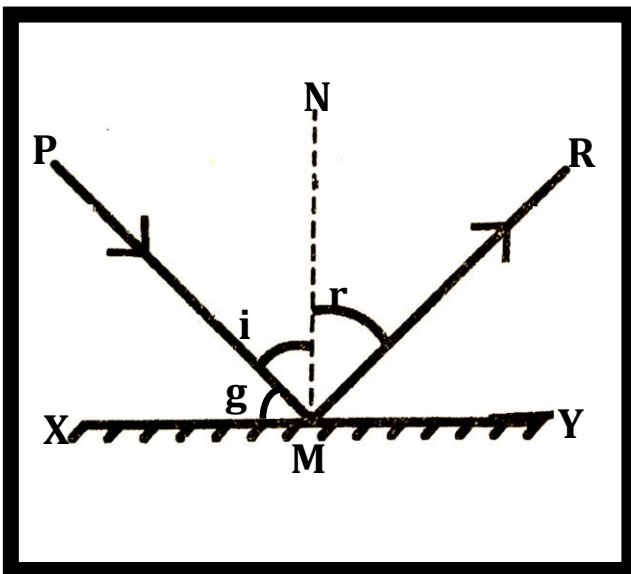
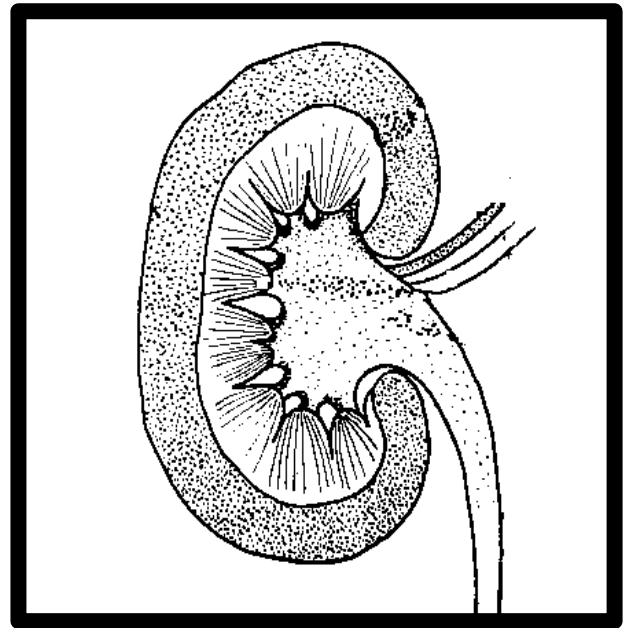
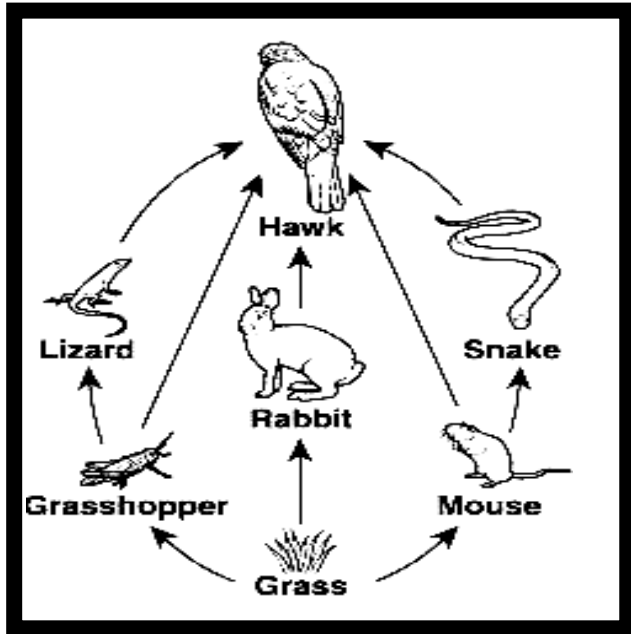


# PARAMOUNT SCIENCE NOTES FOR PRIMARY SEVEN



## TOPICS COVERED

- ❖ EXCRETORY SYSTEM
- ❖ POPULATION AND HEALTH
- ❖ LIGHT ENERGY
- ❖ INTERDEPENDENCE

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# **TOPIC ONE: EXCRETORY SYSTEM**

## **BODY SYSTEMS**

- A system is a group of organs that perform a specific function
- An organ is a group of tissues that perform a specific function
- A tissue is a group of cells that perform a specific function
- A cell is the smallest unit of an organism (this is the basic unit of life)

## **Examples of body systems**

- Digestive system
- Reproductive system
- Muscular system
- Skeletal system
- Nervous system
- Circulatory system
- Respiratory system
- Endocrine system
- Lymphatic system
- Excretory system

## **EXCRETORY SYSTEM**

- This is a body system that removes metabolic waste products from the body

## **What is excretion?**

- This is the process of removing metabolic waste products from the body

## **State two importance of excretion**

- It prevents body poisoning
- It maintains the pH of body fluids

## **Mention three metabolic processes that form excretory products**

- Respiration
- Deamination
- Synthesis of proteins

## **Organs of the excretory system (examples of excretory organs)**

- The skin
- The kidney
- The lungs
- Liver

## **EXCRETORY ORGANS AND THEIR EXCRETORY PRODUCTS**

<b>EXCRETORY ORGAN</b>	<b>EXCRETORY (WASTE) PRODUCTS</b>
Skin	<u>Sweat</u> <ul style="list-style-type: none"><li>▪ Excess salts</li><li>▪ Excess water</li><li>▪ Urea</li><li>▪ Lactic acid</li></ul>
Kidney	<u>Urine</u> <ul style="list-style-type: none"><li>▪ Excess salts</li><li>▪ Excess water</li><li>▪ Urea</li><li>▪ Uric acid</li></ul>
Liver	Bile pigments Cholesterol
Lungs	Carbon dioxide Water vapour

### Why is faeces not regarded as an excretory product?

- It is not formed by a metabolic process

### THE KIDNEYS

- These are two reddish brown bean shaped organs in the abdominal cavity
- They are found on either side of the spine **at the back of the abdomen**
- They are enclosed in a transparent membrane called **renal capsule**

### Name the part of the skeleton that protects the kidneys.

- Pelvis (hip bone)

### FUNCTIONS OF THE KIDNEYS

- They filter blood (remove urine from the body)
- They balance salt and water level in the body/balance body's fluids/for osmoregulation
- They produce a hormone to regulate blood pressure e.g renin

### Waste products by the kidney (components of urine)

- Urea
- Uric acid
- Excess salts
- Excess water

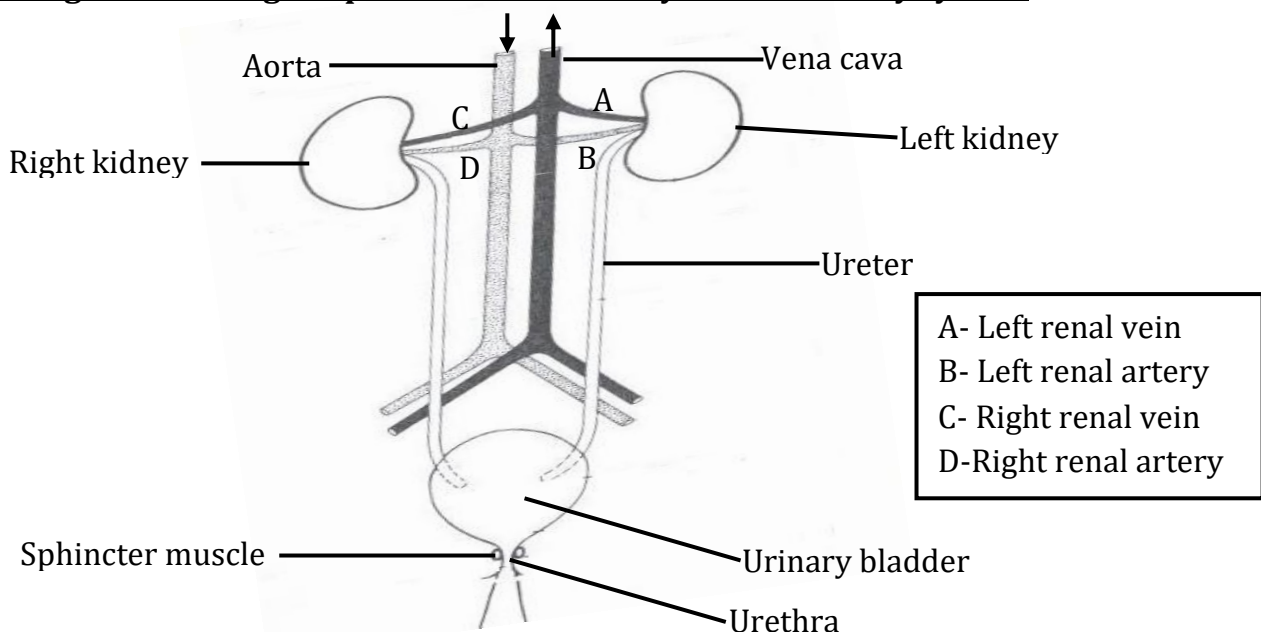
### Name the nitrogenous compounds in urine/filtered by kidneys from blood

- Urea
- Uric acid

### Name the two kidneys found in human beings

- Left kidney
- Right kidney

### A diagram showing the position of the kidneys in the urinary system



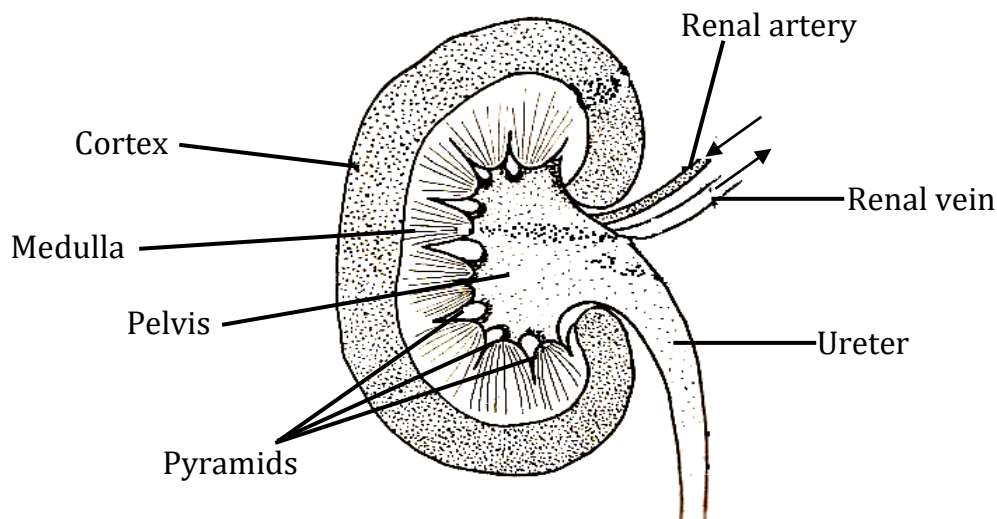
### NOTE

- **Urinary system** is a body system that removes urine from the body
- It consists of the kidneys, ureters, urinary bladder and urethra
- **The kidneys** are the major organs of the urinary system

### Why is the right kidney at a lower level than the left kidney?

- The right kidney is below the liver which is the largest body organ while the left kidney is below the spleen

## **THE STRUCTURE OF THE KIDNEY**



### **Functions of each part of the kidney and urinary system**

#### **Renal artery**

- It carries oxygenated blood from the aorta to the kidneys

#### **Renal vein**

- It carries deoxygenated blood from the kidney to the vena cava

#### **Note**

- ✓ Blood in renal vein is filtered while blood in renal artery is not filtered

#### **Cortex (renal cortex)**

- It is where blood is filtered

#### **How is the cortex adapted to its function?**

- It has nephrons to filter blood
- It has a dense network of capillaries (glomerulus)

#### **Name the main process that occurs in the cortex of the kidney**

- Filtration of blood (ultrafiltration)

#### **Medulla**

- It is where **selective reabsorption** of useful materials occurs

**OR**

- It reabsorbs water and mineral salts that are still needed by the body

#### **Examples of useful materials reabsorbed by the medulla of the kidney**

- |                 |               |
|-----------------|---------------|
| ▪ Water         | ▪ Glucose     |
| ▪ Mineral salts | ▪ Amino acids |

A lot of water is reabsorbed when blood volume is low

Little water is reabsorbed when blood volume becomes normal

#### **Ureter**

- It passes urine from the kidney to the urinary bladder

#### **Urinary bladder**

- It stores urine before it is passed out of the body

#### **Sphincter muscle**

- It opens or closes the urinary bladder

#### **Urethra**

- It passes urine out of the body

## **Pyramids**

- They pass urine from the medulla to the pelvis

## **Pelvis (renal pelvis)**

- It collects urine before it goes to the urinary bladder

## **PROCESSES INVOLVED IN URINE FORMATION**

- Ultrafiltration (Filtration)
- Selective reabsorption (Reabsorption)
- Tubular secretion (Secretion)

## **URINATION (MICTURITION)**

- This is the removal of urine from the body

## **Factors that affect the amount of urine passed out of the body**

- Fluid intake
- Temperature

## **Why do people urinate frequently on cold days?**

- There is little or no sweating hence the kidneys pass out excess water as urine

## **Why do people pass out little urine on hot days?**

- There is much sweating hence less work for the kidneys

## **Why do people pass out a lot of urine when they drink plenty of fluids?**

- For the kidneys to balance the water level in the body

## **Name the blood vessel that carries purified blood from the kidney.**

- Renal vein

## **Why is selective reabsorption important after filtration?**

- It prevents loss of useful materials which are still needed by the body

## **Why do children below three years of age always urinate on the bed?**

- Their urinary bladders are not developed enough to store urine for the whole night

## **What is meant by the term kidney dialysis?**

- This is the process of removing urine from the blood of people with kidney failure

## **DISEASES OF THE KIDNEY**

- Kidney stones
- Nephritis
- Bilharziasis
- Kidney cancer

## **KIDNEY STONES**

- These are hard deposits of salts that form inside the kidneys

## **Causes of kidney stones**

- Dehydration
- Obesity
- Eating too much raw salt

## **Signs of kidney stones**

- Bloody urine
- Frequent urination
- Smelly urine

## **Symptoms of kidney stones**

- Pain in the lower abdomen
- Painful urination

## **BILHARZIASIS**

- It is caused by germs called **schistosomes (blood flukes)**
- It is spread by a vector called **fresh water snails**
- It spreads through drinking, swimming or bathing in contaminated water

