: It involves talking to somebody who has been confirmed to have AIDS or HIV
(iii) **Counseling HIV/AIDS patients:** This is talking to people who have shown signs and symptoms of HIV / AIDS.

**ORGANISATIONS IN UGANDA THAT OFFER COUNSELLING SERVICES.**
TASO – The AIDS support organization.
AIC - AIDS information centre.
ACP - AIDS control program of the Ministry of Health.

GONORRHEA
- Gonorrhea is caused by bacteria called gonococci which attacks the mucus membrane of the urethra in men and walls of the vagina in women.

**Transmission and signs.**
- It spreads through sexual intercourse with and infected person.

**Signs in men**
- Pain when urinating.
- Drops of pus from the penis.
- Painful swelling of the testicles.
- Rash and sores in the genital area.

**Signs in women.**
- She may feel little pain when urinating or have a vaginal discharge weeks or months after contracting the disease.
- Later she feels pain in the lower abdomen.
- Painful menstrual periods.

**Signs in babies.**
- Red and swollen eyes.
- Pus comes out of the babies eyes.

**Effects of gonorrhea**
- Damage to male and female reproductive organs if not treated.
- It may lead to sterility in men and women.
- It affects the urethra by blocking it and therefore makes it difficult for men to pass out urine.
- It causes blindness in babies.

**Prevention and control of gonorrhea.**
- Use the ABC formulae for preventing gonorrhea.
- Seek early treatment for you and your partner.
- Stop sex until you are completely cured.
- Avoid pre-marital and extra marital sex i.e. avoid sex before marriage and outside marriage.

**SYPHILIS**

Syphilis is a disease caused by a bacteria called **Spirochaete.**

**Transmission of Syphilis.**
- Through sexual intercourse with an infected person.
- From infected mother to baby when still in the womb.
- Through blood transfusion.

**Signs and symptoms of syphilis.**

**First stage.**
- Painless sore called chancre.
- Open wound or blister in the genital area of the man or woman.
- Sores also may appear on the lips or anus.
- Lymph nodes swell.

**Note:** At this stage syphilis can be cured.
- The sore may disappear without treatment but disease will continue to spread.

**Second stage**
- Mouth sores
- Sore throat
- Mild fever
- Swollen joints
- Skin rash.
- Itchy rash on the feet or hands.

**NB.** At this stage syphilis can be cured if reported to the health worker.

**Third stage**
- This stage can come five or more years later.
- Heart diseases.
- Paralysis.
- Blindness

- Insanity or madness.

**NB:** Syphilis at this stage is incurable.

**Prevention and control of syphilis.**
- Use the ABC formulae for preventing syphilis.
- Seek early treatment for you and your partner.
- Stop sex until you are completely cured.
- Avoid pre-marital and extra marital sex i.e. avoid sex before marriage and outside marriage.

**Other sexual transmitted diseases.**

Pelvic inflammatory disease (PID)

These are complications of the late stages of gonorrhea in women. It affects the pelvic area.

**Signs and symptoms of PID**
- Pain in the lower abdomen.
- Prolonged menstrual periods.
- Back pain.
- Pain when having sex.
- Vaginal discharge.

**Effects of PID**
- It may lead to infertility.
- There may be tubal or ectopic pregnancy

**Genital warts.**

These are sores on the sexual parts, but can also grow around the arms. They are caused by a virus.

**Genital herpes.**
- It is caused by a virus called herpes simplex.
- It can be a sign of HIV / AIDS or a disease on its own

**Signs and symptoms of genital herpes.**
- Blisters which later burst into painful sores.
- The sores may appear on the penis, vagina anus, buttocks, thighs, mouth, back or chest.
- A person may have fever aches and chills.

**Prevention and control of genital herpes.**
- Keep the sores clean.
- Abstain from sex.
- Seek medical treatment.

**TrichomoniasisVaginallis.**
- It is caused by a protozoa germ called **Trichomonas.**
- The disease is associated with persistent inflammation of the vagina.
- The infection often occurs at the end of the menstrual period.

**Signs and symptoms**

- Itching of the vigina and other genitals.
- Burning sensation during urination.
- Yellowish discharge which looks like spoilt milk.
- Males may experience inflammation of the urethra but are not very much affected by the disease, however they can be carriers.

**Treatment**

It is commonly treated with flagyl.

**Control**

As with other STDs.

**Candida**

- Candida infection of the mouth and vagina is referred to as thrush.
- It is caused by a fungus.
- The fungus lives where there increased sugar levels.
- Women with diabetes and those in advanced pregnancy are vulnerable to this disease.
- People with low immunity are also seriously affected.
- Man acquired the disease through intercourse with a person suffering from vaginal candidiasis.

**Signs and symptoms.**

- Thick whitish discharge.
- Local discomfort caused itching.
- Burning sensation when urinating.
- Men experience irritation of the penis and gets a discharge.

**Prevention and control.**

- Avoid sex outside marriage.
- Avoid sharing basins, towels and under wears.
- Personal hygiene – seek medical treatment

**LymphogranulomaVenereum (Lymphogranuloma)**

- Also referred to as bursting lymph glands in the groin.
- It is caused by a bacteria.

**Signs and symptoms**

- Painful swelling of the lymph nodes which may develop into pus.
- Dark swelling develop in the groin.
- Painful sores in the anus.
- Discharge from the anal sores.

**Prevention and control.**

- Avoid sexual contact until the sores are completely healed.
- Seek early treatment to control its spread.
- Abstain from sex.

**Life skills of avoiding STDS.**

- Go for treatment if there any signs of STDs.
- Have regular medical check up.

- Complete the dose for treatment.
- Abstain from sex until treatment is completed.
- Inform all your partners that you have had sex with to go for treatment.
- Wait until marriage before having sexual relations.

**CONTROLLING AND MANAGING CHANGES IN THE ENVIRONMENT.**

**Conservation.**

- This is the controlled use of a resource that is in limited supply.
- Resources that need to be conserved include:- soil, air, water, plants, animals and minerals.

**Importance of conservation practices.**

- Conservation enables the future generation to benefit from the natural resources that would become extinct.
- Conservation of resources like forests helps to maintain the climate of an area..
- Conservation practices help to ensure constant supply of raw materials to industries that depend on the environment.
- Conservation practices help to promote tourism if animals and plants are protected.
- Conservation practices help to promote good health of people by providing good nutrition from food which is protected and a clean environment.

**MEASURES TO CONTROL ENVIRONMENTAL DEGRADATION**

- Environmental degradation is the lowering of the quality of resources in the environment.

**Types of environmental degradation.**

- Soil or land degradation.
- Deforestation or de-vegetation.
- Wetland degradation.
- Environmental pollution.
- Wild life destruction.
- Causes of environmental degradation.
  (i) Human activities e.g.
  (ii) Natural causes (dictators) / Hazards.

**How to control environmental degradation.**

- Putting laws in place to protect the environment like wetlands, wild life, forests, soil and water.
- Educating people about the value of the environment and maintaining it.
- Using of alternative resources which do not degrade the environment.
- Controlling the growth of the population to reduce pressure on the environment.
- Recycling of some resources to avoid exhaustion of limited resources.
- Controlled harvesting of resources to avoid extinction.

**CONSERVATION OF SOIL**

- Soil conservation refers to careful use of soil without exhausting it.
- It also refers to measures taken to maintain soil fertility.

**How soil becomes exhausted.**

- Through monoculture.
- Bush burning.
- Over cultivation.
- Over grazing.
- Over stocking.
- Disposal of non biodegradable materials e.g. glass, polythene, plastic, metal scrap etc.
- Through excessive soil erosion.
- Through leaching.

**How to conserve soil**

- Applying of artificial and natural fertilizers.
- Mulching of the garden
- Crop rotation.
- Cover cropping.
- Mixed cropping.
- Agro forestry.
- Afforestation and re-aforestation.
- Bush fallowing.
- Terracing.
- Contour ploughing.
- Applying dead or closed seasons.
- Avoid disposal of non biodegradation materials in the soil.

**Effects of soil degradation**

- It leads to low crop yields.
- It leads to death of aquatic life since soil is eroded into water.
- It can lead to siltation.
- It leads to washing away of plants.
- It can lead to floods.

**Protection of wetlands.**

- A wetland is a place with soft soil and water having vegetation growing in it.

**Examples of wetlands.**

- Swamps
- Marshes.
- Pit bogs.
- Inland flood plains.
- Coastal flood plains.
- Tidal flood plains.
- Estuaries.
- Deltas.

**Importance of wetlands.**

- They are habitats for aquatic life.
- Some are sources of rivers.
- Wetland filter surface water.
- They control floods by absorbing water.
- They influence the formation of rainfall.
- They are sources of raw materials for the art and crafts industry.
- They are good areas for research studies.
- They are sources of food like fish.
- They provide water for industrial and domestic use.

**How wetlands are destroyed.**

- By draining water from them.
- By releasing poisonous chemicals into them which leads to pollution.
- By clearing forests around them which leaves them un protected.
- By releasing hot water in them which increases the temperature of the water and kills some animals and plants.
- By filling wetlands with soil to construct buildings.
- By over harvesting of resources from wetlands e.g. papyrus.

**How wetlands can be protected**

- By not realizing poisonous chemicals into wetlands.
- By treating human wastes before releasing them into wetlands.
- By not draining and cultivating in wetlands.
- By putting laws in place against the destruction of wetlands.
- Educating people about the proper use of wetlands.
- By developing local tourism where local people also benefit.
- By proper harvesting of wetland resources.
- By encouraging people to grow upland rice.
- Not allowing wetlands for industrial development.

**Proper harvesting of wetland resources.**

- Harvesting is the getting a ready resource for human use.
- Some of the resources which are harvested include;- Papyrus, grass, palms, fish, snakes, water bucks crocodiles etc.
- Resources in the wetlands are harvested sustainably in the following ways.
    - By catching only mature fish and leaving the young ones to grow.
    - Getting little clay and leaving new clay to form.
    - Cutting papyrus in a way that some is left to act as habitat to aquatic life.
    - Regulating the use of water so that wetlands are not drained.
    - Cutting few trees for human use so that some are left as habitat for animals.

**CONSERVATION OF FORESTS.**

**Importance of forests.**

- Provides timber.
- They are habitat for wild life.

- Modify climate by helping in the formation of rainfall.
- They help to purify air.
- They control soil erosion.
- They provide shade.
- They are a source of medicine.
- They are used for research.

**Forests can be conserved in the following ways;**
- By afforestation.
- By re-afforestation.
- By agro forestry.
- Use of energy saving stoves.
- Use of alternative sources of fuel.
- By rural electrification.
- Enforcing laws against deforestation.
- Improved methods of agriculture.
- Educating people about proper use of forests.
- By harvesting only mature trees.

**BIODIVERSITY**
- Biodiversity refers to a variety of different plants and animals found in the environment.
- The way these animals and plants benefit from each other is called interdependency.

**Ways used to protect biodiversity.**
- By protecting forests against deforestation.
- Avoid poaching of wild animals.
- Avoid unnecessary killing of animals which are hot in protected areas.
- Reducing of over harvesting of plants and wetland materials.
- Controlling the pollution of air, water and soil.
- Educating people about the proper use of flora and fauna.
- Putting laws in place to protect the environment against destruction.
- Keeping endangered species of animals and plants in protected areas.

**CONSERVATION OF ATMOSPHERIC AIR**
- Atmospheric air is air around us. It plays a very big role in supporting life. If the air is contaminated.
- It can lead to diseases and death.

**How atmospheric air is polluted.**
- Through release of poisonous gases from industries.
- Through exhaust fumes from vehicles.
- Through release of dangerous fumes from agricultural chemicals sprayed to control diseases and pests.
- Through dust generated by strong wind and storm.
- Through dangerous chemical released by volcanic eruptions.
- Through gases from dangerous weapons e.g. atomic bombs.

**NEGATIVE EFFECTS OF AIR POLLUTION.**

- It can lead to acidic rains if smoke containing sulphur dioxide reacts with vapour to form acid rains.
- The floating particles of carbon can easily fall on the leaves and disturb the process of photosynthesis and respiration.
- Continuously inhaled carbon, can lead to respiratory diseases bronchitis.
- Smog and fog causes accidents due to poor vision by people.
- Air pollution leads to globel warnings if a lot of carbon is released in the atmosphere.
- Dangerous gases called chloroflora carbons(CFCS) if released in the atmosphere destroy the ozone layer leading ultraviolet rays to destroy life on earth. The (CFCs) are released from fridges, air conditioners, insecticides etc.

**Ways of controlling atmospheric pollution.**

- By planting trees to absorb carbondioxide.
- Using un leaded fuel in automobiles.
- Filtering smoke from industries before releasing it into the atmosphere.
- Reducing industries that produce a lot of smoke.
- Burning the manufacture of weapons of mass destruction.

**Conservation of water.**

- Water is mainly degraded through pollution.
- It can be polluted in the following ways.
- Releasing industrial water.
- Releasing of sewerage in the water.
- Through siltation.
- Seeping of oil in the water.
- Constructing latrines near water sources.
- Defecating and urinating in water sources.
- Releasing of agricultural chemicals e.g.fertilizers. And pesticides in water sources.
- Dumping glasses, polythene and domestic refuse in water.
- Fish poisoning.

**Ways of protecting water sources.**

- Treating of sewage before releasing it into water sources.
- Constructing pit latrines away from water sources.
- Avoid releasing of industrial wastes into water sources.
- Planting trees around water sources.
- Avoid washing cars near water sources.
- Use proper methods of fishing other than poisoning.
- Controlled use of artificial fertilizers.

**ENVIRONMENTAL DEGRADATION.**

- Environmental degradation refers to the destruction of resources in the environment.
- There are both natural and artificial causes of environmental degradation.

**NATURAL CAUSES OF ENVIRONMENTAL DEGRADATION.**

- Earthquake.
- Volcanic eruptions.
- Drought
- Lightening.
- Floods.
- Storms.

**Earthquake.**

- This is a sudden and violent shaking of the earth brought about by internal movement in the earth.

**Effects of earthquakes.**

- Destruction of human life.
- Destruction of property.
- Blocking of communication lines.
- Causes strong storms if it occurs in water.

**How to minimize effects of earthquakes.**

- Constructing earthquakes resistant houses.
- Move out buildings during an earthquake.
- Build houses using light materials that can cause less damage in case of an earthquake.
- Putting early warning systems in place.
- Providing quick first Aid to people affected by earth quakes.

**Volcanic eruption (effects)**

- Causes death to people and property.
- Gases produced cause air pollution.
- Lava can cause water pollution.
- It can lead to displacement of people.
- It can lead to famine.
- It can lead to blocking of rivers and water ways.

**Drought.**

Drought refers to a long dry spell without rain.

**Causes of drought.**

- Deforestation.
- Drainage of swamps.
- Global warnings.
- Over grazing.

**Effects of drought.**

- It leads to famine.
- Death of animals.
- Out break of diseases.

- Infertility of soil.
- Lowering of the water table.

**How to control the effects caused by drought.**
- By protecting vegetation and water sources.
- Practicing soil conservation.
- Planting trees.
- Planting drought resistant crops.
- Planting of quick maturing crops.
- Practice efficient water harvesting and storage methods.

**Lightning**
- Lightning is a strong flash of light in the sky caused by meeting of clouds of two different charges.

**Effects of lightning.**
- It damages property.
- It leads to destruction of trees at times setting them on fire.
- Loss of human and animal life.
- Destruction of electrical appliances.
- Setting of bush fires.

**How to protect your self against lightning.**
- Stay indoors during a thunder storm.
- Avoid standing in rain water during a thunderstorm.
- Don't stand under a tree during a thunder storm.
- Fit buildings with lightning conductors.
- Avoid walking in open bare fields when it is raining.
- Avoid swimming in open water during rain.

**Floods.**
- Flood is a great overflow of water over dry land.

**Caused of floods.**
- Deforestation.
- Global warning.
- Storms.
- Siltation
- Draining of rivers.

**Effects of floods.**
- Destruction of animal and plant life.
- Destruction of property.
- Blocking of communication lines.
- Diseases.
- Contamination of water sources.

**Ways of controlling floods.**

- Maintaining vegetation in catchment areas
- Conserving soil.
- Creating reservoirs to hold excess water.
- Educating people about floods their causes, effects and prevention.
- Protecting wetlands.

**Storms**

- Storms are strong winds that blow with violence.
- They can destroy buildings and plants.
- To avoid destruction caused by storms, plant trees to act as wing breaks.

**HUMAN CAUSES OF ENVIRONMENTAL DEGRADATION.**

Human activities that lead to environmental degradation include:-

- Bad agricultural practices e.g. over cultivation, overgrazing and over stocking.
- Mining
- Construction of roads and buildings.
- Poor disposal of wastes.
- Poaching.
- Drainage of wetlands.

**TYPES OF ENVIRONMENTAL DEGRADATION.**

These are:-

- De-vegetation.
- Silting of water bodies.
- Loss of biodiversity.
- Poor waste management.
- Soil degradation.
- Wetland degradation.
- Pollution.

**De-vegetation.**

This is the removal of plant cover from an area.

- It is caused by high demand for trees, land for agriculture and development.

**Effects of de-vegetation.**

- It exposes soil to erosion.
- It leads to poor yields.
- Loss of habitat
- It leads to drought.
- It leads to loss of animal and plant species.
- It leads to lowering of the water table.

**Control and prevention of de-vegetation.**

- Making laws to protect forests.
- Controlling increase in population.

- Practicing afforestation.
- Re-afforestation and agro forestry.
- Rural electrification.
- Use of energy saving stoves.

**Silting of water bodies.**
- Silting is the washing of soils into water bodies by erosion.

**Causes of silting.**
- Deforestation.
- Cultivation a long river banks.
- Clearing of wetlands.
- Grazing animals along water bodies.
- Dumping soil near water bodies.
- Burning bushes along water bodies.

**Effects of silting of water bodies.**
- Creation of shallow water bodies.
- Drying up of water bodies.
- Flooding of surrounding areas.
- Death of aquatic animals.
- Reduction in the generation of hydro electricity.
- Increase in growth of aquatic plants.

**Ways of controlling silting.**
- Afforestation.
- Agro forestry.
- Re-afforestation.
- Avoid cultivating a long river banks.
- Protect vegetation cover in water catchment areas.
- Protection of wetlands.

**Poor waste management**
- A waste is any material that is a by product of human activity which has no further value. Waste can be in solid, liquid or gas form.

**Why wastes increase in the environment.**
- Lack of proper waste disposal places.
- Lack of methods of recycling.
- Use of resources waste fully.

**Effects of poor waste management.**
- Ugly littering of compounds.
- Pollution of water bodies.
- Poor soils with polythene paper and metal remaining in the soil.
- Disease out breaks.
- Blockage of drainage channels.
- Pollution of air.

**Proper management of wastes (solid wastes)**

Waste can be managed by using the basic 5Rs these are:-

- **Reduction:** minimize generation of waste.
- **Reuse**: eg use a worn out thing for other purposes, using buveera many times, using plastic jerrycans as flower pots, using tyres to sandles.
- **Recycling:** Collecting materials that had been thrown away and processing them to make new products e.g. smelting of metal scraps.
- **Return:** Bottles and containers should be returned to shops and manufactures.
- **Refuse or reject:** The use of materials which are difficult to get rid of. Do not allow materials that can be dangerous to the environment.
- Use paper bags instead of buveera or plastic bags.
- Way forward to overcome environmental problem in Uganda.
- Role of NEMA; community.

**SEXUALLY TRANSMITTED DISEASE (STDS)**

Sexually transmitted disease is also known as sexually transmitted infections (STI) venereal disease
These are groups of contagious diseases that are spread through involvement in sexual activities (contract) with an infected partner

**Examples of STDs**

- AIDS
- Syphilis
- Gonorrhoea
- Genital warts
- Urethritis
- Lymphogranuloma
- Trichomoniasis
- Pelvic inflammatory disease PID
- Genital herpes
- Candida
- Orchitis

These are higher chance of infection among people who have more than one sexual partner

**Causes of sexually transmitted infections**

- Bacteria
- Viruses
- Fungi
- Protozoa
- Edoparasites

They affect a person through a number of ways causing a lot of pain and suffering

**AIDS**

- The term AIDS stands for: Acquired Immune Deficiency Syndrome
- Acquired means got from outside the body
- Immune means protected against or safe from disease, the body is always protected by white blood cells

- Deficiency means lack or shortage of. AIDS virus destroys white blood cells and the body has shortage of them
- Syndrome means a collection or group of diseases and signs which show the presence of a disease
- AIDS is a pattern of diseases symptoms which attacks and destroys white blood cells leaving the body unprotected against infections

**Causes of AIDS**

AIDS is caused by a retro-virus called HIV (Human Immunodeficiency Virus) commonly called AIDS virus

**Transmission of AIDS virus**

- AIDS virus can only survive in the body
- The disease can be spread when body fluids of an infected person get into contact with that of the healthy person.