### **Signs of bilharziasis**

- Bloody urine
- Swollen abdomen

### **Nephritis**

- It leads to inflammation of the kidney

### **DISORDER OF THE KIDNEYS**

- Kidney failure

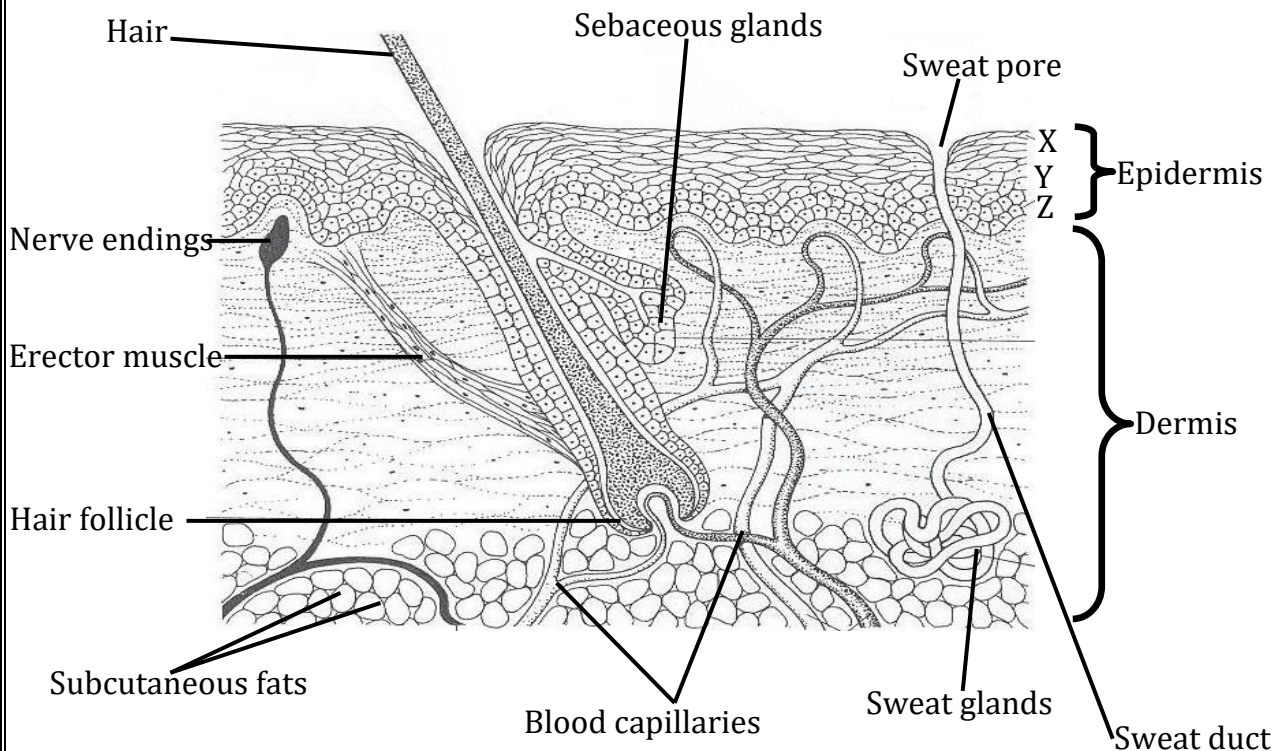
### **Ways of promoting proper working of the kidneys and the urinary system**

- Feed on a balanced diet
- Do regular body exercises
- Drink plenty of safe water
- Do not hold back urine for a long time
- Avoid taking a lot of alcohol
- Avoid eating too much raw (uncooked) salt
- Avoid heavy blows at the lower back of the abdomen
- Have regular medical checkups

### **THE SKIN (INTEGUMENT)**

- This is the outer protective organ of the human body
- It is the largest organ on human body
- The skin is an integumentary organ

### **STRUCTURE OF THE HUMAN SKIN**



X- Cornified layer  
Y- Granular layer  
Z- Malpighian layer

## **Name the two main layers (regions) of the skin**

- Epidermis
- Dermis (corium)

## **THE EPIDERMIS**

- This is the outermost (upper) layer of the skin
- It has no nerves and blood vessels

## **Importance of epidermis region of the skin**

- It protects the inner layer from damage
- It prevents germs and dirt from entering the body

## **Name the layers that make up the epidermis**

- Cornified layer
- Granular layer
- Malpighian layer

### **1. Cornified layer**

- It is the outermost layer of the epidermis
- It is made up of dead cells

## **Functions of the cornified layer**

- It protects the inner parts from damage
- It prevents germs from entering the body
- It prevents water loss by evaporation

## **Why is the cornified layer very thick on palms of hand and soles of feet?**

- To increase friction

### **2. Granular layer**

- It is made up of living cells that gradually die to form the cornified layer

## **Function of the granular layer**

- It is responsible for gradual development of the cornified layer

### **3. Malpighian layer**

- It is made up of actively growing cells which divide by **mitosis** to form new epidermis
- It contains a protein called **keratin**
- It contains a dark pigment called **melanin**

## **Uses of melanin**

- It determines the skin colour
- It acts as a screen to sunshine (it protects the skin from ultraviolet sun rays)

## **Explain the term albinism (albinoism)**

- This is the congenital lack of melanin in the skin, eyes and hair

## **Who is an albino?**

- This is a person with congenital lack of melanin

## **State the uses of keratin**

- It makes the skin tough and flexible
- It produces fingernails and toenails

## **THE DERMIS (CORIUM)**

- This is the innermost (lower) layer of the skin
- The dermis is thicker than the epidermis

## **PARTS OF THE DERMIS LAYER OF THE SKIN**

- sweat glands
- sweat duct
- hair follicle
- erector muscle
- sebaceous glands (oil glands)
- blood capillaries
- nerve endings
- subcutaneous fats (fat cells)

## **FUNCTIONS OF EACH PART OF THE HUMAN SKIN**

### **Blood capillaries**

- They supply food and oxygen to the cells
- They help in temperature regulation
- They remove excretory waste produced in the cells

### **Sweat glands (sudoriferous gland)**

- They produce sweat

### **Components of sweat**

- Excess salts
- Water
- Urea
- Lactic acid

### **Sweat duct**

- They are passages of sweat from the sweat glands to the sweat pores
- They lead sweat to the skin surface

### **Sweat pores**

- They let sweat out of the body

### **Hair follicle (hair root)**

- It is where the hair grows from

### **Hair**

- It regulates body temperature
- **Hair shaft** is the part of hair above the skin

### **How does hair on the skin regulate temperature on cold days?**

- The hair stands on the skin to trap air which prevents heat loss

### **How does hair on the skin regulate temperature on hot days?**

- The hairs lie flat on the skin surface to allow heat loss

### **List down three parts of the human body where hair does not develop**

- Soles of the feet
- Palms of the hands
- The lips

### **Of what importance are the fingernails and toenails?**

- They protect the tips of fingers and toes

### **Hair erector muscle**

- It enables the hair to rise or lie flat on the skin

### **How does the erector muscle enable the hair to rise or fall on the skin surface?**

- By contracting and relaxing

### **Sebaceous glands (oil glands)**

- To produce sebum

### **Sebum**

- This is the oily substance produced by sebaceous gland



### **Importance of sebum**

- It prevents the skin from drying up (desiccation)/ It keeps the skin soft and moist
- It keeps the skin waterproof

### **Subcutaneous fat (fat cells)**

- It stores fats which prevent heat loss
- It protects the muscles and bones from the effects of falls
- It acts as energy store for the body

### **Nerve endings**

- They transmit impulses for heat, touch, pressure, pain and cold to the brain
- They enable the skin to feel

### **FUNCTIONS OF THE SKIN**

- It excretes sweat (removes sweat from the body)
- It regulates body temperature
- It stores fats
- It makes vitamin D with help of sunlight
- It protects the inner parts of the body
- It acts as a waterproof to our bodies
- For feeling (It helps the body to be sensitive to touch, heat and cold)
- It reduces harmful effects of UV (ultra violet) radiation

### **Qn. How is the skin adapted to its function of feeling?**

- It has sensory nerves

### **BODY TEMPERATURE REGULATION BY THE SKIN**

#### **a) HOW DOES THE SKIN REGULATE HUMAN BODY TEMPERATURE ON HOT DAYS?**

- Through vasodilation
- Through sweating (perspiration)/sweat glands produce more sweat
- The hairs lie flat (fall) on the skin surface to allow heat loss

(Through relaxing of hair erector muscles to make the hair lie flat on the skin surface)

### **Vasodilation**

- This is the widening of blood vessels at the skin surface
- It occurs when smooth muscles of blood vessels relax

### **How does vasodilation cool the human body?**

- More blood flow at the skin surface to allow heat loss

### **State the importance of sweating to the human body**

- It cools the human body

### **How does sweating cool the human body on a hot day?**

- Evaporation of sweat causes heat loss

### **How is sweating similar to transpiration?**

- Both cool the organisms/regulate body temperature

### **Why does a dog move while its tongue is out (how is panting important to a dog)?**

- To cool its body/to regulate the body temperature

### **Mention the practices people use to regulate their body temperature on hot days**

- Using umbrellas
- Moving under the shade
- Taking cold drinks
- Turning on an electric fan
- Wearing light clothes

## **Ways through which organisms cool themselves (regulate their body temperature)**

<b>ORGANISMS</b>	<b>HOW THEY COOL THEMSELVES</b>
Dogs	▪ by panting
Plants	▪ through transpiration
Humans and horses	▪ by sweating
Elephants	▪ by flapping their big ears
Owls and doves	▪ by gular fluttering
Pigs and hippos	▪ by bathing in cool mud
Crocodiles	▪ by opening their mouth

### **b) HOW DOES THE SKIN REGULATE HUMAN BODY TEMPERATURE ON COLD DAYS?**

- Through vasoconstriction
- Sweat glands produce little or no sweat
- Through shivering
- The hair stands on the skin to trap air which prevents heat loss

(Through contracting of hair erector muscles to make the hair stand on the skin surface)

#### **Vasoconstriction**

- This is the narrowing of blood vessels at the skin surface
- It occurs when the smooth muscles of blood vessels contract

#### **How does vasoconstriction keep the human body warm on cold days?**

- Little blood flows at the skin surface to prevent heat loss

#### **How does shivering keep the body warm on cold days?**

- Muscles contract rapidly to produce heat

#### **What causes goose pimples on cold days?**

- Contraction of erector muscles

#### **Mention the practices people use to regulate their body temperature on cold days**

- Taking hot drinks
- Sitting near fire
- Putting on thick clothes
- Doing body exercises

### **Ways through which water is lost from the body (causes of dehydration)**

- Severe diarrhoea
- Severe sweating
- Severe vomiting
- Severe burns and scalds

## **DISEASES WHICH AFFECT THE SKIN**

### **Bacterial skin diseases**

- Leprosy
- Boils
- Impetigo
- Cellulitis

### **Fungal skin diseases (mycosis/tinea infections)**

- Ringworm
- Jock itch
- Athlete's foot
- Barber's itch

### **Viral skin diseases**

- Chicken pox (Varicella)
- German measles (Rubella)
- Measles (Rubeola)
- Smallpox (Variola)

### **Deficiency skin diseases**

- Pellagra (caused by lack of vitamin B<sub>3</sub>)
- Scurvy (caused by lack of vitamin C)

### **Other skin diseases**

- **Scabies** (caused by itch mites)
- **Skin cancer:**(caused by over use of bleaching vaseline)
- Eczema

### **DISORDERS OF THE SKIN**

- |                   |                 |
|-------------------|-----------------|
| ▪ Dandruff        | ▪ Corns         |
| ▪ Pimples         | ▪ Blisters      |
| ▪ Bruises         | ▪ Burns         |
| ▪ Vitiligo        | ▪ Scalds        |
| ▪ Acne            | ▪ Skin allergy  |
| ▪ Cuts and wounds | ▪ Herpes zoster |

### **Note**

- **A bruise** is a swelling on a skin caused by internal bleeding due to strong hit
- **Vitiligo** is a condition when the skin losses its pigment cells

### **Give two ways in which wounds heal?**

- By regeneration
- By fibrosis

### **WAYS OF CARING FOR HUMAN SKIN**

- Regular bathing with clean water and soap
- Dry your body with a clean towel after bathing
- Feed on a balanced diet
- Avoid skin bleaching vaseline and body cream
- Cover wounds and cuts with clean bandages
- Perform regular body exercises
- Protect the skin from direct sunshine
- Keep your fingernails short and clean
- Put on clean and dry underwear and stockings
- Do not share clothes with people having skin infections
- Avoid playing with sharp objects
- Put antiseptics on wounds to prevent infections

### **How is the skin similar to kidneys in terms of functions?**

- Both remove metabolic wastes from the body

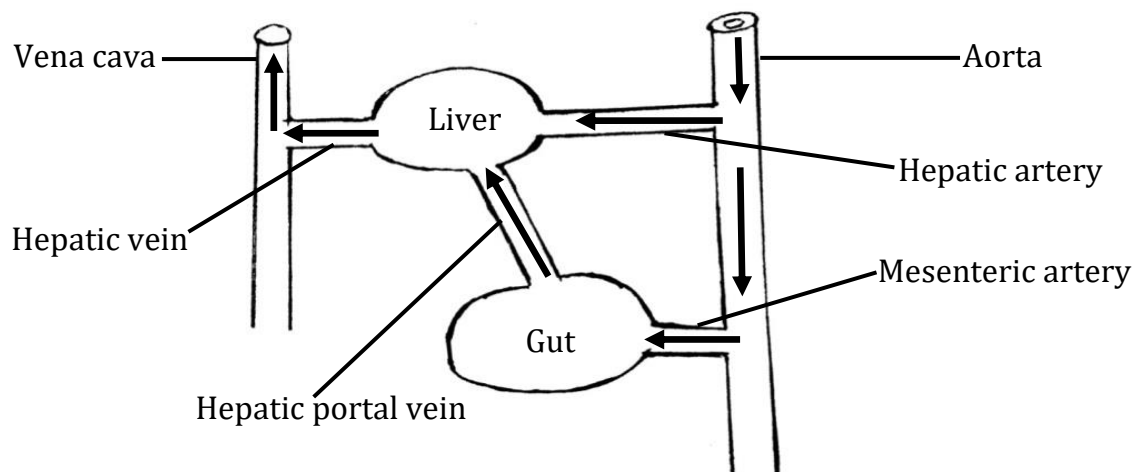
### **THE LIVER**

- This is a large reddish brown organ below the diaphragm.
- It is found in the abdominal cavity
- The liver is the largest organ in the human body
- The liver is the most important organ in the body
- The liver has two lobes; **the right lobe and the left lobe**
- The two lobes are separated by the gall bladder
- The gall bladder **stores bile**