Body fluids can be exchanged in the following ways: -

- Sexual contacts with an infected person
- Recurring a blood transfusion from an infected person
- Sharing or using sharp cutting instruments
- From an infected pregnant mother to her unborn baby

**AIDS virus can not spread by:**

- Normal shaking of hands
- Bites from mosquitoes and bed bags
- Caring for AIDS patient
- Sharing cattery and cooking utensils
- Hugging or embracing AIDS patients
- Cleaning, washing beddings and clothing people with HIV/AIDS

**Signs and symptoms of HIV/AIDS**

**Signs:** the major sign of AIDS are:

- Herpes zoster locally called “kisipi” which inflames the skin making it appear as sealed
- Chronic diarrhoea which may last for more than a week
- Sudden loss of about 10% of the normal body weight
- Skin cancer which is also called kaposisscarcomer. It causes itching and leads to scratching that leaves black spots
- Swollen lymph glands especially those of the neck and armpits
- Oral thrush whereby the tongue , gums , lips, and inside the of the mouth plus the alimentary canal have sores and turn whitish pink
- Chronic cough which lasts long

**Symptoms**

- Tiredness without any proper cause
- General body weakness
- Persistent fever which is on an off

**Groups of people who are vulnerable or at high risk of getting AIDS `**

- Sexually active people between the ages of 15-45years
- Rape and defilement victims
- Long distant truck drivers and traders who often have casual sex when away from their married partners for a long time
- Prostitutes who sell themselves for sex to many partners

**Effects of AIDS /HIV**

There are many effects of HIV/AIDS on infected person, family and community

- They suffer personal pain from the disease
- The family spends a lot of money on treatment , care and feeding
- They are stigmatized or isolated in the society
- Loss of family income if the bread winner dies
- Many children are orphaned and become child parents

**Prevention and control of HIV/AIDS**

There is currently no cure against AIDS, so people need to guard themselves against the disease by;

- ABC approach
- Having one faithful sexual partner
- Abstain from sexual intercourse until marriage
- Avoid practices which involve risks of getting AIDS like tattooing , ear piercing etc
- Use of condoms during sex
- Screening blood before marriage and transfusion
- Steriling medical instruments such as syringes and needles before use or disposing them

**How can we care and manage AIDS patients**

- People with AIDS need support in many ways
- Counseling – is a special form of communication through which a person is helped to control his/her feelings by a counselor
- Eating a balanced diet
- Join good social groups to relax and avoid heavy work
- Should give up bad habits like smoking and drinking alcohol

**Types of counseling**

- Pre-HIV antibody test counseling
- Post-HIV antibody test counseling
- Counseling HIV/AIDS patients

**Importance of counseling**

- It prevents AIDS victims from committing suicide
- Avoids spread of the disease to others knowingly
- To encourage people to continue to live longer and useful

**Organizations in Uganda that offers counseling services**

In Uganda, there are many governmental and non governmental organizations which offer counseling services.

**TASO:** The AIDS support organization. It also provides supplements food for patients

**AIC:** AIDS information center

**ACP:** AIDS control programmes of ministry of health. It also provides HIV/AIDS testing

**Gonorrhoea**

- It is a venereal disease caused by a bacterium called gonococci (sing gonococcus)
- It is spread through sexual intercourses with an infected person

**Signs in men**
- Pain when urinating
- Discharge of pus from the penis
- Painful swelling on the testicles
- Rash and sores on the genital areas

**Signs in women**
- Slight pain when urinating
- Sometimes very painful monthly periods
- Vaginal discharge of smelly pus
- Pain in the lower abdominal

**Signs in babies**
- Red and swollen eyes
- Pus comes out of the baby eyes

**Effects of gonorrhoea**
- It leads to permanent damage of male and female reproductive organs
- Leads to sterility in both men and women
- Cause blindness in babies
- Blocks the urethra making urination difficult and painful

**Control and prevention of gonorrhoea**
- Using the ABC formula for preventing AIDS and other STDs

A Abstain from sexual intercourse
B Be faithful to your partner
C Condoms should be used during sexual intercourse

- Seek early medical treatment
- Stop playing sex until you are completely treated

**Syphilis**
- Syphilis is a chronic and dangerous venereal disease caused by a bacterium called spirochete
- It is spread by having sexual contact with the infected person

**Signs and symptoms vary with stages**
- Painful sores called chancre appears 2-5 weeks after infection
- In second stage a number of signs and symptoms such as sore in mouth, throat, itching skin, rashes appears
- In the third stage the bacteria cause heart disease , paralysis, blindness and insanity or madness

**Prevention and control of syphilis**
- It is prevented by practicing ABC approach
- Infected people should see a doctor immediately

**Other urinary tract infections**
Pelvic inflammatory disease (PID)
It affects the abdominal and pelvic area

**Epididymitis**

Serious infection of the epididymis leading to swelling tenderness and pain in the testicles

**Genital herpes**
These are sores (inflammation) of the genitals caused by virus called the herpes simplex

**Trichomoniasisvaginalis**
It is caused by protozoa called trichomonas
The disease causes inflammation of the vagina

**Genital warts**
These are sores the sexual parts and around the anus
They are caused by a virus

**Hydrocele**
Is an increase in quantity of fluids in the sac around the testis and epididymis

**Orchitis**
Inflammation of the testes due to injury or infection of tuberculosis

**Candidiasis**
It is also caused thrush and is caused by a fungus

**Sterility**
Mabilliyt of a man to impregnate a woman or a woman failing to conceive

**Lymph glandcoma**
This refers to enlarged lymph nodes spread by sexual contact

**Urethritis**
A disease that causes the urethra to become sore and swollen

**Prevention**
- Using ABC approach
- Seeking medical attentions
- Personal hygiene especially of the genitals

**LIGHT ENERGY**
Light is a form of energy which affects our organs of sight i.e. our eyes

**Sources of light**
There are two sources of light
- Natural sources
- Artificial sources

**Natural sources of light**
- Sun
- Stars
- Erupting volcanoes
- Glow worms

- Fire flies

**Artificial sources of light**
- Electric bulbs
- Touches
- Candles
- Lumps
- Charcoal stoves

These sources of light can either be luminous (direct) or non luminous (indirect)

**Luminous sources of light**
These are sources of light, which emit (produce) their own light.

Examples of luminous sources (objects)
- Sun
- Stars
- Erupting volcanoes
- Fire flies
- Bulbs
- Candles
- Touching
- Burning charcoal
- Hands of clocks

NB: Hot sources of light are said to be **"incandescent"**

**Non-luminous objects: (indirect sources)**
These are sources of light which just reflect from other sources

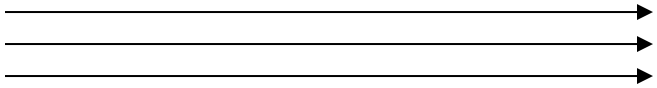
**Examples of non-luminous objects**
- The moon
- Planets
- Plane mirrors

**Transition of light (how light travel)**
Light travels in all direction and in straight lines from the source
NB: set up experiments to prove how light travels

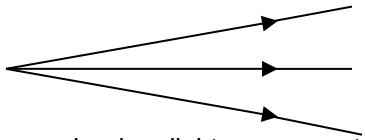
**Rays and beams**
A ray is a straight line along which light travels.
A ray is represented with an arrow to show direction of light eg _____

**A beam is a group of rays**
There are three types of beams namely;-

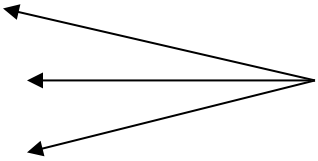
**a)** **Parallel beams:** is when light rays move from the source and can not meet.



**b) Diverging beams:** is when light rays spread out from the source eg car head lights, bicycle lead lamps



**c) Converging beams:** is when light rays come towards a point



**Speed of light**

The speed of light in about 300,000km/s in air and vacuum
Light travels faster than sound in air
Examples to prove that light travels faster than sound

- We hear thunder after we have seen lightening
- At a race track, we see the flash of starters gun before we hear the bang
- The sound of an axe is heard after we have seen the axe strike when cutting

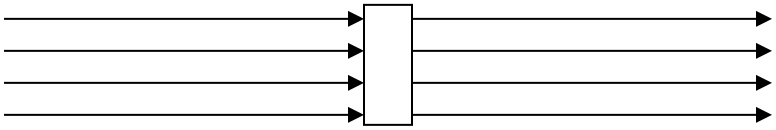
**Effects of light on different materials**

When light rays meet an object, one of the following will happen:-

- Light can be absorbed , diffused or scattered
- Light can be bounced back or reflected
- Light rays may be allowed to go through ; transmition materials can be grouped into the following categories:-
  - i) transparent objects
  - ii) translucent objects
  - iii) opaque objects

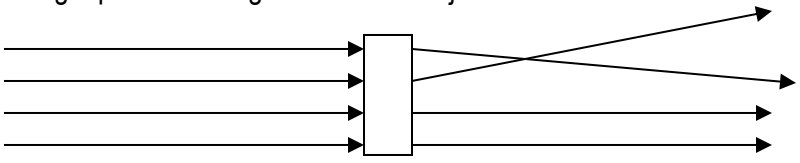
**Transparent objects**

These are objects which allow most of the light to pass through them and we can see through them.
Examples; glass, water, air etc
All light passes through transparent objects



**Translucent objects**

These objects which allow some light to pass through them but we cannot see through them. This is because they diffuse or scatter the light rays.
Examples;
Frosted glass, waxed paper, thin cloth, light bulbs tissues paper etc
Little light passes through translucent objects because of diffusion



**Opaque objects**

These are objects which don't allow light to pass through them so we cannot see through them. Opaque objects cast shadows e.g. wood, stones, metals, walls, bricks etc.

**Shadows**

A shadow is a region of darkness caused by the obstruction of light by an opaque object
When the source of light is small point, a sharp complete shadow is formed called a total shadow or umbra
When the source of light is big, a total shadow called umbra is surrounded by half or partial shadow called penumbra

**Eclipse**

An eclipse is a shadow formed by the obstruction of light by either the moon or earth
The word eclipse means to cut off light

**Types of eclipses**

This occurs when the moon comes in between the sun and the earth and all the three are in a straight line.
When this happens the sun casts the shadow of the moon on the earth

**Eclipse of the moon (lunar eclipse)**

**Solar eclipse**

This occurs when the earth lies in between the moon and the sun
The sun casts the earth's shadow on the moon
This happens only when there is a full moon

**Annular eclipse of the sun**

This occurs when the moon comes between the sun and the earth but the moon may be far away from the earth and the umbra fails to reach the earth

The earth only receives a partial eclipse (penumbra) and the sun will be encircled by a ring.

**Reflection of light**

Reflection is the bouncing back of light rays when they strick a shinny opaque object

**Types of reflection**

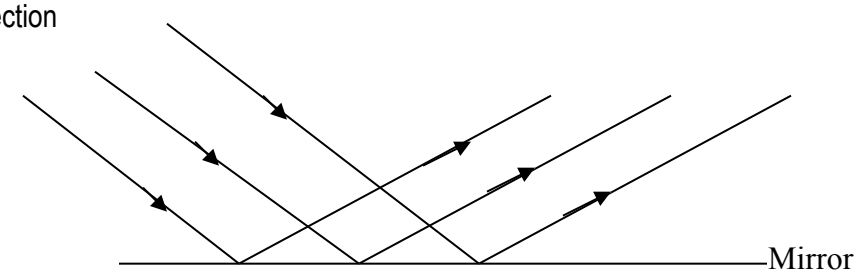
There are two types of reflection

- Regular reflection
- Irregular reflection

**Regular reflection**

- Is the type of reflection where the beam is sent back in a definite direction.
- It is produced when light falls on a smooth shinny surface e.g. mirrors

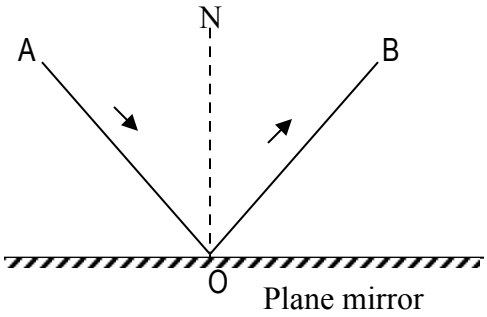
- We are able to view ourselves in plane mirrors because they are highly polished and give a regular reflection

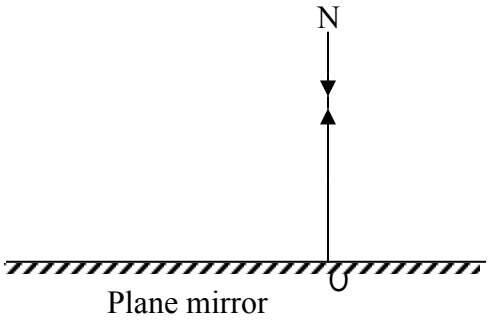



**Irregular reflection**

- Is a type of reflection where the beam is scattered and thrown back in all directions
- Rough unpolished surfaces give irregular reflection (diffuse reflection)
- We are unable to see clear images on walls because may give irregular reflection

**Reflection principal and its laws.**



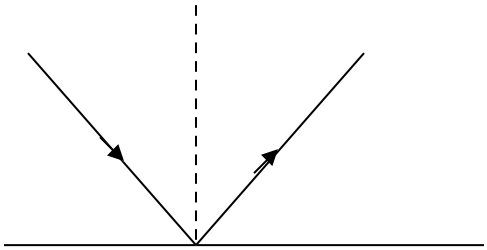

AO Incident rays
OB Reflected rays
ON Normal
I angle of incident
R angle of reflection
0 point of incidence

There are two laws of reflection

- The incident ray, the reflected ray and the normal ray at the point of incidence, all lie in the same plane
- The angle of incidence is equal to the angle of reflection

NB: when the incident ray strikes the mirror at an angle of $90^0$ the reflected ray takes the same route and this is called total internal reflection;

Qn.1.
An incident ray makes an angle of $60^0$ to the mirror what is the angle of reflection.



The normal ray makes $90^0$ to the mirror.
$60^0 + I = 90^0 - 60^0$
$60^0 - 60^0 + j = 90^0 - 60^0$
$j = 30^0$

$\angle$ of incidence = $\angle$ of reflection
Therefore: L of reflection = $30^0$

**Reflection of light by different materials**
- Dark dull materials are good absorbers of light which is converted to heat
- In hot weather people prefer white clothes and in cold weather they prefer dark clothes
- A black dress appears black because it absorbs all colours and reflects none
- White objects appears white because they reflect all colours
- Green objects appear green because they absorb all the other colours and reflect only green into out eyes

**Images and objects**
An image is light picture

**Characteristics of images formed by plane mirrors**
- The distance of the object from the mirror is the same as the distance of the image behind the mirror
- The images are laterally inverted
- The image is the same as the object
- The image always upright / erect
- The image is virtual i.e. can not be cast on the screen

**Uses of plane mirrors**
- They are used to certain parts of the body that we can not see eg behind the head
- They are used in periscopes

**Curved mirrors**
- There are mirrors which are sphere like in shape
- Though they have different shapes , they obey the laws of reflection
- They are of two types
  a) Convex mirror
  b) Concave mirrors

**Characteristics of images formed by convex mirrors**

- The images are smaller than the object. (diminished)
- The images are upright (erect)
- Images are behind the mirror (virtual)

**Uses of convex mirrors**

- They are used in driving mirrors of vehicles
- They give a wider view of the object and form upright images thus they are used as driving mirrors
- They are used in super markets

**Concave mirrors (converging mirrors)**

- Images are larger than the object
- Images are virtual
- Images are erect –upright

**Uses of concave mirrors**

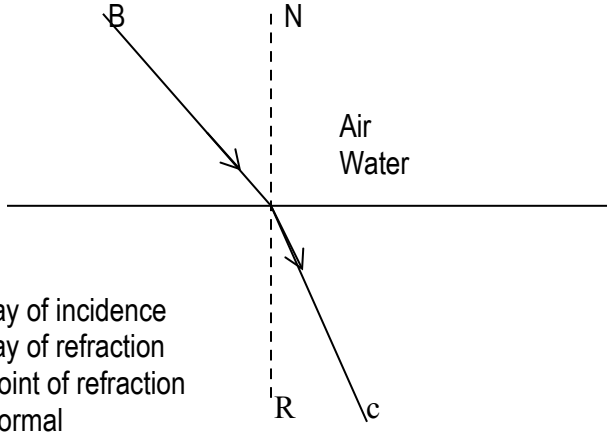
- They are used by barbers as shaving mirrors
- They are used by dentists
- They are used in search lights and head lamps
- They are used in telescopes to focus on heavenly bodies

**REFRACTION**

Refraction is the bending of light rays as they pass from one transparent medium to another of different densities i.e. air to glass, air to water, glass to water.

The bending of light is caused by;

- Change of speed as light passes from one medium to another
- Difference in optical density of the two media




| | |
|---|---|
| BO | ray of incidence |
| OC | ray of refraction |
| O | point of refraction |
| NR | normal |
| I | angle of incidence |
| R | angle of refraction |

**NOTE**

- When the ray passes from one medium to a more optically dense medium, the refracted ray bends towards the normal
- When a ray passes from a more optically dense medium to less optically dense medium, the refracted ray bends away from the normal

**The law of refraction**

- The incident ray and the refracted ray are on opposite sides of the normal
- The incident ray, the refracted ray and the normal all lie in the same plane

**Effects of refraction /disadvantages of refraction**

- Swimming pools appears shallower than their real depth
- Refracted stick fixed vertically can partly dipping in water appears to be shorted than they are
- A ruler or stick partly dipped at an angle into some water appears bent

**Mirages**

A mirage is an optical illusion caused by the bending of light rays due to layers of air having different densities and temperature e.g. sheet of water seen on a highway during a hot day

**Effects of mirages**

Mirages may lead to accidents on highways
Mirages cause false images along high ways and in deserts

**Lenses**

A lens is a transparent material with curved side capable of refracting light
The curved surfaces of a lens help to bend or refract light passing through the lens

**Types of lenses**

There are two types of lenses

i) convex lens
ii) concave lens

**Convex lens (converging lens)**

Is a lens which is thicker in the middle and thinat the edges?

When a parallel beam reaches the lens it come together at a point in front of the lens

**Concave lens (diverging lens)**

Is a lens which is thin in the middle and thicker at the edges
When a parallel beam strikes a concave lens it spreads outwards after passing through the lens

**Uses of lenses**

- They are used in optical instruments
- An optical instruments is one which uses either a lens prism or lens plane mirror or curved mirrors

**Examples of optical instruments**

- Cameras
- Microscopes
- Spectacles
- Magnifying glasses
- Telescope

- Binoculars
- Projectors

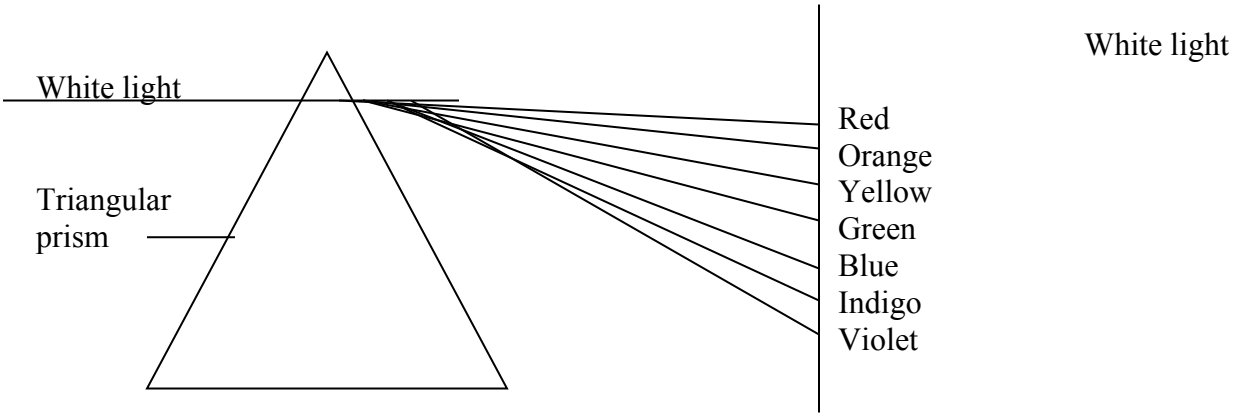
**Dispersion of light**

Dispersion of light is the splitting of white light into the seven colours of the spectrum

**Dispersion of light is due to refraction of light**

- A spectrum is a band of seven distinct colours.
- A spectrum is formed when white light is split by the act of prism
- A prism is a device that splits white light into seven colours
- An example of a natural light spectrum if a rain bow

**Colours of the spectrum**




**Note:**A rainbow is a natural spectrum formed when white light from the sun is split by raindrops

**Primary colours and secondary colours**

A primary colour is one that can not be obtained by mixing other colourse.g red, blue, and green.

A secondary colour is colour made by mixing two primary colourseg yellow, magenta, peacock blue or cyan

How to make secondary colours
Red + green = yellow
Red + blue = magenta
Blue + green = cyan or peacock blue

**"Complementary colours**" are pair of coloured light which form white light when mixed eg
Red + peacock blue = white
Green + magenta = white
Blue + yellow = white

Illustration

NB: white is a universal colour

**The pinhole comera**
A pinhole camera works on the principle that light travels in straight lines
**Characteristics of images formed in pinholes cameras**
- The image is diminished (smaller than the object)
- The image is inverted (upside down)
- The image is real (it can be cast on the screen)

**The structure of a pinhole camera**

**The photographic camera**
A camera is an optical instrument because it uses a convex lens
It consists of a light proof box with five functional parts

**The structure of a camera**

**Functions of each part**
- **The film:** is a light sensitive piece of appear on which an inverted image is formed
- **Diaphragm:** it has a circular hole in the centre called the a perture required. The diaphragm regulates the amount of light energy that has been allowed in by the lens
- **The lens:** it focuses the real image on the film
- **The shutter:** it opens the diaphragm for a short time to expose the film to light
- **Focusing ring:** it adjusts the distance of the lens from the film

NB: The inside is painted black to control internal reflection

**Characteristics of images formed by the camera**
- The image is diminished
- The image is real
- The image is inverted

NB:
- The exposed film is removed from the camera in the dark
- The film is developed by putting it in chemical solution and the result is a negative
- It is called a negative because the light parts in the negative appear dark in the picture (positive and vice verse)

**The human eye**
The eye is an organ of sight
It is spherical in shape and enclosed in a socket of the skull called the orbit

**Parts of the eye and their functions**

- The eye lid
- They cover and protect the eye
- Blinking can be voluntary or by reflex action
- Regular blinking distributes a fluid (tear ) over the surface of the eye which prevent it from drying
- Tears cleans up the eye and digests some germs that may have entered the eye

**Conjunctiva**

- Is a thin layer which lies inside the eye lid. It covers the front of the eyeballs

**Sclerotic**

- It is a tough non elastic protective coat around the eye ball
- It supports and maintain the shape of the eye ball

**Cornea**

- It is the transparent part of the sclerotic.
- It helps in refracting and converging light

NB: It is in the cornea that bending of light rays occurs.