### **Why is the liver regarded as the most important body organ?**

- It performs many functions compared to other body organs

## **POSITION OF THE LIVER**



### **Mesenteric artery**

- It carries oxygenated blood from the aorta to the digestive tract (gut)

### **Hepatic artery**

- It carries oxygenated blood from the aorta to the liver

### **Hepatic vein**

- It carries deoxygenated blood from the liver to the vena cava

### **Hepatic portal vein**

- It carries blood with digested food from the gut (digestive tract) to the liver

### **Why does blood from the ileum go to the liver before circulation?**

- To be detoxified ( for the liver to remove toxic substances)
- For the liver to store excess nutrients

## **FUNCTIONS OF THE LIVER**

- It produces bile juice (bile)
- It excretes bile pigments
- It helps in deamination

**Deamination:** is the process by which the liver converts excess amino acids into urea

- It regulates blood sugar level

**How?** By storing excess glucose

- It produces heat
- It detoxicates blood
- It stores some vitamins and mineral salts
- It makes plasma proteins; like fibrinogen
- It produces cholesterol

**Why is a liver called an excretory organ?**

- It removes bile pigments from the body

**How are bile pigments formed?**

- By the breakdown of dead red blood cells

**Why does a dead body (corpse) feel cold?**

- The liver which produces heat has stopped working

**Why is a liver called a storage organ?**

- It stores some vitamins, mineral salts and glucose

**Note**

- Vitamins stored by the liver include: **Vitamins A, D, E and K**
- Mineral salts stored by the liver include: **iron, copper and potassium**

## **BILE JUICE**

- This is a digestive juice which has no enzymes
- It is produced by the liver and stored in the gall bladder

## **Importance of bile juice**

- To breakdown (emulsify) fats in the duodenum
- To neutralize acidic chyme from the stomach
- To provide alkaline conditions for proper working of enzymes in duodenum

## **IMPORTANCE OF GALL BLADDER**

- To store and concentrate bile
- To control the flow of bile into the duodenum

## **DETOXICATION (DETOXIFICATION)**

- This is the process by which the liver removes toxic substances from blood

## **Name three toxic (harmful) substances removed from blood by the liver**

- Alcohol
- Urea
- Expired drugs

## **FUNCTIONS OF PANCREAS**

- It produces pancreatic enzymes
- It produces insulin hormone

## **FUNCTIONS OF INSULIN HORMONE**

- It stimulates the liver to regulate blood sugar level
- It stimulates glucose uptake by the body cells to produce energy

## **Name the metabolic disease caused by lack of insulin in the body**

- Diabetes

## **Give any two causes of diabetes**

- Lack of insulin
- Insulin resistance
- Obesity

**Insulin resistance** is when the liver cells don't respond well to insulin

## **Mention two signs of diabetes**

- Frequent urination
- Dark skin patches
- Slow healing of cuts and wounds

## **Symptoms of diabetes**

- Severe thirst
- Severe hunger
- Tiredness
- Blurred vision

## **DISEASES OF THE LIVER**

- Liver cirrhosis (caused by too much drinking of alcohol)
- Hepatitis A and B
- Liver cancer
- Liver abscess (these are boils which form pus in the liver)

## **HEPATITIS B**

- It is caused by a virus called **hepatitis B virus (HBV)**
- It affects the liver

### **How does hepatitis B spread?**

- Through playing unprotected sex with infected person
- Through sharing contaminated needles with an infected person
- Through body contact with infected body fluids

### **Signs of hepatitis B**

- Dark urine
- Vomiting
- Jaundice (the skin and sclera turn yellow)

### **Prevention and control of hepatitis B**

- Immunize using Hep B vaccine
- Use condoms during sex
- Avoid sharing needles with an infected person
- Use latex gloves during fisting or fingering

### **CARE FOR THE LIVER**

- Avoid taking a lot alcohol
- Always drink safe water
- Avoid drug abuse
- Make regular body exercises
- Feed on balanced diet

### **THE LUNGS**

- These are two spongy and elastic pink organs in the **chest cavity**
- The lungs are protected by the part of human skeleton called **rib cage**
- The lungs are both excretory and respiratory organs

### **Why are lungs regarded as excretory organs?**

- They remove carbon dioxide and water vapour from the body

### **Why are lungs regarded as respiratory organs?**

- They supply the body with oxygen for respiration

### **Name the two lungs in the human body**

- Left lung
- Right lung

### **Why do lungs feel spongy?**

- They have many alveoli (air sacs) inside them

### **Why are lungs elastic?**

- For easy expansion and contraction during breathing

### **Name the membrane that encloses the lungs**

- Pleural membrane

### **State the importance of the pleural membranes (pleura) on the lungs**

- It produces pleural fluid

### **State the importance of the pleural fluid**

- It reduces friction between the lungs and ribs

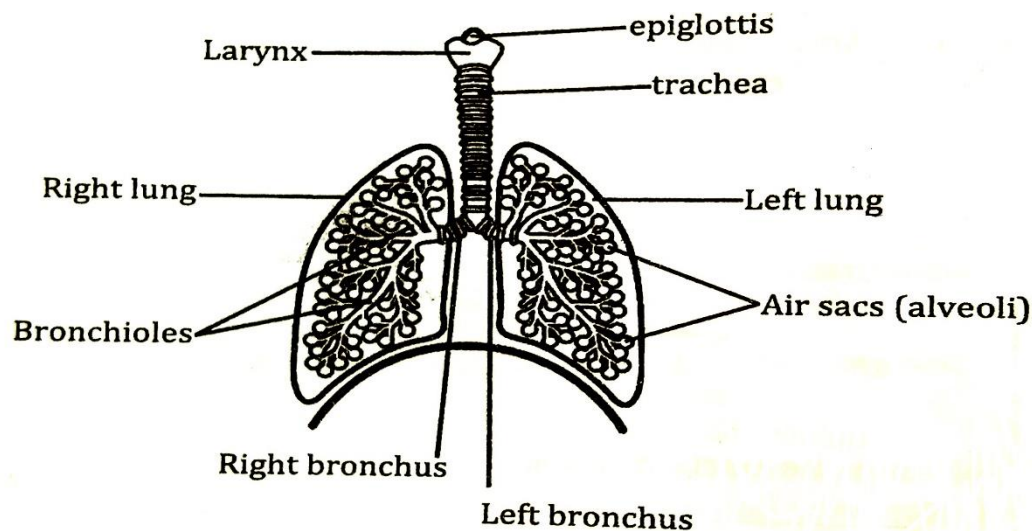
### **Of what importance is the pleural cavity?**

- It holds the pleural fluid

### **What do we call the muscles that hold together the ribs in one position?**

- Intercostal muscles

## **THE STRUCTURE OF THE LUNGS (RESPIRATORY SYSTEM)**



## **FUNCTIONS OF LUNGS**

- They remove carbon dioxide and water vapour from the body
- They supply the body with oxygen for respiration
- They are used for breathing

## **How are lungs adapted to their functions?**

- They are spongy and elastic
- They have very many alveoli
- They contain very many blood vessels
- They have a moist surface
- They are covered in thin membranes

## **NOSE**

- It is an olfactory organ (sense organ for smell)

## **Importance of the nose**

- For smelling
- It cleans, warms and moistens inhaled air

## **Why is the temperature in the nose slightly higher than that of other body parts?**

- To warm the inhaled air before it reaches the lungs

## **CONTENTS OF THE NOSE AND THEIR IMPORTANCE**

### **1. Mucus (snot)**

- To trap germs and dust
- To moisten air
- To prevent the nose from drying up

### **2. Cilia**

- To filter air /to trap dust and germs

## **Of what function are cilia and mucus in the nose?**

- To trap dust and germs (to clean the air)

## **Mention three things that happen to inhaled air in the nose**

- Air is cleaned (filtered)
- Air is warmed
- Air is moistened

## **What warms the inhaled air in the nose?**

- Blood in the vascular membrane

### **Why is it not advisable to breathe through the mouth?**

- There is no cilia to filter air
- Air is not warmed and it can chill the lungs

### **Why do people sometimes breathe through the mouth?**

- Due to nasal congestion
- Due to nose bleeding
- Due to deviated nasal septum

### **DISORDERS OF THE NOSE**

- Nose bleeding
- Nasal congestion (accumulation of mucus in the nose)

### **Diseases of the nose**

- Sinus infection (Sinusitis)
- Nasal polyp
- Hay fever

### **CARE FOR THE NOSE**

- Wash the nose with clean water and soap.
- Do not share handkerchiefs
- Use a clean piece of cloth to clean the nose
- Avoid rough games that can harm the nose
- Do not allow mucus to flow and reach the lips

### **Why should we cover the nose while sneezing?**

- To prevent spread of droplet infections

### **THROAT (PHARYNX)**

This is a common passage for food and air

- It carries air to the wind pipe and food to the gullet.

### **EPIGLOTTIS**

- It prevents food from entering the wind pipe during swallowing (it prevents choking)

### **How does the epiglottis prevent choking?**

- By closing the wind pipe during swallowing

### **LARYNX (VOICE BOX)**

- It has vocal cords which vibrate to produce sound

### **THE TRACHEA (WIND PIPE)**

- It is the passage of air from the nose to the lungs.

### **Why is the trachea made up of rings of cartilage?**

- To keep it open all the time.

### **State what would happen to the trachea in absence of the rings of cartilages if the air pressure inside is low.**

- The trachea would collapse (close) and lead to suffocation

### **NOTE**

- The trachea contains cilia **to trap dust and germs**
- The trachea divides into two **bronchi** (left bronchus and right bronchus)
- The bronchi subdivide into **bronchioles**
- The bronchioles end into tiny air sacs called **alveoli**

### **ALVEOLI (AIR SACS)**

- It is where gaseous exchange occurs
- Gaseous exchange in the alveoli occurs by **diffusion**

### **In which human body organ does gaseous exchange take place?**

- In the lungs



### **Where in the lungs does gaseous exchange take place?**

- In the alveoli (air sacs)

### **By what process does oxygen in the alveoli enter red blood cells and carbon dioxide leave blood?**

- Diffusion

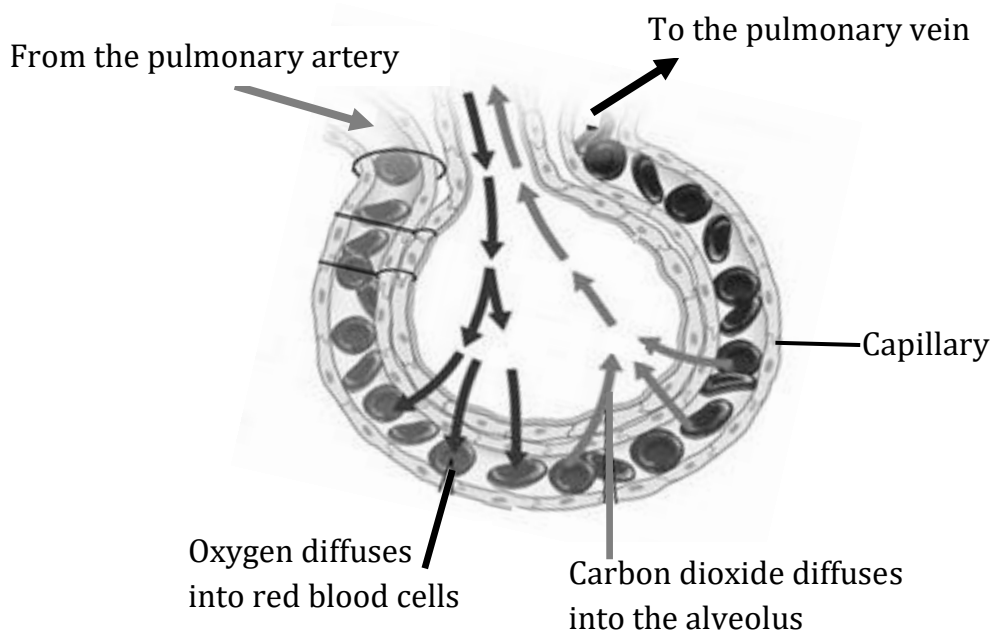
### **What is meant by the term diffusion?**

- This is the movement of molecules from an area of high concentration to an area of low concentration

### **What is meant by the term gaseous exchange?**

- This is the process by which blood releases carbon dioxide and gains oxygen

### **THE STRUCTURE OF THE ALVEOLUS**



### **What do the arrows represent in the above diagram?**

- They represent gaseous exchange.

### **ADAPTATIONS OF ALVEOLI (AIR SACS) TO THEIR FUNCTION**

- They have thin walls

For easy diffusion of gases

- They have a lot of blood capillaries

To supply them with food nutrients

- They have a moist surface

For easy diffusion of gases

- They are numerous (very many in number)

To increase the surface area for gaseous exchange

### **DIAPHRAGM**

This is a dome-shaped muscle that separates the chest cavity and abdominal cavity

- It helps in breathing

### **INTERCOSTAL MUSCLES**

- They hold the ribs in position.

### **BREATHING (VENTILATION OF THE LUNGS)**

- This is the movement of air in and out of the lungs

### **Give two importance of breathing**

- It provides oxygen to the body for respiration
- It removes carbon dioxide and water vapour from the body

### **What is tidal air?**

- This is the amount air that moves in and out of the lungs during a normal breath

### **TYPES (PHASES/MECHANISMS) OF BREATHING**

- Breathing in (inhalation/inspiration)
- Breathing out (exhalation/expiration)

### **1. BREATHING IN (INHALATION OR INSPIRATION)**

- This is the movement of air into the lungs

### **Events/things that occur during inhalation**

- Intercostal muscles contract
- Ribs go upwards and outwards
- Diaphragm contracts/flattens/moves downwards
- Volume of the chest cavity increases
- The lungs expand

### **Why do lungs expand during inhalation?**

- To create space for the air entering
- They are filled with air

### **Which property of air enable lungs to expand during inhalation?**

- Air occupies space

### **Why does the diaphragm go downwards during inhalation?**

- To provide space for expansion of the lungs

### **Why do ribs go upwards and outwards during inhalation?**

- To provide space for the expansion of the lungs

### **State the importance of inhalation/breathing in**

- It provides oxygen to the body for respiration

### **Correct order showing the mechanism of inhalation**

- Diaphragm and intercostal muscles contract
- Volume of chest cavity increases (size of the chest and lungs increases)
- Air pressure inside decreases
- Air rushes into the lungs

### **Why is inhalation said to be an active process?**

- It involves muscle contraction that requires energy

### **2. BREATHING OUT (EXHALATION OR EXPIRATION)**

- This is the movement of air out of the lungs.

### **Events/things that occur during exhalation**

- Intercostal muscles relax.
- Ribs go downwards and inwards
- Diaphragm relaxes and becomes dome-shaped (move upwards)
- Volume of the chest decreases
- The lungs contract (go to their original size)

### **Why do lungs contract during exhalation?**

- To force out air

### **Which property of air enable lungs to contract during exhalation?**

- Air can be compressed

### **State the importance of exhalation/breathing out**

- It removes carbon dioxide and water vapour from the body

### **CORRECT ORDER SHOWING THE MECHANISM OF EXHALATION**

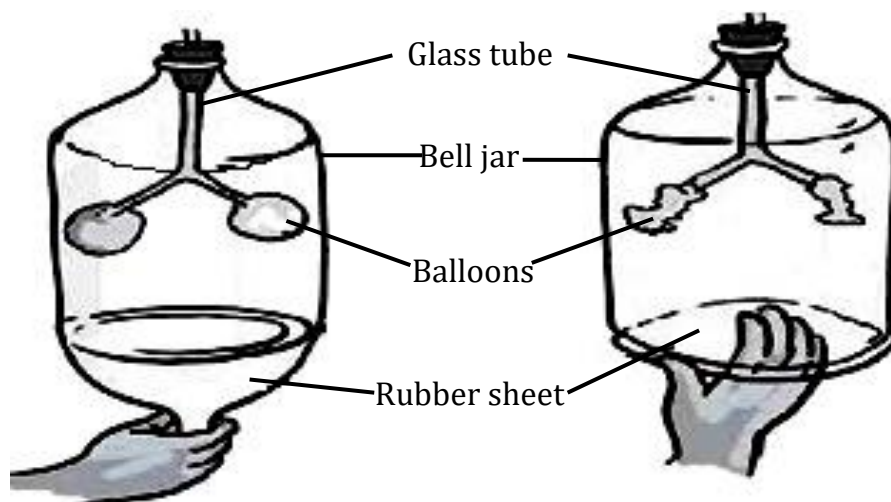
- Diaphragm and intercostal muscles relax
- Volume of chest cavity decreases (size of the chest and lungs decreases)
- Air pressure inside increases
- Air moves out of the lungs

### **Why is exhalation regarded as a passive process?**

- It does not involve muscle contraction

### **A MODEL SHOWING THE MECHANISMS OF BREATHING**

- Cut off the bottom of a plastic bottle
- Cover and tie the open end with a rubber sheet
- Tie two empty balloons to a Y - shaped (straw) glass tube
- Insert the straw into the bottle through its cork



### **Which body system is illustrated above?**

- Respiratory system

### **What do the following parts represent?**

- Glass tube (straw) ----- trachea
- Balloons----- lungs
- Bell jar (plastic bottle) ----- chest cavity
- Polythene bag (rubber sheet)----- diaphragm

### **What happens to the balloons when the rubber sheet is pulled outwards/downwards?**

- The balloons expand

### **What happens to the balloons when the rubber sheet is pushed inwards?**

- The balloons contract

### **COMPOSITION OF AIR BREATHED IN AND OUT**

Type of air	Inspired air	Expired air
Oxygen O <sub>2</sub>	21%	16%
Carbon dioxide Co <sub>2</sub>	0.03%	4%
Nitrogen N <sub>2</sub>	78%	78%
Water vapour	Less	More
Rare gases	0.97%	0.97%

### **QUESTIONS:**

#### **Why do we breathe out less oxygen?**

- It is used in the body during respiration

#### **Why is there more carbon dioxide and water vapour in exhaled air?**

- They are produced in the body during respiration.

#### **Why is the percentage of nitrogen and rare gases the same in both inhaled air and exhaled air?**

- They are neither produced nor used in the body

#### **Why does a person breathe heavily after a vigorous exercise?**

- To pay the oxygen debt.

#### **Why does a person breathe heavily during a vigorous exercise?**

- To supply the body with more oxygen for respiration

### **RESPIRATION**

- This is the oxidation of food (glucose) in the living body cells to produce energy
- It is a **chemical change**
- It takes place in the **living cells** (living body cells)

#### **How is respiration an important process among living things?**

- It enables them to get energy

### **AN EQUATION SHOWING RESPIRATION**

Glucose (Food) + Oxygen  $\longrightarrow$  Energy + Carbon dioxide + Water vapour

#### **Raw materials for respiration**

- Glucose (food)
- Oxygen

#### **Products of respiration**

- Energy  $\longrightarrow$  main/useful product
  - Carbon dioxide
  - Water vapour
- } byproducts/waste products

#### **Explain the meaning of the term oxidation.**

- This is the process by which oxygen combines with a substance

### **TYPES OF RESPIRATION**

- **Aerobic respiration**

This is the type of respiration that uses oxygen

- **Anaerobic respiration**

This is the type of respiration that does not use oxygen

**Mention three human respiratory organs**

- Nose
- Lungs (they are the main respiratory organs)
- Trachea (wind pipe)

**DISORDERS OF THE RESPIRATORY SYSTEM**

- Hiccups
- Sneezing
- Choking: it is caused by blockage of the wind pipe by a foreign object
- Yawning
- Coughing: it is caused by irritation of wind pipe by the dust

**Hiccups**

- These are involuntary contractions of the diaphragm

**Causes of hiccups**

- Taking carbonated drinks
- Taking too much alcohol
- Sudden excitement
- Swallowing air along with food
- Overeating

**DISEASES OF THE RESPIRATORY SYSTEM (RESPIRATORY DISEASES)**

**1. Communicable (infectious) respiratory diseases**

- Tuberculosis (TB)
- Diphtheria
- Whooping cough (Pertussis)
- Pneumonia
- Influenza (Flu)
- Common cold
- Acute bronchitis
- COVID-19

**2. Non-communicable (non-infectious) respiratory diseases**

- Lung cancer
- Asthma
- Emphysema
- Chronic bronchitis
- Asbestosis: it is caused by too much exposure to asbestos

**List down three respiratory diseases caused by tobacco smoking**

- Lung cancer
- Emphysema
- Chronic bronchitis

**Name two respiratory diseases worsened by tobacco smoking**

- Asthma
- Tuberculosis

**ASTHMA**

- It is a hereditary disease of the respiratory system

**Sign of asthma**

- Difficulty in breathing on cold days
- Wheezing

**How does asthma make breathing difficult?**

- It blocks the bronchioles

### **Why is asthma called a hereditary disease?**

- It is genetically transmitted from parents to offspring

### **LUNG CANCER**

- It is a respiratory disease
- It is caused by exposure to tobacco smoke and radon gas

### **Signs of lung cancer**

- Coughing up -blood
- Difficulty in breathing
- Wheezing
- Weight loss

### **Symptom of lung cancer**

- Chest pain

### **Name the carcinogen (substance that causes lung cancer) in tobacco smoke**

- Tar

### **Why is lung cancer called a death sentence?**

- It has no cure

### **How does regular tobacco smoking cause lung cancer?**

- It causes abnormal growth of lung cells

### **TUBERCULOSIS**

- It is a bacterial airborne disease (droplet infection)
- It attacks the respiratory and skeletal system
- It mainly affects the lungs and the backbone (spine)

### **Name the germ (bacterium) which causes tuberculosis**

- Mycobacterium tuberculosis

### **How does tuberculosis spread?**

- Through inhaling contaminated air
- Through drinking unboiled milk from tubercular cows

### **Signs and symptoms of tuberculosis**

- Chronic cough
- A lot of sweating at night
- Loss of body weight

### **Prevention and control of tuberculosis**

- Immunize babies using BCG vaccine
- Isolate and treat the sick people
- Drink boiled or pasteurized milk

### **PNEUMONIA**

- It is a respiratory disease
- It mainly affects the lungs
- It can be caused by bacteria or viruses

### **Signs of pneumonia**

- Difficulty in breathing
- Wheezing
- Stuffy nose

### **How does pneumonia make breathing difficult?**

- It causes inflammation of the alveoli

### **Name the vaccine that protects infants against pneumonia**

- PCV (Pneumococcal conjugate vaccine)

### **CARE FOR THE RESPIRATORY SYSTEM**

- Perform regular body exercise

- Eat meals containing low animals fats
- Avoid cigarette smoking
- Feed on a balanced diet
- Take infants for immunisation
- Always keep the nose away from dust
- Always breathe through the nose

# **TOPIC TWO: LIGHT ENERGY**

## **ENERGY**

- This is the ability to do work

## **Examples of forms of energy**

- Light energy
- Sound energy
- Electricity
- Heat energy
- Chemical energy
- Mechanical energy
- Solar energy
- Magnetism

## **Optics**

- This is the study of light

## **LIGHT ENERGY**

- This is the form of energy that enables our eyes to see objects.
- This is the form of energy that stimulates sense of sight
- This is the form of energy produced by luminous objects

## **Why is light called a form of energy?**

- It does work

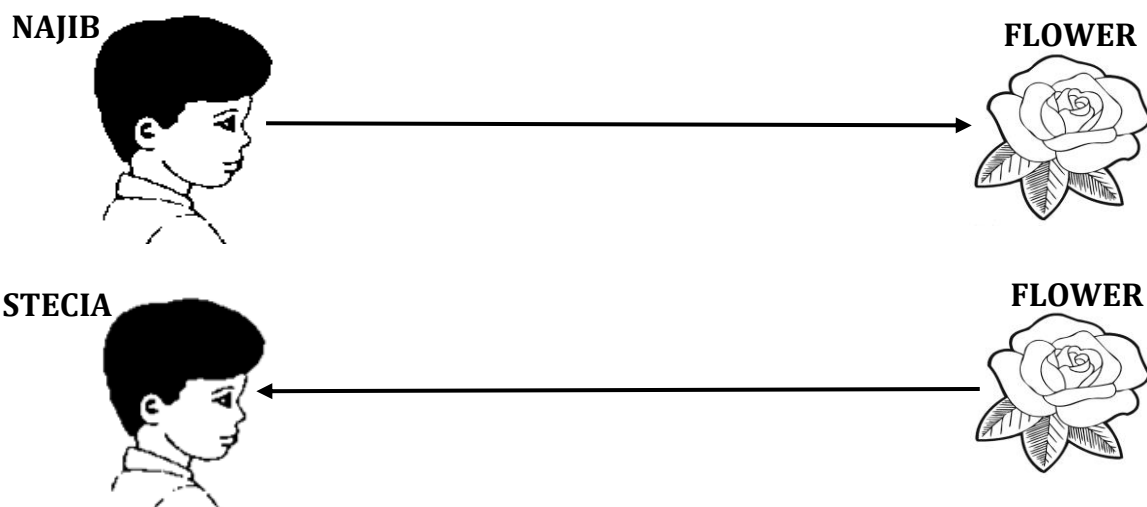
## **Importance (uses) of light/work done by light**

- Light enables us to see objects
- Light enables us to use optical instruments
- Sunlight enables plants to make their own food
- Sunlight enables eggs of reptiles, amphibians and fish to hatch.
- Sunlight helps human skin to make vitamin D
- Sunlight is used to generate solar electricity
- Ultraviolet (UV) light is used in water treatment to kill germs
- Light is used in photography

## **How are we able to see objects?**

- We are able to see objects when they reflect light into our eyes.

## **Study the diagrams below**



## **Who is able to see the flower?**

- Stecia

## **Give a reason for your answer**

- The flower reflects light into her eyes



### **Why is Najib unable to see the flower?**

- The flower does not reflect light into his eyes

### **Ways through which objects give out light**

- Some objects emit light on their own
- Some objects reflect light from other sources

### **SOURCES OF LIGHT**

- A source of light is an object which produces light.

### **Groups (types) of sources of light**

- Natural sources of light
- Artificial sources of light

### **Natural sources of light**

- These are sources of light that exist by nature

### **Examples of natural sources of light**

- Sun: it is the main natural light source
- Stars
- Lightning
- Erupting volcanoes
- Glow-worms
- Fireflies
- Jellyfish
- Dragonfish
- Sea star

### **Artificial sources of light**

- These are manmade objects that produce light

### **Examples of artificial sources of light**

- Light-bulbs
- Torches
- Lamps
- Burning candles
- Fire
- Red hot charcoal
- Lanterns
- Televisions

### **LUMINOUS OBJECTS**

- These are objects which produce their own light

They are also called **direct sources of light**

### **Examples of luminous objects**

- Sun
- Stars
- Light bulb
- Burning candle
- Lantern
- Red hot charcoal
- Fire
- Fireflies
- Glow-worms
- Burning charcoal
- Erupting volcano
- Jellyfish
- Dragonfish
- Sea star

### **Groups of luminous objects**

- Incandescent objects
- Luminescent objects

#### **i) Incandescent objects**

- These are objects that produce both light and heat

### **Examples of incandescent sources of light**

- Sun
- Stars
- Filament electric bulbs
- Red hot charcoal
- Erupting volcanoes
- Burning candles

### **ii) Luminescent objects**

- These are objects that emit light without heat

### **Examples of luminescent objects**

- Glow-worms
- Fireflies
- Jellyfish
- Fluorescent lamps
- Television
- Dragonfish
- Sea star