**Choroids**

- It has a dense network of blood capillaries supplying food and oxygen to the eye
- It is pigmented black to reduce internal reflection of light within the eye

**Iris**

- It regulates the size of the pupil and controls the amount of light entering the eye
- It determines the colour of the eye

**Pupil**

- Admits light into the eye

**Retina**

- This layer contains sensitive cells called rods and cones in dim light and night vision
- Human see clearly during day because they have much cones
- Some animals are able to see clearly see at night because they have more rods
- On the retina is where the image is formed

**Fovea (yellow spot)**

- It has the highest concentration of cones
- It gives an accurate interpretation of the image and is where the sharpest image is formed

**Blind spot**

- It spot doesn't have an light sensitive cell
- It is where the optic nerve leaves the eye and also where blood vessels can nerves join the optic nerves

**Lens**

- Refracts light rays and focus the image on the retina

**Suspensory ligaments**

- Holds the lens in position by attaching it to the ciliary body

**Aqueous and vitreous humour**

- These are solutions of salt, sugar and proteins in water
- They refract light to produce an image on the retina
- Help to maintain the shape of the eye

**The optic nerve**

- Transport nerve signals to the brain for interpretation

**Eye lashes**

- They help to trap large air borne particles

**Tear glands**

- They lie under the eyelids
- They secrete a solution of sodium hydrogen carbonate and sodium chloride (tear)
- They have an enzymes which destroys some bacteria

**Characteristics of images formed by the eye**

- The images are diminished
- Images are real
- Images are inverted only that they are corrected by the brain

**Similarities between the human eye and a photographic camera**

| Human eye | Photographic camera |
|---|---|
| • Image falls in a light sensitive retina<br>• Has a convex lens<br>• It is covered by a black layer choroids<br>• Irish controls the amount of light that enters the eye by regulating the size of pupil<br>• The image formed is inverted diminished and real<br>• The eyelids keeps out light<br>• The ciliary muscles determines accommodation of the lens | • Image falls on a light sensitive film<br>• Has a convex lens<br>• Is covered by light proof box<br>• The diaphragm controls the amount of light entering the camera by a adjusting the size of the aperture<br>• The image formed is inverted diminished and real<br>• Focusing ring determine the distance of the lens from the film<br>• The shutter keeps out light |

**Differences between a human eye and a camera**

| Human eye | Camera |
|---|---|
| • Distance between the lens and retina is fixed<br>• Shape of lens easily changes to focuses at different distances<br>• Lens is soft and elastic<br>• Image is focused by making lens thicker<br>• Aqueous and vitreous humours refracts light<br>• The iris adjust itself | • The distance between the lens and film changes<br>• The shape of the lens does not change<br>• Lens is hard<br>• Image is focused by moving lens<br>• Only the lens refract light<br>• The diaphragm can be adjusted |

**Eye defects**

**Causes of eye defects**

- Eye strain
- Abnormal shape of the eye ball
- Abnormal shape of the lens
- Colour blindness

**Examples of eye defects**

- There are four eye defects of common in humans namely;
  a) Short sight (myopia)
  b) Long sight (hypermetropia)
  c) Old age sight ( presbyopia)
  d) Astigmation

**Correction of short sightedness**

Short sight is corrected by wearing spectacles with concave lenses

**Long sight**

Its the inability to see nearby objects clearly;

**Causes**

- Small or short eye ball

- Too thin eye lens

NB: the point of focus for nearby objects is behind the retina

**Correction of long sight**

Long sight is corrected by wearing spectacles with convex lenses

**Old age sight**

When the lens loses its elasticity it can no long change in shape

It becomes suitable for only distant vision (long sight)

Old age sight people usually require reading glasses which have converging lenses. This happened in old age above sixty years .

**Astigmatism**

It is the most common of all eye defects

It is caused by the surface of the cornea not being perfectly smooth or spherical

This results in blurred vision

Astigmatism is corrected by wearing spectacles with cylindrical lenses

**Diseases of the eye**

**Conjuctivitis**

- It causes the swelling of conjunctiva
- It is caused by gonorrhoea

There are three types of conjuctivities

- Acute conjuctivities
- Chronic conjuctivities
- Gonorrhoeaconjuctivities

**Signs**

- The white part of eye becomes pink
- Waterly discharge from the eyelid with mucus and pus
- Scratching and burning sensation in the eyelid
- Looking cause pain

**Trachoma**

**Caused by a virus called chlamydia**

- It is highly contagious and infectious disease
- It is common in places with poor hygiene and overcrowding where water is scarce and people don't wash hands and their eye

**How trachoma spread**

a) By houseflies
b) Sharing hands with an infected person
c) Sharing of the same basin with an infected person
d) Shaking hands with another infected person

**Signs and symptoms**

- Redness and itching on the eye
- Waterly discharge from the eyelids
- Swelling of the eyelids
- Pain while looking at light

**River blindness**

- It is caused by a tiny worm (onchocercavulvulus)
- It is carried by a small hump back fly known as a black fly or simulim fly
- This fly breeds from fast flowing rivers

**Signs and symptoms**

- Bumps on the lips and legs
- Itching skin rashes
- Severe skin itching

**Prevention and control**

- Spraying using insecticides against the adult fly
- Treatment of the infected person

**Others diseases**

**Blephartitis:**

An inflammation of the margin of the eyelid
The eyes itch and burn and swell

**Cataracts:**

This is when the lens of the eye becomes grey and opque
They are caused by an injury or continued exposure of the eye to high temperature

**Glaucoma**

Caused by increased internal pressure of fluids
It can come about by itself or progress from another disease

**Iritis**

The swelling caused by other disease or or injury to eye

**Sty**

This is a small inflammation on the eye lid. It looks like a small boil
It is usually a sing of poor general health, anaemia or diabetes

**Corneal ulcer**

It is caused by an injury to the cornea

**Care of the eye**

- Don't rub your eyes with dirty fingers
- Don't strain your eyes by reading

a) Very small prints is too little or direct sunlight
b) In moving vehicles
c) In wrong postures like in bed

- Don't expose your eyes to very bright or glaring light
- Always wash your eye with clean water and soap, every morning and evening
- Never look directly at the sun, it may spoil your retina
- If there is anything wrong with your eyes visit an eye specialists
- When reading use a correct distance of about 30cm
- Don't share towels or clothes with people who have sick eyes

# GROWING CROPS AND TREES

The growing of trees and crops together is called agro-forestry

**Importance of agro-forestry**

- Trees prevent rain from hitting the soil directly hence controlling soil erosion
- Trees provide shade to other crops and animals
- Some trees are used as boundary and hedges
- Trees provide wood fuel
- Fruits trees provide food to the farmer
- Crop residues can be used as feeds to livestock
- Tree barks and leaves are used as local medicine

**Examples of indangerous species of trees**

- Mivule
- Mangoes
- Jack fruit
- Musizi
- Ennongo
- Mutuba
- Ficus (mutuba)
- Mahogany

**Examples of exotic trees**

- Cypress
- Gingko
- Pine
- Cedar
- Podo
- Encalputus
- Fir

**Growing of trees**

**Selection of planting materials**

- Trees grow from seeds or cuttings

**Quality of good seeds for planting**

- The seeds should have a high germinating rate
- They should be free from pests
- They should be free from diseases
- They should not be broken
- They should be obtained from healthy parent tree
- They should be of reasonable size depending on the variety

**Starting a tree nursery bed**

The following should be present:-

- Poles
- Hoes

- Watering jag
- Polythene papers
- Dry grass
- Water source
- Seeds or cuttings

**Procedures or preparing a nursery bed for trees**
- Clear and dig up the area
- Add compost manure to the soil you have dug up
- Put seeds in the soil
- Construct a shade and cover it with grass
- Watering should be every evening to allow water stay in the soil for long

**Care for seedlings**
- Constantly water the seedlings
- Remove any weeds
- Spray the seedlings to control pests
- Thin out the diseased or those infected with pests
- Fence off the nursery bed to protect it against animals
- Hardening off should be done when about to transplant the seedlings

**Transplanting**
This is the transfer of seedlings from the nursery bed to the main garden
Transplanting is done in the evening because of the following reasons;
(a) Reduce the rate of transpiration
(b) Control watering or wilting
(c) Give roots time to set in and start absorbing water
(d) Reduce evaporation of water from the soil

**Caring for trees**
This can be done through:-
- Slashing
- Spraying with herbicides
- Planting cover crops
- Mulching
- Mechanical weeding using a hoe
- Uprooting

**Weeding;** it refers to the removal of the wanted crops from the garden.

**Mulching**
This helps to conserve moisture in the soil

**Pruning**
This is the removal of excessive, unproductive, diseased, and damaged branches and leaves of a plant

**Advantages of pruning**

- It reduces hiding places for pests
- It allows plants to get enough sunlight
- It reduces overcrowding and creates space for the plant to grow
- It helps wind to easily move through the trees without breaking them
- Pruning should be done to wards the end of dry season to allow easy recovery of the tree at the beginning of the rain

**Thinning**

This is the removal of excess seedlings from the garden

**Advantages**

(a) It removes hiding places for pests
(b) Creates space for plants to grow bigger
(c) Reduces over crowding
(d) Reduces competition for nutrients

**Pests and diseases control in trees**

These should be controlled mainly by spraying

**Disadvantages of pests**

(a) Some pests eat and destroy the trees
(b) Some pests spread disease
(c) Pests reduce the quality of yields
(d) Pests reduce the speed at which the trees grow
(e) They increase the cost of production since pesticides are bought to control them

**Spacing of trees**

- This means planting trees at a desired distance from each other.
- Different trees require different spacing
- Spacing depends on the type of tree whether it is small or big
- Spacing also depends on whether machine or human labour is going to be used.

**Methods of harvesting trees**

**Pollarding**

This is the cutting off of the tip or the top of the tree
It encourages the branches below to grow thicker
When practiced on trees like mangoes, they produce more and better fruits

**Diagram**

**Lopping**

This is the cutting off of the side branches from the trunks
Mature branches are harvested as the tree continues to growing

**Illustration**

**Coppicing**

The cutting off the trunck of a tree leaving only a short stump to grow shoots

**Illustration**

**Selective felling of trees**

Cutting down selected trees while others are left to grow. New trees are planted in the spaces left by the fallen trees

**Preparing wood for different uses**

Timber for building and furniture is sowed into plants of specific sizes
They are placed together on flat surface to ensure they remain straight. Air must flow through the plants

Wood for fire wood needs to be split and allowed to dry because wet wood does not burn well. Splitting wood allows water to escape and evaporate easily to allow drying process.

Wood meant for fencing and electricity poles should have their barks removed and chemical used for treatment. This prevents at tacks from pests and diseases.

**Storage of wood**

(f) Wood like timber should be stored in a cool dry place to avoid warping or bending
(g) The timber should also be properly seasoned ie allowed to dry in a cool dry place and chemicals applied
(h) Fire wood should be stored in a dry place to avoid it getting damp.