### **Name any three living things that produce light/ bioluminescent organisms**

- Glow-worms
- Fireflies
- Jellyfish
- Dragonfish
- Sea star

### **Why do some organisms glow (produce light)?**

- To attract mates
- To scare away predators
- To trap their prey

### **NON LUMINOUS OBJECTS**

- These are objects which do not produce their own light

They are also called **indirect sources of light** or **reflectors of light**

### **Examples of non-luminous objects**

- Moon
- Mirrors
- Planets

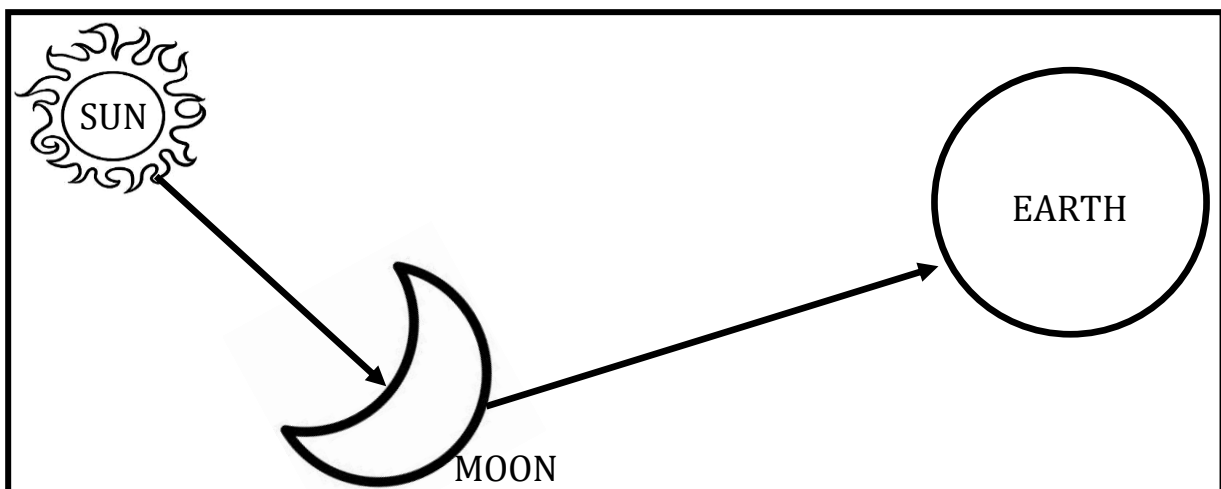
### **Why is the moon not called a luminous source of light?**

- It does not produce its own light but reflects it from the sun

### **How does light from the sun reach the earth at night?**

- It is reflected onto the earth by the moon

### **An illustration showing how the moon reflects light from the sun to the earth**



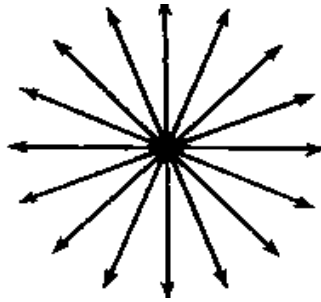
### **PROPERTIES OF LIGHT**

- Light travels in a straight line
- Light travels in all directions from the source
- Light can be reflected
- Light can be refracted
- Light does not need a medium to travel (can travel through vacuum)

## Transmission of light (how does light travel?)

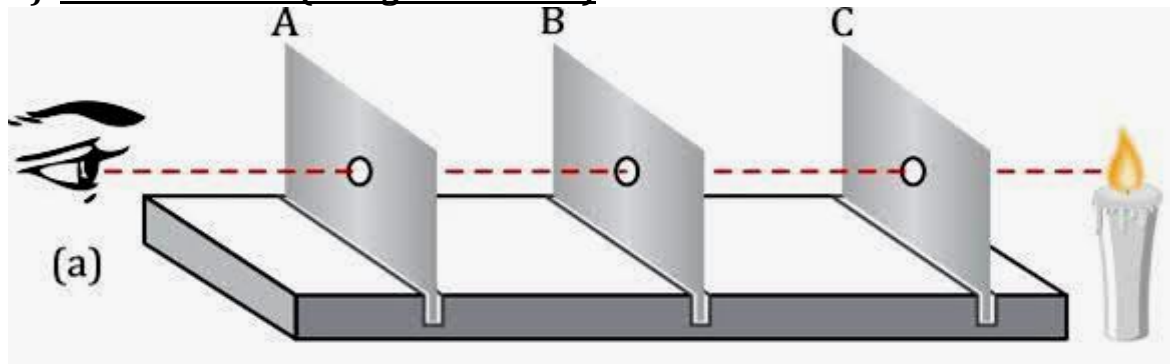
- Light travels in a straight line
- Light travels in all directions from the source

### An illustration to show that light travels in all directions from the source



## EXPERIMENT TO SHOW THAT LIGHT TRAVELS IN A STRAIGHT LINE

### a) EXPERIMENT 1 (Using cardboards)



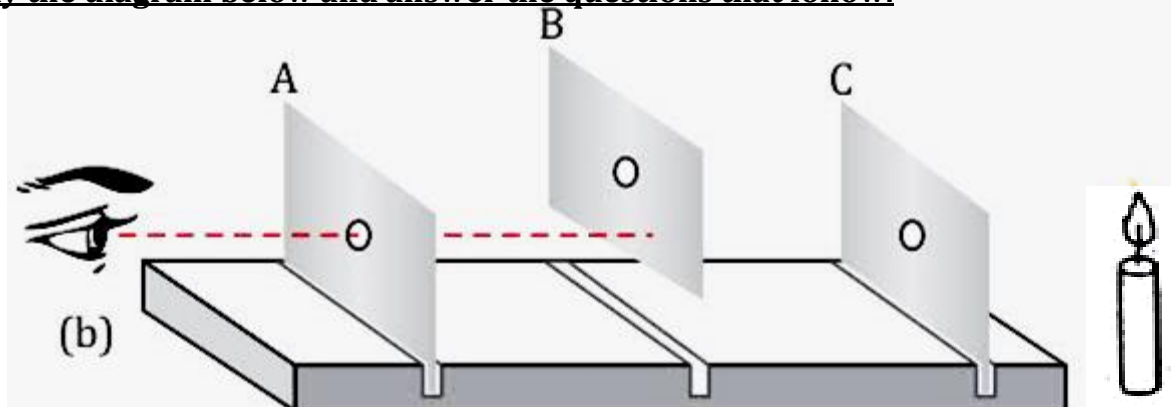
### Why is the observer able to see candle light in figure (a) above?

- The holes in the cardboards are in a straight line

### What does the experiment above represent?

- It shows that light travels in a straight light

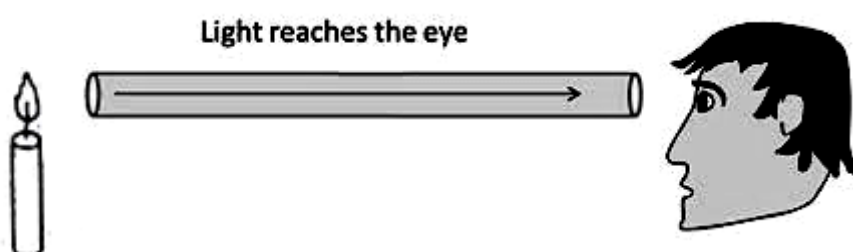
### Study the diagram below and answer the questions that follow.



### Why is the observer unable to see candle light in figure (b) above?

- The holes in the cardboards are not in straight line

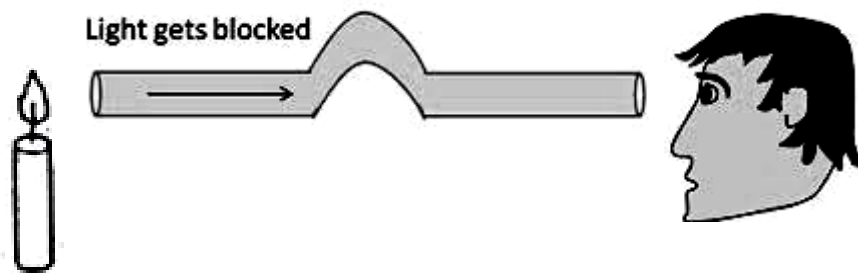
### EXPERIMENT 2: (Using a straight tube/straw/pipe)



**Why is the observer able to see light in the diagram above?**

- The tube/pipe is straight

**Use the diagram below to answer the question about it.**



**Why is the observer unable to see light in the diagram above?**

- The tube is bent/not straight

**FACTS TO PROVE THAT LIGHT TRAVELS IN A STRAIGHT LINE.**

- We cannot see objects around corners **because** light travels in a straight line
- Shadows occur because **due** to obstruction of light by an opaque object
- Light from a projector travels in a straight line
- Sunlight passing through a hole in a roof travels in a straight line
- Light from rising and setting sun travels in a straight line
- Light from a torch travels in a straight line

**Why can't we see around corners and barriers?**

- Light travels in straight lines

**How is light similar to sound and heat?**

- They travel in all directions from the source
- They are forms of energy

**How does light differ from sound in terms of movement?**

- Light travels by rays while sound travels by waves
- Light can travel through vacuum while sound cannot travel through vacuum
- Light travels faster than sound

**Why is light and heat able to travel through vacuum?**

- They do not need a medium to move

**Why is light able to travel through vacuum yet sound cannot?**

- Light does not need a medium to move while sound needs a medium to move

**THE SPEED OF LIGHT**

- The speed of light is about 300,000,000 m/s in vacuum
- Light travels fastest in **vacuum** and slowest in **diamond**
- Light does not need a medium to move
- The speed of light reduces as it moves from a rarer (less dense) to denser medium
- The speed of light increases as it moves from a denser to a rarer (less dense) medium

**Why does light travel faster in air than in glass?**

- Air is less dense than glass

**Why does light travel fastest in vacuum?**

- There is no matter (there are no molecules)

## **NOTE**

- Light travels faster than sound in air
- Light travels at a speed of 300,000,000 m/s in air while sound travels at a speed of 340 m/s in air

## **FACTS TO PROVE THAT LIGHT TRAVELS FASTER THAN SOUND**

- Lightning is seen before thunder is heard
- Light is seen before sound is heard during fireworks
- The starter's gun flash is seen before the bang is heard at the race track
- An axe is seen striking a tree before sound is heard when cutting a tree

## **Why is lightning seen before thunder is heard on a rainy day?**

- Light travels faster than sound

## **Qn. The sun is 150,000,000 Km away from the earth and light travels at a speed of 300,000 Km/s. How long does sunlight take to reach the earth?**

Time=  $\frac{\text{Distance}}{\text{Speed}}$

Speed

$$T = \frac{150,000,000 \text{ km}}{300,000 \text{ km/s}}$$

$$T = 500 \text{ seconds}$$

## **∴ Sunlight takes 500 seconds to reach the earth**

## **A TABLE SHOWING THE SPEED OF LIGHT IN DIFFERENT MEDIA**

Medium	Speed of light
Vacuum	300,000 km/s
Air	299,000 km/s
Water	224,000 km/s
Glass	198,000 km/s
Diamond	12,000 km/s

## **EFFECTS OF DIFFERENT OBJECTS ON LIGHT**

### **State the things that may happen to light as it meets an object**

- Light may be reflected
- Light may be refracted
- Light may be absorbed
- Light may be transmitted (allowed to pass through)

## **GROUPS OF OBJECTS (MATERIALS) THAT AFFECT LIGHT**

- Transparent objects
- Translucent objects
- Opaque objects

### **1. Transparent objects**

- These are objects which allow all the light to pass through them.

### **Why are we able to see clearly through transparent objects (why can't transparent objects form shadows)?**

- They allow all the light to pass through them

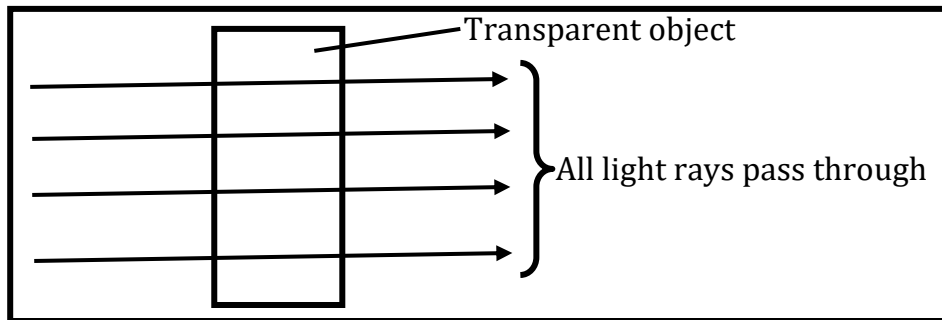
### Examples of transparent objects

- Clear glass
- Clear water
- Clear air
- Vacuum

### What happens to light when it strikes a transparent object?

- All light pass through it

### A diagram showing the effect of a transparent object on light



### Uses of transparent objects

- Clear glass is used to make car windscreens
- Clear glass is used in windows on houses
- Clear glass is used in lenses
- Clear glass is used in lamps

## 2. Translucent objects

- These are objects which allow little (some) light to pass through them

### Why are we unable to see clearly through translucent objects?

- They scatter light rays
- They allow little light to pass through them

### Why does little light pass through translucent objects?

- It is due to diffusion

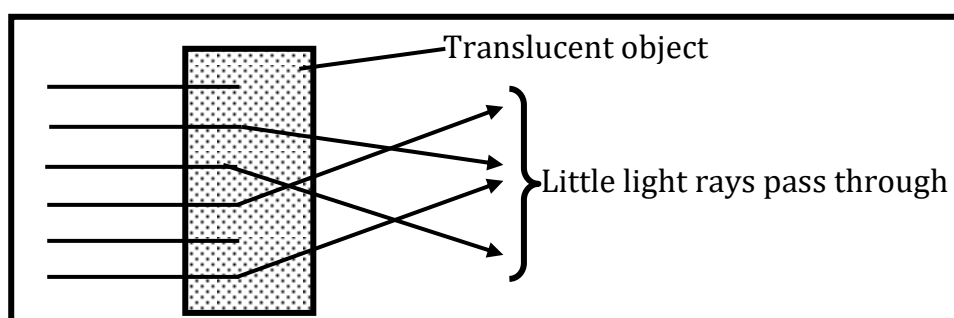
### Why can a person behind a translucent material get a sunburn on a sunny day?