**Combining agro-forestry with animal husbandry**

**Advantages**

(i) Trees provide shade to animals
(j) Trees provide fencing materials
(k) Trees provide oxygen and sell up carbondioxide
(l) The trees help to control soil erosion
(m) Some trees provide food to the animals

# BODY SYSTEMS

**Definition of system:**
A group of organs specialized to perform a similar function
Examples are:
- Digestive
- Reproductive
- Muscle – skeletal
- Nervous
- Circulatory
- Respiratory
- Endocrine
- Lymphatic
- Excretory system.

**Excretory system**
Excretion is the removal of waste products from the body.
Excretory system is a body system that deals with the removal of wastes from the body

**Organs of the excretory system**
The body organs, which carry out excretion, are;
(n) The skin
(o) The kidney
(p) The lungs

**THE SKIN**

**Illustration of the structure of the skin.**

**The skin is made of two main layers**
a) Epidermis
b) Dermis

**The epidermis**
This is the outermost region of the skin
The epidermis is made up of three layers
I) Cornified layer
II) The granular layer
III) The malpighian layer

**Cornified layer**

It is found on the top surface of the skin.
It consist of dead cells that offer resistance to damage and bacterial invasion

**Malpighian layer**
Is a layer of cells which divide actively to produce the epidermis
In this layer, there are pigment **granules** and **melanin** that determine the skin colour.

**Granular layer**
Contains living cells that gradually give away to form eh cornfield layer.
Increase resistance to damage and bacterial invasions
It reduces the loss of water by evaporation

**The dermis**
This region is the innermost layer of the skin and it stores fats under it.
This region contains the following parts:
**Capillaries**: supply food and oxygen to the skin and removes excretory products. Capillaries help in temperature control.

**Sweat gland:** secrets sweat, sweat contains excess salts, urea and water.
**Sweat duct:** is an opening /pore that leads sweat to the surface of the skin
**Hair follicle:** is a deep pit of granular and malpighian layer cells that multiply to build hair
**Sebaceous glands:** These produce oily substances called sebum that keeps the skin water proof.
**Sub-cutenous fats:** the fat layer beneath the skin acts as a heat insulator that helps to control heat loss
**Nerves:** transmit impulses for touch, heat etc

**Functions of the skin**
- Excretes salts, water, and some urea
- Regulates body temperature
- Stores fats
- Makes vitamin D by help of sunlight
- Protects the body against germ infection
- Is the a sense organ for feeling

**Body temperature regulation**
**On hot days**
- Blood vessels vasodilate /widens allowing more blood to flow near the surface and more heat is lost by radiation
- Sweat glands produce more sweat through which heat is lost by evaporation
- Erector muscles relax causing hair to lie flat on the body to allow wind to easily sweep off heat

**On cold days**
- Blood vessels narrow (vasoconstriction) and so blood is withdrawn from the surface limiting heat loss by radiation
- Decrease in sweat produce thus reducing heat lost by evaporation
- Through shivering, heat is produced by the contracting muscles
- Fats under the skin act as a heat insulator
- Erector muscles contract causing hair to erect and trap air around the skin which act as an insulator to heat loss

- When hair erect, goose pimples appear on the skin

**Skin diseases**

The skin commonly destroyed by diseases like:

- Ring worm
- Scabies
- Athletes foot
- Leprosy
- Corns

**Care of skin**

- Wash your body daily with warm clean water and soap
- Rub your body with a towel after bathing
- Wounds and cuts should be well covered with sterilized bandages
- Take exercises daily to keep it working in proper order
- Eat a balanced diet.

**The kidneys**

Kidneys are two brown bean shaped organs at the back of the abdominal cavity

**Illustration of the internal structure of the Kidney.**

**Parts of the kidney and their functions**

**Renal artery:** is a branch of aorta that supply oxygenated blood to the kidney
**Renal veins:** takes deoxygenated blood from the kidney to the venna cava
**Cortex:** is a region where blood filtered to remove urea, uric acid, excess salts, and water.
**Medulla:** is a region where selective re-absorption takes place by the nephrones
**Pelvis:** urine is corrected here from the numerous nephrones
**Urethra:** is a passage of urine to the urinary bladder
NB: urine is formed through ultra-filtration and selective re-absorption in the kidney
**The urinary bladder:** Is an elastic and muscular sack that stores urine briefly

**Disease of the kidney**

- Cancer of the kidney
- Kidney failure
- Kidney stone

**Waste products excreted by the kidney**

- Uric acids
- Urea
- Excess salts

- Excess water

**The liver**

- The liver is said to be the biggest organ in the body because it performs many functions compared to other body organs.
- The liver is a large reddish brown organ below the diaphragm.
- It supplied oxygenated blood by the **Hepatic artery**. The liver receives blood rich in digested food from the alimentary canal by help of the **Hepatic portal vein.**

**Functions of the liver**

1. The liver regulates blood sugar
- Too much sugars and lack of enough sugar in the blood causes diabetes
- The liver control sugar levels by the help of insulin
- Insulin is produced by the pancreases and helps to stimulate the liver to remove glucose from blood by converting it into glycogen for storage
- The liver deaminates amino acids and convert them into carbohydrates
- Alcohol , poisonous drugs and poisonous substances produced during metabolism are made harmless by the liver.
2. It helps in the process of excretion.
3. Stores vitamins and mineral salts.
4. It helps in detoxication process.
5. It produces heat energy.

**Disease of the liver**

- Cirrhosis of the liver
- Hepatitis
- Liver abscess these are boils which form pus in the liver

**Care for the liver**

- Avoid taking too much alcohol
- Have a balanced diet
- Always have exercise to keep it in good working conditions

**The respiratory system**

- Respiration is the process in which the body uses food and oxygen to produce carbondioxide, water vapour and energy.,
- Respiration takes place in the **body cells**

**Types of respiration**

There are two types of respiration ie;

- Aerobic respiration – one which uses oxygen
- Anaerobic respiration –one which does not use oxygen

**Difference between breathing and respiration**

Breathing is simply taking in of air rich in oxygen into the lungs and the taking out of air with more carbondioxide.

Illustration (diagram) of the internal structure of the skin.

**Organs of respiration and their function**

**Epiglottis:** it is a flap which protects the opening of the tranchea during swallowing of food

**Nose:**

The air passage into the trachea

- It contains cilia and mucus which help to trap germs and dirt which enter the nose
- In the nose the air is cleaned, warmed and moistured
- It is not advisable to breathe through the mouth because;
- The air will not be warmed so it can chill or make the lungs very cold
- The mouth has no cilia to trap dirt and germs

**The trachea**

- Also called the wind pipe
- It is the passage of air down the lungs
- The trachea contain tiny cilia for traping dirt and germs
- The trachea is made up of rings of cartilage which keep it open and to prevent it from collapsing which can cause suffocation
- It divides into the bronchi which continues to divide in bronchioles and end up into air sacs

**The lungs:** The lungs are both excretory and respiratory organs. This is because they are used in respiration and also in putting out waste products.

- The lungs excrete carbondioxide from the body which is wastes product of respiration
- It is in the lungs where gaseous exchange takes place in the body. However in the lungs, gaseous exchange takes place in the air sack or alveoli

**Adaptation to their function**

They are thin walled to allow gases to diffuse through easily

They are surrounded by a net work of blood capillaries which supply them with blood

**Composition of air breathed in and out**

| Type of air | Inspired air | Expired air |
|---|---|---|
| Oxygen $O_2$ | 21% | 16% |
| Carbondioxide $Co_2$ | 0.03% | 4% |
| Nitrogen $N_2$ | 78% | 78% |
| Water vapour | Less | More |
| Rare gases | 0.97% | 0.97% |

Explanation

- 2.1% of $0_2$ is breathed in but only 165 is breathed out because most of it is used in various body reactions.
- 0.03% of $Co_2$ is breathed in and 4% is expired because more of it is produced by various reactions like respiration.
- 78% of $N_2$ is inspired and 78% is expired because no body reaction needs $N_2$ to occur.
- Less water is inspired but more is expired because more of water vapour is produced by different body

- 0.97% of rare gas is inspired and similar amount is expired because no body reactions requires it to occure.

**Mechanism of breathing (expiration and inspiration)**
**Inspiration**

- The volume of the chest and lungs increase
- The diaphragm and intercostals muscles contract
- The ribs go upwards and outwards
- The lungs expand
- The stomach enlarges or swells

**Expiration**

- The volume of the chest and lungs decrease
- The ribs go downward and inwards
- The diaphragm and intercostals muscles relax
- The lungs and stomach go to their original size

**The pleural membranes**

- The lungs are covered by plural membranes which secrete fluid called plural fluids
- This fluid reduce friction between the lungs and ribs
- The ribs are held together in position by the intercostals muscles

**Diseases and disorders of the respiratory system**
**Disorders**

- Hicaps
- Sneezing
- Choking
- Yawning

**Disease**

- Tuberculosis
- Influenza
- Diphtheria
- Emphysema
- Bronchitis
- Asthma
- Pneumonia
- Lung cancer
- Whooping cough

**Care for the respiratory system**

- Eat a balanced diet
- Perform regular exercises
- Eat meals containing low animals fats
- Avoid smoking
- Have regular physical exercises.

**Regular exercises have the following advantages to the body**

- The heart muscles grow stronger and larger
- The heart delivers more blood to the body muscles
- You don't get tired and get out of breath easily
- They reduce the level of fats in the body
- The risk of heart disease and high blood pressure is reduced
- Ligaments and tendons become stronger and reduce chances of injury
- Joints become flexible
- Weight is lost

## SIMPLE MACHINES

A machine is a device or tool that simplifies man's work.

**How a machine makes work easy**

- A machine reduces the force needed to do a certain job .
- Changes the direction of forces
- Increases the speed of work

**Types of machines**

- **Complex machines**: are machines made up of many parts and needs training to use.
- **Simple machines**: are machines made up of few parts and does not need training to use.

**Terms used in machines**

**WORK: -** result of any action requiring energy
Is a product of force applied and distance moved by the load.
Work done = force X distance moved by load
Work is measured in units called joules
Force is measured in Newtons ( 1kgF = 10N)

**Force:** is a push or pull exerted on an object
**Power:** is the rate at which energy is changed from one form to another
**Mass:** the quantity of matter contained in an object. Mass is measured in units called grams.

**Types of simple machines**

There are several groups of simple machines

i) Levers
ii) Inclined planes /slopes / plank / ramp
iii) Wedges
iv) Screws
v) Pulleys
vi) Wheels and axe

**LEVERS**

A lever is a rigid bar turning freely at a fixed point called pivot or fulcrum.
**Load (L)** is the force weight that is to be overcome
**Effort (E)** is the force we exert when using a lever.
**Fulcrum (F)** is a fixed turning point
**Effort arm:** the distance from the effort to the fulcrum
**Load arm:** the distance from the load to the fulcrum

**NB:** some times, the load is called resistance.

**Classification of levers**
There are 3 classes of levers:
Levers are classified according to the arrangement of the load, **fulcrum**, and **effort** i.e.