- Some sun rays can pass through it

### Examples of translucent objects.

- Frosted glass
- Tinted glass
- Tracing paper
- Wax paper
- Oiled paper
- Sunglasses
- Stained glass
- Lampshade
- Smoky air
- Cloudy water
- Plastic skylight
- Thin cloth

### A diagram showing the effect of a translucent object on light



### **Uses of translucent materials**

- Frosted glass is used in church windows
- Frosted glass is used in doors and windows of bathrooms
- Tracing paper is used in class
- Tracing paper is used as a screen in pinhole cameras
- Tinted glass is used in cars
- Tinted glass is used to make some light bulbs
- Sunglasses protect our eyes from direct sunlight
- Plastic skylights allow daylight into the house
- Wax paper is used to wrap food for cold storage

### **Why are doors and windows of bathrooms made with frosted glasses?**

- For privacy of the bathroom user
- To protect the bathroom user from being seen by people outside

### **3. Opaque objects**

- These are objects which do not allow any light to pass through them

### **Why are we unable to see through opaque objects?**

- They do not allow light to pass through them

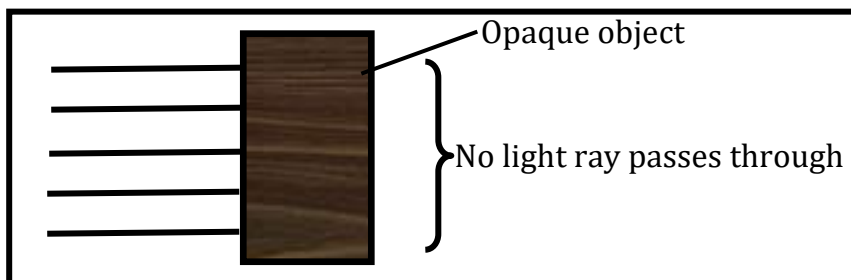
### **What happens when light strikes an opaque object?**

- Light is blocked and a shadow is formed

### **Examples of opaque objects**

- |              |                   |
|--------------|-------------------|
| ▪ Wood       | ▪ Metal           |
| ▪ Blackboard | ▪ Brick wall      |
| ▪ Human body | ▪ Blackout fabric |
| ▪ Stone      |                   |

### **A diagram showing the effect of an opaque object on light**



### **Uses of opaque objects**

- They form shadows which provide shades
- Brick walls promote privacy in buildings
- Blackout fabrics keep out sunlight and heat in party tents

### **Name two groups of objects used to make windowpanes**

- |                       |                       |
|-----------------------|-----------------------|
| ▪ Transparent objects | ▪ Translucent objects |
|-----------------------|-----------------------|

### **SHADOWS**

- This is a dark region formed when light is blocked by an opaque object

### **How is a shadow formed?**

- When light is blocked/obstructed by an opaque object

### **On which principle is a shadow formed?**

- Light travels in a straight line

## CHARACTERISTICS OF A SHADOW

- A shadow resembles the shape of the opaque object
- A shadow is formed in opposite direction of the light source
- A shadow is dark in colour

## FACTORS THAT AFFECT (DETERMINE) THE SIZE OF A SHADOW

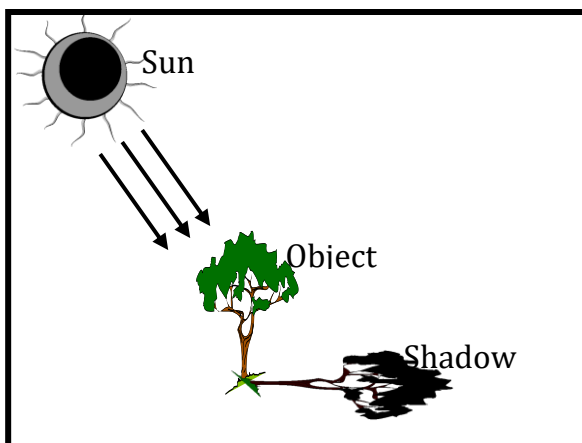
- Distance of the light source from the opaque object
- Size of the opaque object
- Size of the light source
- Position of the light source (angle at which light strikes an opaque object)

### Note

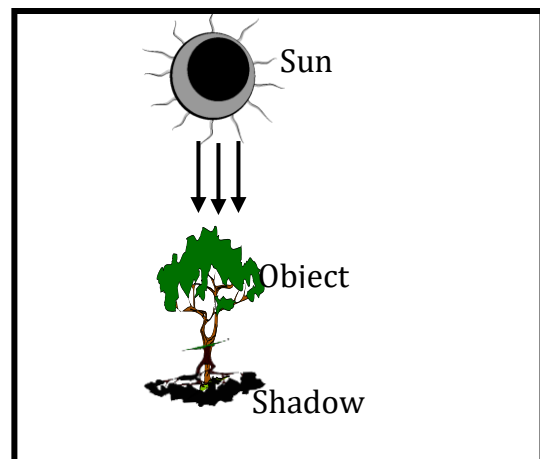
- If the source of light is far from the opaque object, **the shadow is smaller than the object**
- If the source of light is nearer the opaque object, **the shadow is bigger than the object**.

## DIAGRAMS SHOWING THE SIZE OF SHADOWS FORMED BY THE SUN AT DIFFERENT POSITIONS IN THE SKY

### IN THE EVENING



### AT MIDDAY (NOON)



### Why is the shadow shortest at noon (midday)?

- The sun is directly overhead

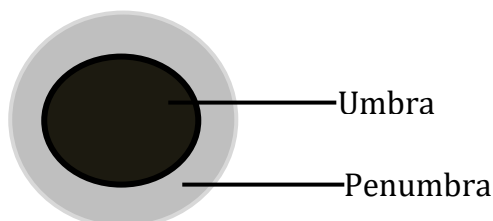
### Why is the shadow longest at sunrise and sunset (in the early morning and early evening/late afternoon)?

- The sun is low on the horizon/the sun is low in the sky

## TYPES/REGIONS/PARTS OF THE SHADOW

- Umbra (total shadow)
- Penumbra (partial shadow)

## A DIAGRAM SHOWING PARTS/REGIONS OF A SHADOW



### UMBRA

- This is the darkest part of the shadow
- This is the region of complete shadow

It is dark **because** it does not receive any light



### How is an umbra formed?

- By total obstruction of light from a small source

### When is an umbra shadow formed?

- When the light source is far away from an opaque object
- When light from a small source is completely blocked by an opaque object
- When light passing through a narrow opening is blocked by an opaque object

### PENUMBRA

- This is the lighter part of the shadow
- This is the region of partial shadow

It is light **because** it receives some light

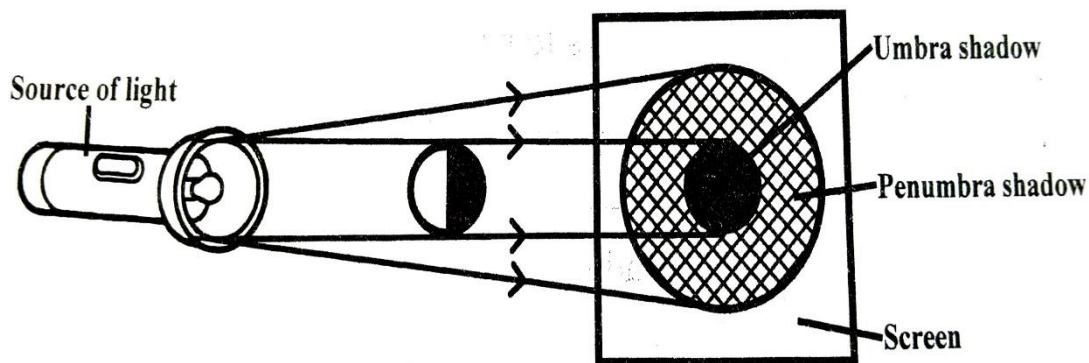
### How is penumbra formed?

- By partial obstruction of light from a big source

### When is penumbra formed?

- When the light source is nearer to the opaque object
- When light from a big source is blocked by an opaque object
- When light passing through a wider opening is blocked by an opaque object

### A simple illustration of formation of a shadow



### USES OF SHADOWS

- They provide shades
- They are used to estimate time
- They are used to tell directions
- They help people to hide

### DANGERS OF SHADOWS

- They are a source of fear at night
- They are hiding places for dangerous people and animals

### ECLIPSE

- This is a shadow formed when sunlight is obstructed by either the moon or earth.

### Note:

- The sun is stationary (does not move)
- The earth revolves around the sun on its fixed curved path called **orbit**.
- The moon moves around the earth but the moon's orbit is not fixed.
- The moon and the earth move
- As the moon and earth move, they sometimes come in straight line with the sun
- When this occurs, either the moon or the earth is blocked from receiving sunlight
- In this case, we say that it is an eclipse

## **TYPES OF ECLIPSES**

- i) Solar eclipse (eclipse of the sun)
- ii) Lunar eclipse (eclipse of the moon)

### **SOLAR ECLIPSE (ECLIPSE OF THE SUN)**

This is the type of eclipse that occurs when the moon comes in between the sun and the earth.

- The moon blocks sunlight and its shadow is cast on the earth

### **Characteristics of solar eclipse**

- The moon is in between the sun and earth
- The shadow is cast on the earth
- It happens during day time
- It is a very rare type of eclipse

### **Why can't the moon's shadow fully cover the earth?**

- The moon is smaller than the earth

### **Where is the shadow cast during solar eclipse?**

- On the earth

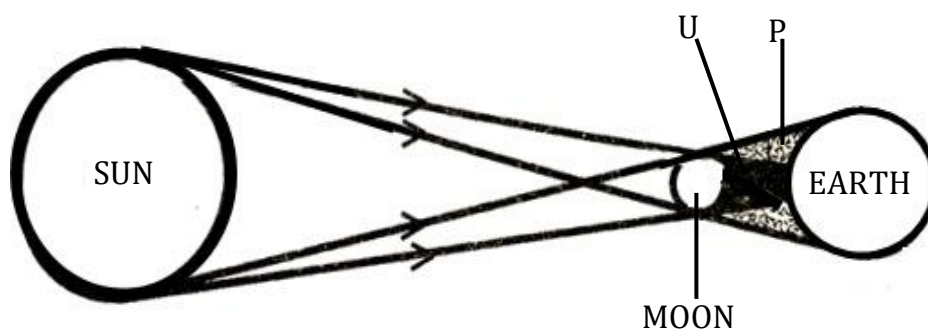
### **How is solar eclipse formed?**

- It is formed when the moon is in between the sun and the earth.

### **Mnemonic for solar eclipse**

- Some Men Eat Snakes (SME-----Solar eclipse)

### **A DIAGRAM SHOWING SOLAR ECLIPSE**



P – Penumbra (partial eclipse)

U – Umbra (total eclipse)

### **Types of solar eclipses**

- Total solar eclipse
- Partial solar eclipse
- Annular solar eclipse

### **Total solar eclipse**

This occurs when the sun, moon and earth are in a direct line and the moon completely blocks sunlight

- The sky becomes very dark as if it were night

### **Partial solar eclipse**

This occurs when the sun, moon and earth are not exactly lined up

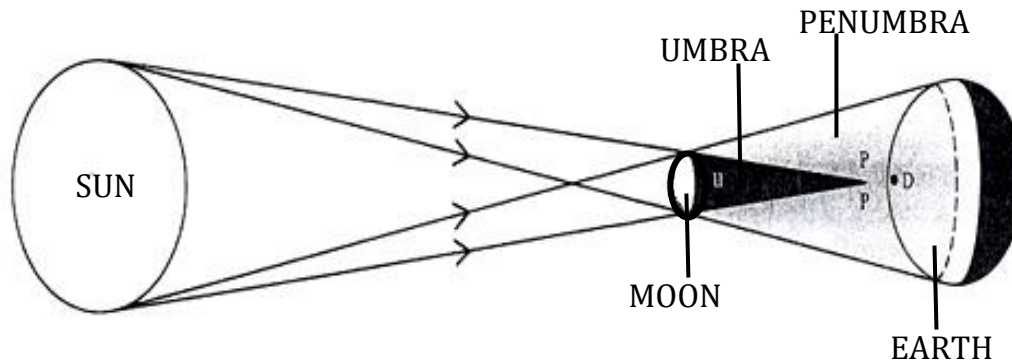
- A dark shadow appears on only a small part of the earth's surface

### **Annular solar eclipse**

This occurs when the moon is in straight line between the sun and earth but the moon's shadow fails to reach the earth.

- The moon's shadow fails to reach the earth **because** the moon is very far from the earth
- The umbra fails to reach the earth and the earth only receives penumbra
- A ring of fire is seen around the dark moon (The dark moon is encircled by a ring of light)

### **A diagram showing annular solar eclipse**



### **What will a person at position P see?**

- A ring of fire around the dark moon

### **Why can't the moon's shadow reach the earth during annular solar eclipse?**

- The moon is farther away from the earth

### **LUNAR ECLIPSE (ECLIPSE OF THE MOON)**

This is the type of eclipse that occurs when the earth comes in between the sun and the moon.

- The earth blocks sunlight and its shadow is cast on the moon

### **Characteristics of lunar eclipse**

- The earth is in between the sun and moon
- The shadow is cast on the moon
- It happens only on the night of a full moon.
- The moon is in total eclipse so it doesn't reflect any light.

### **Why is the whole moon under total eclipse/total shadow/umbra during lunar eclipse?**

- The earth is bigger than the moon

### **Why can't the moon reflect any light during lunar eclipse?**

- The moon is in total eclipse

### **Why is the earth's shadow able to cover the moon fully during lunar eclipse?**

- The earth is bigger than the moon

### **Where is the shadow cast during lunar eclipse?**

- On the moon

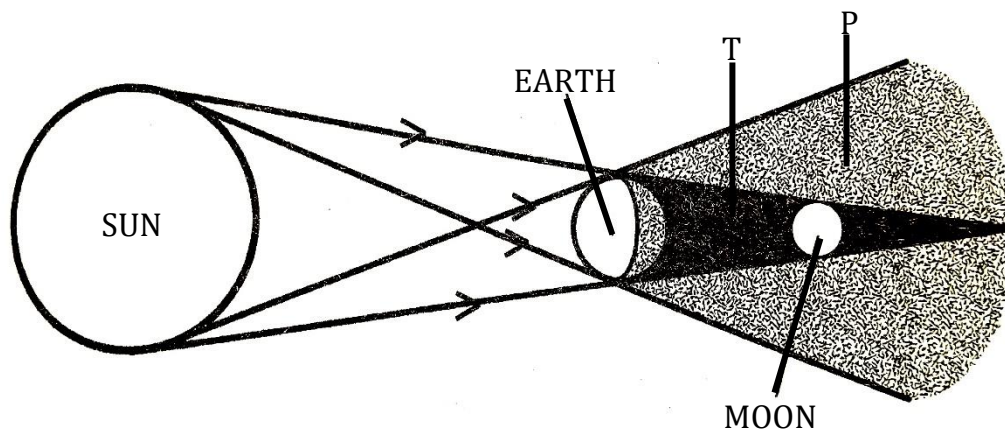
### **How is solar eclipse formed?**

- It is formed when the moon is in between the sun and the earth.