There are three classes of levers:-
- First class lever
- Second class lever
- Third class lever

**First class levers (EPL)**
First class levers where the fulcrum is between the load and effort

**Examples first class lever illustration**
- Claw bar
- Seesaw
- Beam balance
- Scissors
- Pliers
- Claw hummer
- Lid opened
- Pinsers
- Reduces / implifies work by reducing load arm and increasing the effort arm.

**Second class lever (PLE)**
This is a class of levers in which the load is placed between the effort and fulcrum
Examples of second class levers / illustration
- Wheel barrows
- Crow bar
- Foot
- Nut crackers (diagram each)
- Bottle opener
- An oar
- Doors and windows

**Third class levers (LEP)**
This is a class of levers where the effort is between the pivot and load.
Examples of third class levers.
- Pair of tongues
- Tweezers
- Spade
- Arm
- Fishing rod

**Advantages of each class**
- **1st class lever:** - The effort and load moves in different directions
- **2nd class lever:-** The effort needed to move the load is less than the load force

- **3rd class lever:-** The effort moves through a shorter distance.

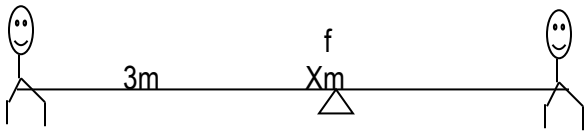
**MOMENTS**

**The law of levers**

- The load force multiplied by the load-arm is equal to the effort force multiplied by the effort –arm OR
- The sum of clockwise moments about any point equals the sum of anti clockwise moments
- A moment is the turning force about a pivot.

**Examples**

1. A man who weighs 90kg. sits 3m away from the fulcrum. Where will a boy whose weight is 30kg. sit in order to balance with the man?




**Given:**

Load = 90kg.
Load arm = 3m
Effort = 30kg.
Effort arm = x

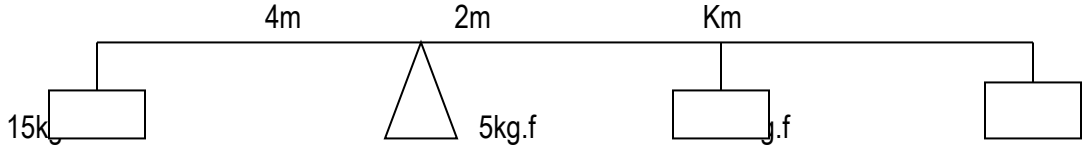
**Solution:**

Load X load arm = effort X effort arm
90 kg. X 3m = 30kg.x Xm
270 = 30x
$\frac{270}{30} = \frac{30x}{30}$ ( dividing both sides by 30)
X = 9m

Therefore, the boy will sit 9m away from the fulcrum.

**Example 2:**

In the diagram below, find the value of K




| | | |
|---|---|---|
| Load X load-arm | = | effort X effort –arm |
| 15kg.f x 4m | = | 2m x 5kg.f + (2+Km) X 10kg.f |
| 60 | = | 10kg.f + 20 + 10K |
| 60 | = | 30 + 10K |
| 60-30 | = | 30-30 + 10K |
| $\frac{30}{10}$ | = | $\frac{10K}{10}$ |
| 3 | = | K |

Therefore: K = 3m

**Mechanical advantage of a machine (MA)**

Mechanical advantage is the number of times a machine simplifies a given work.

$$MA = \frac{load}{Effort}$$

**NB. MA is a ratio and has no units**

If the mechanical advantage of a machine is greater than 1 then the machine uses less effort to overcome the load

If the mechanical advantage of a machine is less than 1, then the machine uses greater effort to overcome a small load.

Qn: An effort of 40N is applied to a lever to overcome a load of 200N. Calculate the mechanical advantage of the lever.

Solution:

$$MA = \frac{Load}{Effort}$$

$$= \frac{200N}{40N}$$

$$= 5.$$

NB: It means work becomes five times easier to do.

**Efficiency of a machine**

The efficiency of a machine is the ratio of the work output to the work input of a machine

- It is always expressed in percentage and always less tan 100% due to friction
- The output is the work done on the load by a machine
- The input is the work done by the effort on the machine
- The efficiency of a machine depends on its maintenance. It can be improved by;
- Replacing and repairing the worn out parts
- Regular oiling to minimize friction

$$\text{Efficiency} = \frac{\text{output}}{\text{Input}} \times 100\%$$

Qn: By using a machine, an effort of 30N was moved through a distance of 15m to raise a load of 120N to a height of 3m. Calculate the efficiency of the man.

$$\text{Efficiency} = \frac{\text{Load x distance load moves}}{\text{Effort X distance effort moves}} \times 100\%$$

$$= \frac{120N \times 3m}{30N \times 15m} \times 100\%$$

$$= \frac{4}{5} \times 100$$

$$= \mathbf{80\%}$$

**VELOCITY RATIO**

The velocity ratio of a machine is the ratio of distance moved by effort to distance move by load.

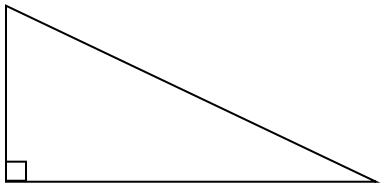
Velocity ratio = distance moved by effort / Distance moved by load

The velocity ratio of a lever can be found by measuring the two arms of the lever.

Velocity ratio of a lever = Length of effort arm / Length of load arm

**Inclined planes/slopes**

- An inclined plane is a sloping or slanting surface connecting a lower level to a higher level.
- The vertical height of an inclined plane is the distance moved by load while the slanting surface is the distance moved by the effort



- The longer the inclined plane, the less effort needed to move the load up the incline

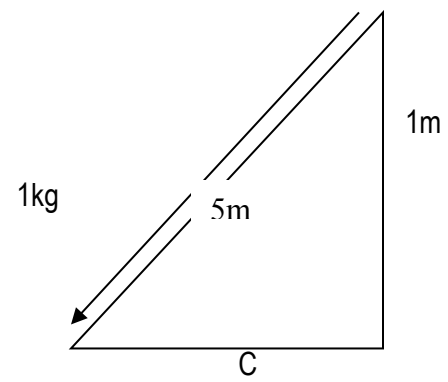
**Examples of inclined planes**

- Stair cases
- A winding road
- A plank of wood
- Ramp

**Uses of inclined plane**

- Helps in loading heavy goods on lorries
- Helps people climb tall buildings using less force
- Helps vehicles to ascend steep hills using less force
- Helps builders to carry building materials to higher levels.

Calculations on inclined planes




a) Calculate the work done if load is moved from point A to B

Work done = force X distance moved by load

= 10N x 1m

= 10J

b) What is the velocity ratio of the machine?

Velocity ratio = Distance effort moves

$$= \frac{\text{Distance load moves}}{\text{5m}}$$
$$= \frac{\text{5m}}{\text{1m}}$$
$$= 5$$

**Wedges**

- A wedge is a double inclined plane
- A wedge is a machine with two slanting surfaces

**Examples**

- An axe
- A panga
- Nails
- Scissors
- Spars
- Bullets

**Uses of wedges**

- Wedges are used in splitting logs of wood
- Wedges are used for cutting trees and other objects
- Wedges are used for sewing
- Wedges are used in construction

**Screws**

A screw is an inclined plane wound round a rod.

Examples

- Motor car jack
- Bolts and nuts
- Spiral stair cases
- Bottle lids

**Uses of screws**

- A car jack is used in lifting heavy vehicles
- Screws hold things together tightly e.g. screw nails, vice
- Screws are used to drill holes in metals and wood
- Screws are used to tighten bottled lids

**Wheel and axle**

These are machines composed of two rotating wheels together
The small wheel is called the axle or shaft
An axle is a rod on which a wheel turns

**Examples of wheel and axle machine**

- A car steering wheel
- Handle of bicycles
- Pedals and chains of a bicycles
- Doorknob
- Egg beater

**Application of wheels and axle in daily life**

- A winch /windlass is used to get water from a well

- Doorknobs are used to open door using less effort
- Pedals and chains are used to transfer effort causing a movement in bicycles
- A car steering wheel works on the principles of wheels and axle.

**Gears and belt drives /conveyor belts**

Gear wheels are special forms of wheel with teeth around their edges which help to multiply force
These teeth miterlock with the teeth of another wheel
The wheel rotate in opposite directions
If gear wheel A has 40 teeth and gear wheel B has 20 teeth. In one revolution of A, B turns twice.

**Examples of machines that use gear wheels**

- Watches
- Gear boxes of cars

**Advantages of using gear wheels**

- They help to multiply force
- They change the direction of rotation
- They help to multiple speed of rotation

**Drive belts**

- Drive belt transmit motion from one wheel to another wheel
- If a driven wheel has 48 teeth, and the driving wheel has 16 teeth, the driving wheel will make 3 revolutions in each single revolution of the driven wheel
- Both wheels move in the same direction

**Examples of machines that use drive belts**

- Bicycles
- Sewing machine
- Grain mills
- Cooling fan of a motor car

**Conveyor belts**

These are special belts used to move things easily from one place to another

**Uses of conveyor belts**

- They are used to transport manufactured goods e.g. bottling lines of sodas and beers
- Escalators are used to climb from one level of a higher level in tall buildings

**PULLEYS**

- A pulley is freely rotating wheel with a grooved rim
- A rope or chair passes over the pulley
- The grooved rim prevents the rope from slipping off the rim
- The frame which holds the pulley is called a **block**

**Types of pulley systems**

There are three types of pulley systems

- Single fixed pulley
- Single movable pulley

- Block and tackle system /fixed movable pulley

**Single fixed pulley**

- A single fixed pulley does not move
- A single fixed pulley acts as a first class lever because the fulcrum is at the centre of the axle
- It has a mechanical advantage of By pulling downs wards as it is easier to raise an object by exerting a downward pull

Qn: Find the effort applied to pull a load of 50 kg.f using a single fixed pulley.

MA L/E

1/1 = $\frac{50kgf}{E}$

E = 50kg.f

**Single moveable pulley**

- A moveable pulley moves along the rope
- It does not change the direction of the effort
- It has mechanical advantage 2
- The effort needed is half and load to be overcome

Qn: What force will be needed to raise a load of 50kg.f using the movable pulley system?

**Solution:**

L = 2E

50 = 2E

$\frac{50}{2} = \frac{2E}{2}$

25kgf = E

- Moveable pulley act as a turning class two lever with the fulcrum and effort at either sides of the wheel and load in the middle

**Block and tackle or fixed moveable pulleys**

This is a pulley system which consists of two blocks containing one or more pulleys in each block according to the mechanical advantage required.