### **Mnemonic for lunar eclipse**

- Simon Entered My Latrine (SEM-----Lunar eclipse)

### A diagram showing lunar eclipse



- P – Penumbra (partial eclipse)
- T – Umbra (total eclipse)

### DIFFERENCES BETWEEN SOLAR AND LUNAR ECLIPSE

Solar eclipse	Lunar eclipse
The moon is between the sun and the earth	The earth is between the sun and the moon
The shadow is cast on the earth	The shadow is cast on the moon
It occurs during day time	It occurs on the night of full moon

### THE SOLAR SYSTEM

This refers to the sun and all the objects that move around it

- The sun is at the centre of the solar system
- The sun is orbited by; planets, moons, asteroids, comets and meteoroids

### CELESTIAL (ASTRONOMICAL) BODIES

- These are natural objects in the sky

### Celestial (astronomical) bodies in the solar system

- Sun
- Planets
- Moons
- Comets
- Asteroids
- Meteoroids

Asteroids and meteoroids are space rocks

Comet is a big snowball with a rock in the middle

### Why the sun is called a star?

- The sun produces heat and light

### What is the colour of stars?

- Stars are either yellow, red or blue

### PLANETS

- These are celestial bodies moving round the sun

### THE EIGHT PLANETS IN SOLAR SYSTEM

ORDER FROM THE SUN (NEAREST TO FARTHEST)	ORDER OF SIZE (LARGEST TO SMALLEST)
1. Mercury	1. Jupiter
2. Venus	2. Saturn
3. Earth	3. Uranus
4. Mars	4. Neptune
5. Jupiter	5. Earth
6. Saturn	6. Venus
7. Uranus	7. Mars
8. Neptune	8. Mercury

**Mnemonic for order of planets from the sun**  
**My Very Excellent Mother Just Served Us NIDO**

- Venus is **brightest planet** known as the **morning star (evening star)**
- **Mercury** is the **closest planet to the sun** but it is not the hottest planet
- Venus is **hottest planet**

**Why is Venus the hottest planet yet it is not the closest to sun?**

- Venus has a lot of greenhouse gases than other planets

**FACTS ABOUT THE UNIVERSE**

- Earth takes 24 hours to rotate on its axis and 365 days to move around the sun
- Earth's only natural satellite is **the moon**
- Earth is the only planet that can support life

**Why are living things able to survive on earth?**

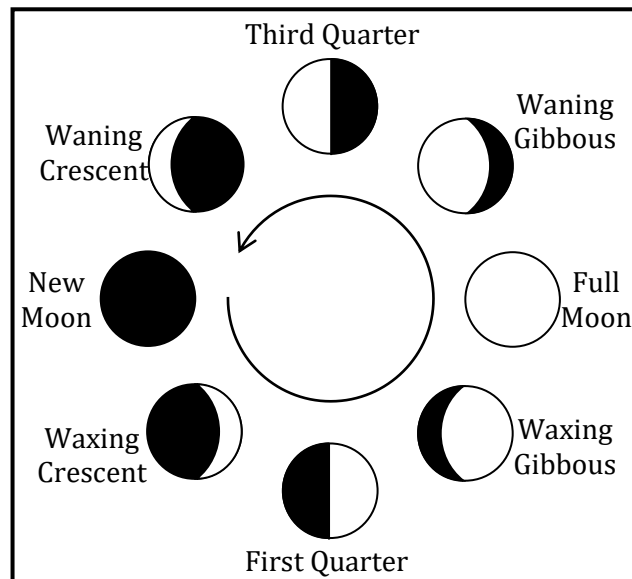
- Earth has enough oxygen in its atmosphere
- Earth has water on its surface
- Earth's temperature is not too hot or too cold

**Why is there no life on other planets except Earth?**

- There is no oxygen to support life

**PHASES OF THE MOON**

- New moon
- Waxing crescent moon
- First quarter moon
- Waxing gibbous moon
- Full moon
- Waning gibbous moon
- Last quarter moon
- Waning crescent moon



**When does a blue moon occur?**

- It occurs once every three years

**WHEN IS THE MOON SAID TO BE:**

**i) Waxing?**

- When it is increasing in size day by day

**ii) Waning?**

- When it is decreasing in size day by day

**What general name is given to the first and last quarter moons?**

- Half moon

**Galaxy**

This is a group of stars in the night sky

- Our galaxy is called **Milky Way galaxy**
- A galaxy is held together by the **force of gravity**

### Why do objects weigh less on moon than on earth?

- The moon's gravity is less than the earth's gravity

### NOTE

- **Astrology** is the study of movements and relative positions of celestial bodies to judge their influence on human actions
- **Astronomy** is the study of all celestial bodies outside the earth's atmosphere
- **Astronomer** is a scientist who studies about celestial bodies
- **Astronaut** is a person who is trained to travel in a spacecraft

### REFLECTION OF LIGHT

This is the bouncing (sending back) of light rays as they strike a shiny surface

- It occurs due to presence of a shiny object in the path of light

### Types of light reflection

- Regular (specular) reflection
- Irregular (diffuse) reflection

### REGULAR (SPECULAR) REFLECTION

This is the type of reflection where light rays are bounced (sent back) in a definite direction

- It occurs on **smooth shiny surfaces** (such as plane mirror and silvered metal)

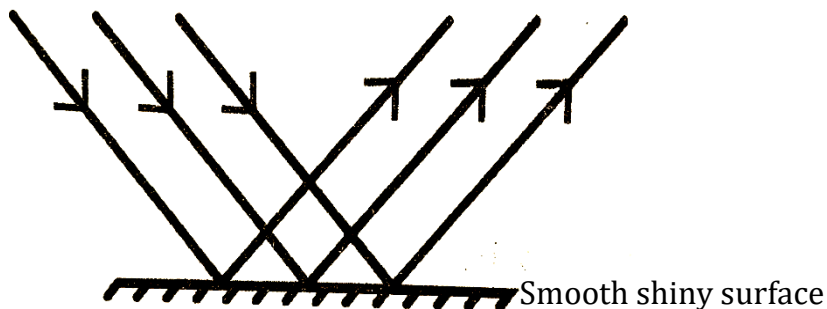
### Why do we see clear images in plane mirrors and silvered metals?

- They produce regular reflection

### Why do plane mirrors and silvered metals produce regular reflection?

- They are smooth shiny surfaces

### An illustration showing regular (specular) reflection



### IRREGULAR (DIFFUSE) REFLECTION

This is the type of reflection where the light rays are bounced (sent back) in different directions.

- It occurs on **rough shiny surfaces** (such as iron sheets and painted walls)

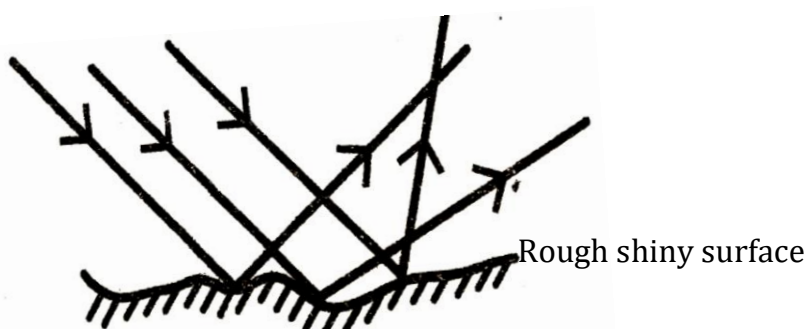
### Why are we unable to see clear images on painted walls and iron sheets?

- They produce irregular reflection.

### Why do iron sheets and painted walls produce irregular reflection?

- They are rough shiny surfaces

### An illustration showing irregular (diffuse) reflection



### Why are the rays reflected as shown above?

- The surface is rough and shiny

### Differences between regular and irregular reflection

Regular reflection	Irregular reflection
<ul style="list-style-type: none"><li>▪ It occurs on smooth shiny surfaces</li></ul>	<ul style="list-style-type: none"><li>▪ It occurs on rough shiny surfaces</li></ul>
<ul style="list-style-type: none"><li>▪ Light rays are sent back in a definite direction</li></ul>	<ul style="list-style-type: none"><li>▪ Light rays are sent back in different directions</li></ul>

### NOTE:

- Smooth shiny surfaces are also called **highly polished surfaces**
- Rough shiny surfaces are also called **unpolished surfaces**

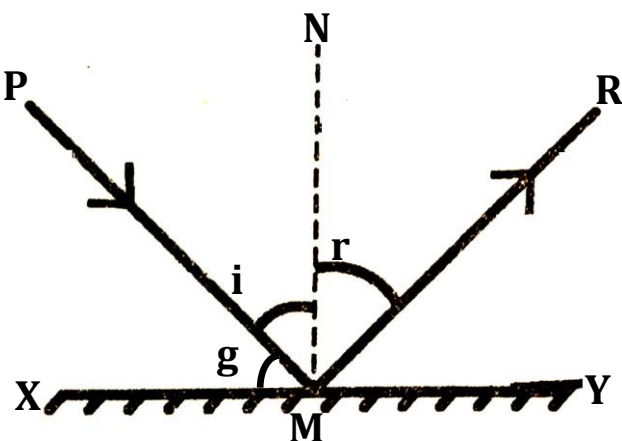
### Why do we polish our shoes?

- To reflect heat

### LAWS OF REFLECTION:

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

### A diagram showing regular reflection



XMY -Plane mirror  
M -Point of incidence  
PM-Incident ray  
RM-Reflected ray  
NM-Normal  
i-Angle of incidence  
r-Angle of reflection  
g -Glancing angle

### GIVE THE MEANING OF THE FOLLOWING TERMS?

#### Point of incidence

- This is the point at which the incident ray strikes the shiny surface.

#### Incident ray

- This is the ray of light that hits the shiny surface.

#### Reflected ray

- This is the ray of light sent back by the shiny surface.

#### Normal

- This is an imaginary line drawn perpendicular to the shiny surface at the point of incidence.

### Why is the normal always dotted?

- It is imaginary

#### Angle of incidence

- This is an angle between the incident ray and the normal

#### Angle of reflection

- This is an angle between the reflected ray and the normal

### Glancing angle

- This is the angle between the shiny surface and the incident ray

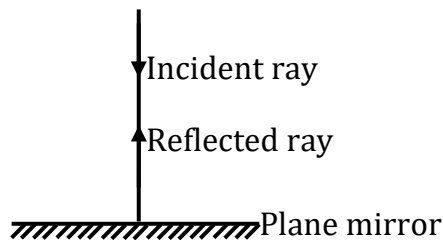
### NOTE

- The ray of light that strikes the mirror at a right angle is reflected in the same direction (path)
- If the incident ray and the reflected ray are perpendicular to the surface, the angle of incidence and the angle of reflection are equal to  $0^\circ$  while the glancing angle is  $90^\circ$

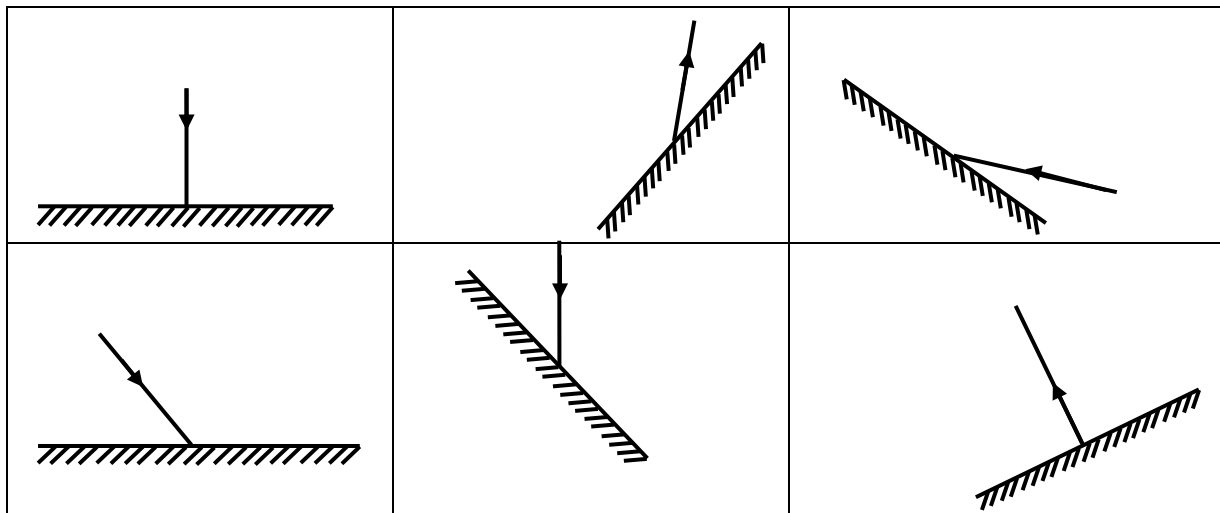
### TOTAL INTERNAL REFLECTION

- This is when the incident ray strikes the mirror perpendicularly and the reflected ray takes the same route (path)

### An illustration showing total internal reflection



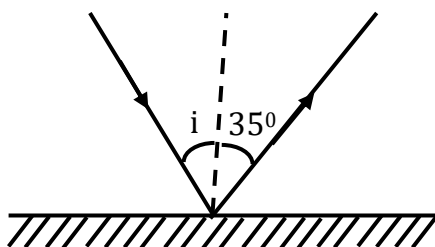
### COMPLETE THE FOLLOWING DIAGRAMS



### CALCULATIONS RELATED TO LIGHT REFLECTION

#### Example 1

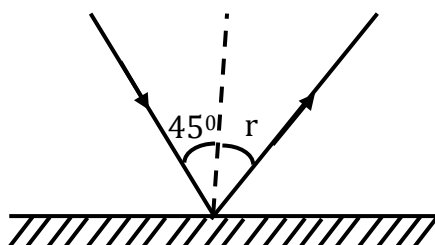
Find the value of the angle of incidence in the figure below.



$$\begin{aligned} i + 35^\circ &= 90^\circ \\ i + 35^\circ - 35^\circ &= 90^\circ - 35^\circ \\ i &= 55^\circ \end{aligned}$$

#### Example 2

Find the value of the angle of reflection



$$\begin{aligned} \text{Since; } i &= r \\ r &= 45^\circ. \end{aligned}$$



### **Example 3**

The incident ray makes an angle of  $60^\circ$  to the mirror. What is the angle of reflection?

The normal makes  $90^\circ$  to the mirror

$$60^\circ + i = 90^\circ$$

$$60 - 60 + i = 90^\circ - 60^\circ$$

$$i = 30^\circ$$

Since;  $i = r$

$$r = 30^\circ$$

### **Example 4**

If the angle between the incident ray and the mirror is  $32^\circ$ , what is the size of the reflected ray?