**Uses of pulleys**

- They are used by break down vehicles to pull stranded vehicles
- They are used in lifts in buildings
- They are used on cranes to lift and load heavy goods
- They are used in scaffolds by painters to paint high buildings
- They are used to raise flags at schools

**FRICTION**

Friction is a force that tend to oppose motion between objects

**Types of friction**

- **Static friction**: is the friction between two surfaces which are trying to move but have not yet started moving
- **Dynamic friction**: is the friction between two surfaces when one is moving over the other
- **Viscosity friction**: is the type of friction which occurs in liquids

**Advantages of friction (as a useful force)**

- It helps in walking and movement of cars
- Helps us to light a match stick
- Helps us to brake moving objects
- Helps in climbing trees and mountains
- Helps in writing using a ball point pen
- Helps in grinding when using grinding stone
- Helps in washing clothes

**Disadvantages of friction (as a nuisance force)**

- More force is needed to produce movement
- Efficiency of machine is reduced
- Causes unnecessary heat in machine
- Causes unnecessary noise
- Causes wear and tear of objects
- Delays work

**Ways of increasing friction**

- Putting treads or grips on tyres and shoes soles
- Putting spikes on sports boots ‘
- Making road surfaces rough, by putting tarmac or marram
- Putting grooves on handles of objects

**Ways of reducing friction**

- By making surface which rub each other smooth and hard
- Oiling or greasing moving parts of the machine (lubrication)
- Using ball bearing
- Using rollers
- Streamlining bodies of moving vessels

**ENVIRONMENTAL DEGRADATION.**

- Environmental degradation refers to the destruction of resources in the environment.
- There are both natural and artificial causes of environmental degradation.

**NATURAL CAUSES OF ENVIRONMENTAL DEGRADATION.**

- Earthquake.
- Volcanic eruptions.
- Drought
- Lightening.
- Floods.
- Storms.

**Earthquake.**

- This is a sudden and violent shaking of the earth brought about by internal movement in the earth.

**Effects of earthquakes.**

- Destruction of human life.
- Destruction of property.
- Blocking of communication lines.
- Causes strong storms if it occurs in water.

**How to minimize effects of earthquakes.**

- Constructing earthquakes resistant houses.
- Move out of buildings during an earthquake.
- Build houses using light materials that can cause less damage in case of an earthquake.
- Putting early warning systems in place.
- Providing quick first Aid to people affected by earth quakes.

**Effects of volcanic eruption**

- Causes death to people and property.
- Gases produced cause air pollution.
- Lava can cause water pollution.
- It can lead to displacement of people.
- It can lead to famine.
- It can lead to blocking of rivers and water ways.

**Drought.**

Drought refers to a long dry spell without rain.

**Causes of drought.**

- Deforestation.
- Drainage of swamps.
- Global warnings.
- Over grazing.

**Effects of drought.**

- It leads to famine.
- Death of animals.
- Out break of diseases.
- Infertility of soil.
- Lowering of the water table.

**How to control the effects caused by drought.**

- By protecting vegetation and water sources.
- Practicing soil conservation.
- Planting trees.
- Planting drought resistant crops.
- Planting of quick maturing crops.
- Practice efficient water harvesting and storage methods.

**Lightning**

- Lightning is a strong flash of light in the sky caused by meeting of clouds of two different charges.

**Effects of lightning.**

- It damages property.
- It leads to destruction of trees at times setting them on fire.
- Loss of human and animal life.
- Destruction of electrical appliances.
- Setting of bush fires.

**How to protect your self against lightning.**

- Stay indoors during a thunder storm.
- Avoid standing in rain water during a thunderstorm.
- Don't stand under a tree during a thunder storm.
- Fit buildings with lightning conductors.
- Avoid walking in open bare fields when it is raining.
- Avoid swimming in open water during rain.

**Floods.**

- Flood is a great overflow of water over dry land.

**Causes of floods.**

- Deforestation.
- Global warning.
- Storms.
- Siltation
- Draining of rivers.

**Effects of floods.**

- Destruction of animal and plant life.
- Destruction of property.

- Blocking of communication lines.
- Diseases.
- Contamination of water sources.

**Ways of controlling floods.**
- Maintaining vegetation in catchment areas
- Conserving soil.
- Creating reservoirs to hold excess water.
- Educating people about floods their causes, effects and prevention.
- Protecting wetlands.

**Storms**
- Storms are strong winds that blow with violence.
- They can destroy buildings and plants.
- To avoid destruction caused by storms, plant trees to act as wind brakes.

**HUMAN CAUSES OF ENVIRONMENTAL DEGRADATION.**

Human activities that lead to environmental degradation include:-
- Bad agricultural practices e.g. over cultivation, overgrazing and over stocking.
- Mining
- Construction of roads and buildings.
- Poor disposal of wastes.
- Poaching.
- Drainage of wetlands.

**TYPES OF ENVIRONMENTAL DEGRADATION.**

These are:-
- De-vegetation.
- Silting of water bodies.
- Loss of biodiversity.
- Poor waste management.
- Soil degradation.
- Wetland degradation.
- Pollution.

**De-vegetation.**

This is the removal of plant cover from an area.
- It is caused by high demand for trees, land for agriculture and development.

**Effects of de-vegetation.**
- It exposes soil to erosion.
- It leads to poor yields.
- Loss of habitat
- It leads to drought.
- It leads to loss of animal and plant species.

- It leads to lowering of the water table.

**Control and prevention of de-vegetation.**
- Making laws to protect forests.
- Controlling increase in population.
- Practicing afforestation.
- Re-afforestation and agro forestry.
- Rural electrification.
- Use of energy saving stoves.

**Silting of water bodies.**
- Silting is the washing of soils into water bodies by erosion.

**Causes of silting.**
- Deforestation.
- Cultivation a long river banks.
- Clearing of wetlands.
- Grazing animals along water bodies.
- Dumping soil near water bodies.
- Burning bushes along water bodies.

**Effects of silting of water bodies.**
- Creation of shallow water bodies.
- Drying up of water bodies.
- Flooding of surrounding areas.
- Death of aquatic animals.
- Reduction in the generation of hydro electricity.
- Increase in growth of equatic plants.

**Ways of controlling silting.**
- Afforstation.
- Agro forestry.
- Re-afforestation.
- Avoid cultivating a long river banks.
- Protect vegetation cover in water catchment areas.
- Protection of wetlands.

**Poor waste management**
- A waste is any material that is a by product of human activity which has no further value. Waste can be in solid, liquid or gas form.

**Why wastes increase in the environment.**
- Lack of proper waste disposal places.
- Lack of methods of recycling.
- Use of resources waste fully.

**Effects of poor waste management.**
- Ugly littering of compounds.

- Pollution of water bodies.
- Poor soils with polythene paper and metal remaining in the soil.
- Disease out breaks.
- Blockage of drainage channels.
- Pollution of air.

**Proper management of wastes (solid wastes)**

Waste can be managed by using the basic 5Rs these are:-

- **Reduction:** minimize generation of waste.
- **Reuse**: e.g. use a worn out thing for other purposes, using buveera many times, using plastic jerrycans as flower pots, using tyres to sandles.
- **Recycling:** Collecting materials that had been thrown away and processing them to make new products e.g. smelting of metal scraps.
- **Return:** Bottles and containers should be returned to shops and manufactures.
- **Refuse or reject:** The use of materials which are difficult to get rid of. Do not allow materials that can be dangerous to the environment.
- Use paper bags instead of buveera or plastic bags.

## ESSENTIAL DRUGS AND DRUGS OF DEPENDENCE

**What is a drug?**

A drug is a chemical substance which affects the way one's mind and body works.

- It can either help or harm the body system
- Drugs are either in manufactured form or raw form
- Raw drugs are either in the form of plants and animal parts or extracts from animal or plants.
- If drugs are manufactured and tested in laboratories, they are called laboratory manufactures

**Characteristics of laboratory manufactured drugs**

- They are carefully made and tested
- Their strength , stability and purity is known
- They are the same for each quantity
- Their effect on human health is known
- They are packaged and properly protected
- They are well labeled
- They have expiry and manufactured dates

**Examples of laboratory manufactured drugs**

- Aspirin
- Chloroquine
- Quinine
- Fancida
- Panadol
- Babrendazole
- Coartem

**Characteristics of traditional drugs**

- They are made of raw plants and animals
- Their strength, purity and stability changes

- They are of different quantities
- Their effect on human health is not known
- They are not well labeled
- They are not well packaged

**Examples of traditional drugs**

- Mululuza
- Kigagi
- Bombo

**Essential drugs**

Essential drugs are drugs needed to cure and prevent common diseases affecting the majority of people in an area or country

They may be traditional or laboratory manufactured drugs

**Qualities of essential drugs**

- They should be affordable to make the cost of treatment manageable
- They should be accessible and available wherever needed
- They should be effective to cure, prevent and control diseases
- They should be safe when the correct dosage is used
- They should have a satisfactory value for money

**Examples of essential drugs**

- Cough mixture
- Chloroquine
- Paracetamol
- Piriton
- Penicillin
- ORS
- Fetralycline

**Drug prescription**

This refers to health workers written information on how a drug should be used.

If a drug is taken without a prescription, the patient will either take under or over dose.

**Over dose**

This is the taking in of more medicine than is required

An overdose is dangerous to the body because it can lead to poisoning or death

**Under dose**

This is when one takes fewer than the required

**Disadvantages of under dose**

- It helps the patient to know the correct drug , its dosage relation to age, weight and duration of treatment
- It prevent over dose which is harmful and poisonous to the body
- It prevents under dose which makes germs resistant to the medicine
- It prevents and controls misuse of drugs

**Storage of drugs**

- Drugs should be stored well in places where there is no moisture m direct heat or sunlight
- These conditions destroy the effectiveness of the drug
- Drugs should always be kept out of reach of children

**Advantages of proper storage of drugs**

- It prevents drug misuse
- It controls poisoning which would result if children tool the drug
- It prevents contamination of the drug
- It helps to maintain the shelf spam of the drug
- It prevents drugs from getting easily stolen

**Dangers of buying drugs from shops**

- They don't have prescriptions
- Some of them are not stored properly
- Some of the drugs are sold might be expired
- Some of the drugs might be false

**Drug misuse**

This is the use of a drug without the health workers advice or it is the use of a drug in a wrong way.

**Drugs of dependence**

These are drugs which cause addition after prolonged use
An additional to a drug is a strong desire that one feel uncomfortable when he/she does not use the drug

**Drug dependency**

This is the continuous use of drugs on a regular basis after the body has become used to it. It is a result of drug abuse.

**Drug abuse**

This is the use of drugs in away that is harmful to the body of the user. It can also be the illegal use of the drug.

**Common drugs of dependency**

- Marijuana
- Khart or miraa
- Cocaine
- Glue
- Aviation fuel
- Heroin
- Alcohol
- Tobacco
- Paint thinner

**Why people abuse drugs**

- Some people abuse drugs to overcome fear ‘
- Due to peer influence
- To keep awake or sleep
- Due to good advertisement on the
- To pass time
- To feel warm
- To get energy
- To concentrate on what they are doing
- To gain more appetite

**Effects of drugs of dependence to an individual**

- Brain damage
- Loss of appetite
- Insomnia (inability of sleep)
- Job neglect
- Self neglect
- Low immunity to disease

**Effects to the family**

- Family neglect
- Family aggression and violence
- Criminal acts like defilement and rape
- Poverty
- It sets a bad example to the children

**Effects to the community**

- It leads to increased accidents
- Criminal behaviour
- Poor job performance

**Life skills that can help you to avoid drugs**

- Desist from bad peer groups
- Through counseling and guidance
- Follow good morals elders
- Spending leisure time constructively by engaging in productive activities
- Reading good material which is useful to life.

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