Let the angle of incidence be  $i$

$$i + 32^\circ = 90^\circ$$

$$i + 32^\circ - 32^\circ = 90^\circ - 32^\circ$$

$$i = 58^\circ$$

Since;  $i = r$

$$r = 58^\circ.$$

### **IMPORTANCE OF LIGHT REFLECTION**

- It enables us to see objects
- It enables formation of images in mirrors
- It enables us to identify colours of objects
- It enables us to see around corners using periscopes

### **How does reflection help drivers to control accidents?**

- It enables them to see images of vehicles and people behind through driving mirrors

### **REFLECTORS OF LIGHT**

- These are materials which reflect light

### **Examples of good reflectors of light**

- Shiny (polished) objects
- White objects/brightly coloured objects

### **ABSORBERS OF LIGHT**

- These are materials which absorb light

### **Examples of absorbers of light**

- Unpolished objects
- Black/dull coloured objects

### **Why do people in hot places (desert areas) wear white clothes?**

- White reflects heat (sun's heat)

### **Why do people in cold weather wear dark clothes?**

- Dark clothes absorb heat and keep the body warm

### **Why is a white cloth seen easily at a distance than a black cloth?**

- White reflects light while black absorbs light

### **Why do objects appear their colour?**

- They absorb all other colours and reflects their own colour

### **Why does a black object appear black?**

- It absorbs all colours and reflects none

### **Why does a white object appear white?**

- It reflects all other colours and absorbs none

### **Why does a green dress appear green?**

- It absorbs all other colours and reflects green

### **Why does a red shirt appear red?**

- It absorbs all other colours and reflects red

### **Why do most people in hot weather prefer wearing white clothes to black or dark clothes?**

- White clothes reflect sun's heat while black clothes

### **Why are most car boards painted white?**

- To reflect sun's heat

### **IMAGES**

- An image is the reflection of a real object
- An image is a copy of an object formed by reflection or refraction of light

### **How is an image formed?**

- When light rays meet or appear to meet after reflection

### **Types of images**

- Real images
- Virtual images

### **Real images**

- These are images which are formed on the screen
- They are formed by light rays that meet at a point after reflection

### **Instruments that form real images**

- Camera
- Convex lens
- Projector
- Telescope
- Human eye

### **Virtual images**

- These are images which cannot be formed on the screen
- They are formed by light rays that appear to meet behind the mirror after reflection

### **Instruments that form virtual images**

- Periscope
- Microscope
- Mirrors
- Concave lens

### **EXAMPLES OF IMAGES**

- Diminished images
- Magnified images
- Erect images
- Inverted images

### **Diminished images**

- These are images which are smaller than the object

### **Instruments that form diminished images**

- Convex mirror
- Concave lens
- Pinhole camera
- Human eye

### **Magnified images**

- These are images which are bigger than the object

### **Instruments that form magnified images**

- Concave mirrors
- Convex lens
- Magnifying glasses
- Microscope
- Projector

## **Erect images**

- These are images which are upright

## **Instruments that form erect images**

- Plane mirror
- Convex mirror
- Concave mirror
- Concave lens

## **Inverted images**

- These are images which are upside down

## **Instruments that form inverted images**

- Pinhole camera
- Lens camera
- Projector
- Human eye

## **MIRRORS**

- A mirror is a smooth glass material with a silvered surface that reflects light

## **Groups (types) of mirrors**

- Plane mirrors
- Curved (spherical) mirrors

## **PLANE MIRRORS**

- These are mirrors with flat reflecting surfaces e.g. dressing mirrors

## **On which principle do plane mirrors form images?**

- On the principle of light reflection

## **Characteristics of an image formed by plane mirrors**

- The image distance is equal to the object distance from the mirror
- They are laterally inverted (image is turned sideways)
- They are equal to the object in size
- They are upright (erect)
- They are virtual

## **Mnemonic is VEELD**

V --- Virtual

E --- Erect

E --- Equal to the object in size

L --- Laterally inverted

D --- Distance of image and object from the plane mirror is equal

## **Lateral inversion**

- This is the sideways reversal of images

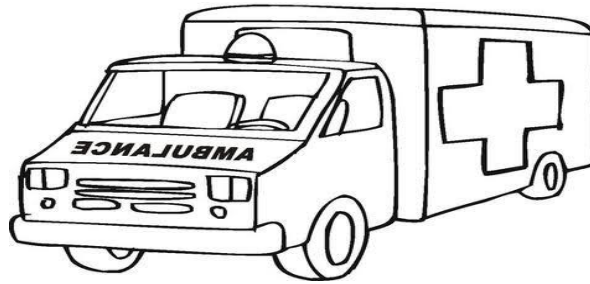
## **An illustration showing lateral inversion**



## **Why are images formed by plane mirrors laterally inverted?**

- Due to reflection of light by the plane mirror

**The word AMBULANCE is indicated in mirror writing on the vehicle as shown below**



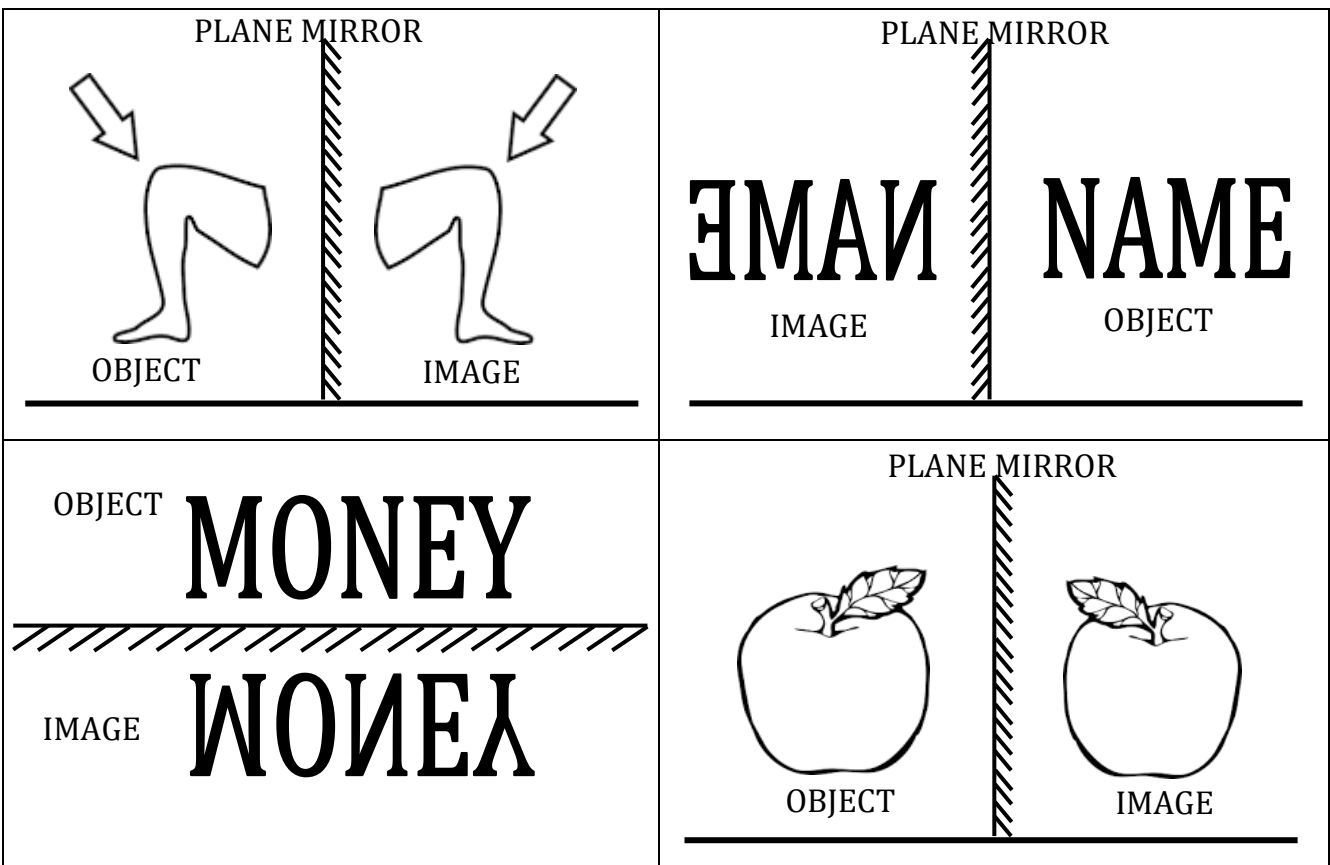
**Why is the word AMBULANCE put in mirror writing?**

- For correct reading by other drivers in their side mirrors (rear-view mirrors)

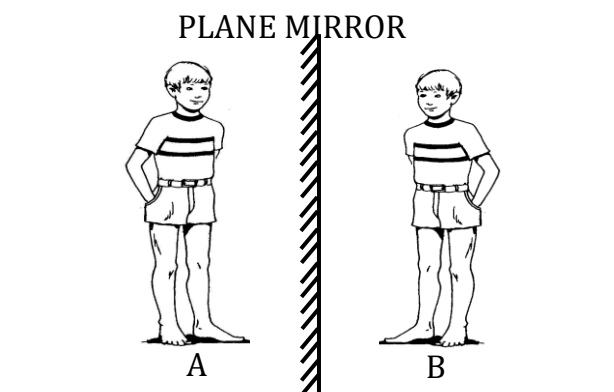
**Why is it easier for drivers in front to read the word AMBULANCE in mirror writing on the vehicle?**

- It is corrected by the driving mirror during reflection
- It is corrected by lateral inversion during reflection by the driving mirror

**DRAWING IMAGES FORMED BY PLANE MIRRORS**



**The diagram below shows a boy using a plane mirror. Use it to answer the questions below**



**Which letter which shows the object?**

- Letter B

**Give a reason to support your answer in (a) above.**

- It is in front of the mirror

**What enables a very big tree to fit in the view of a human eye?**

- The human eye forms diminished images

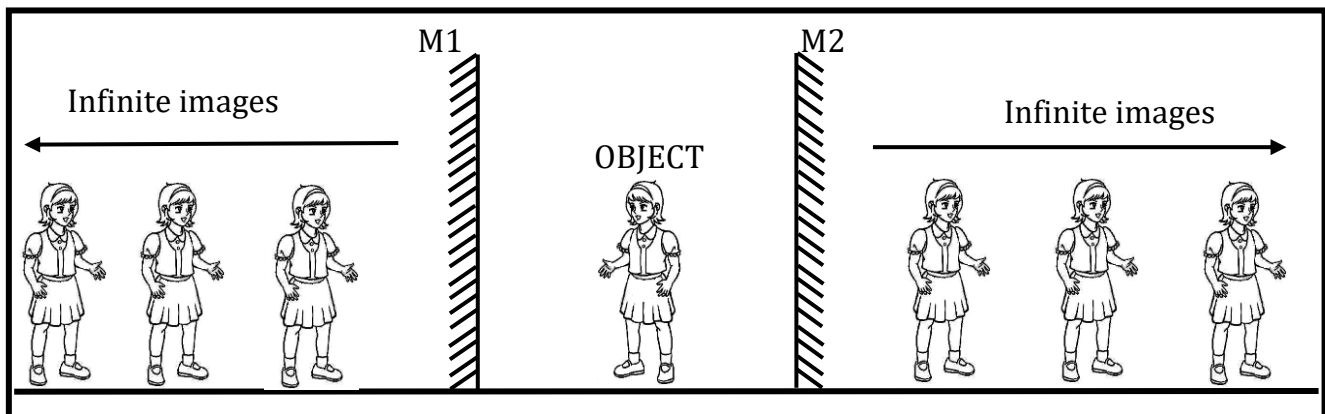
**INFINITE IMAGES**

- These are images which are endless

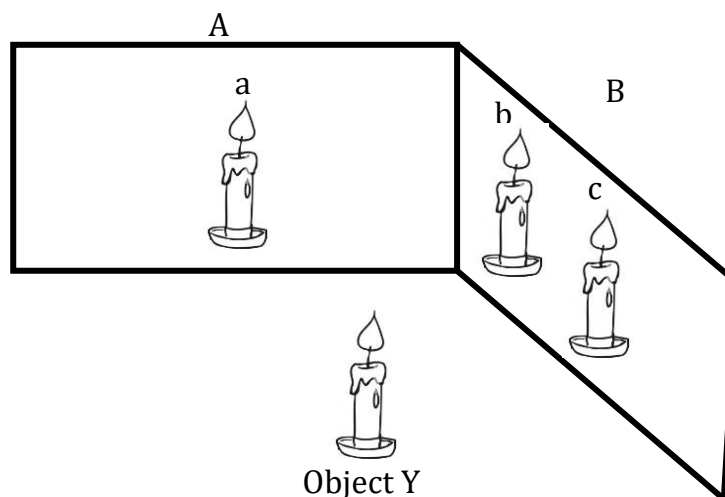
**How are infinite images formed?**

- When an object is placed between two plane mirrors which are parallel to each other

**A diagram showing infinite images**



**An illustration showing two plane mirrors placed perpendicularly (at a right angle)**



**Note**

- They form three images of an object in front of them.

**Why?**

- This is because the image of object Y in mirror A is **a**, in mirror B is **c** and the image of **a** in mirror B is **b**

**How is an image similar to an echo?**

- Both are formed by reflection

**Calculations involving distances of images and objects from plane mirrors**

1. An object was placed 5m away from the plane mirror.

- a) **How far was the image from the plane mirror?**

**Solution**

Since the distances of the image (v) and object (u) from the plane mirror is equal,

$$U = V$$

$$5\text{m} = V$$

The image was 5m away from the plane mirror

**b) How far was the image from the object?**

$$5\text{m} + 5\text{m}$$

$$= 10\text{m}$$

2. After reflection by a plane mirror, the image was formed 15m away from the plane mirror.

**a) How far was the object from the plane mirror?**

- The object was 15m away from the plane mirror

**b) How far was the object from the image?**

- The image distance is equal to the object distance from the mirror.

**c) How far was the object from the image?**

$$15\text{m} + 15\text{m}$$

$$= 30\text{m}$$

**Applications (uses) of plane mirrors**

- They are used as dressing mirrors
- They are used in periscopes in submarines
- They are used in kaleidoscopes
- They are used in a sextant
- They are used in an overhead projector

**Devices that use plane mirrors**

- Periscope
- Kaleidoscope
- Overhead projector

**KALEIDOSCOPE**

- This is an optical device that produces colourful designs and patterns

**What enables a kaleidoscope to produce colourful designs and patterns?**

- Multiple reflections in the plane mirrors

**PERISCOPE**

This is an instrument used to see over an obstacle and around corners

- It consists of a tube with two plane mirrors set parallel to each other in its corner and inclined at an angle of  $45^\circ$  to the path of light rays

**Why are plane mirrors fixed parallel to each other in a periscope?**

- To reflect light

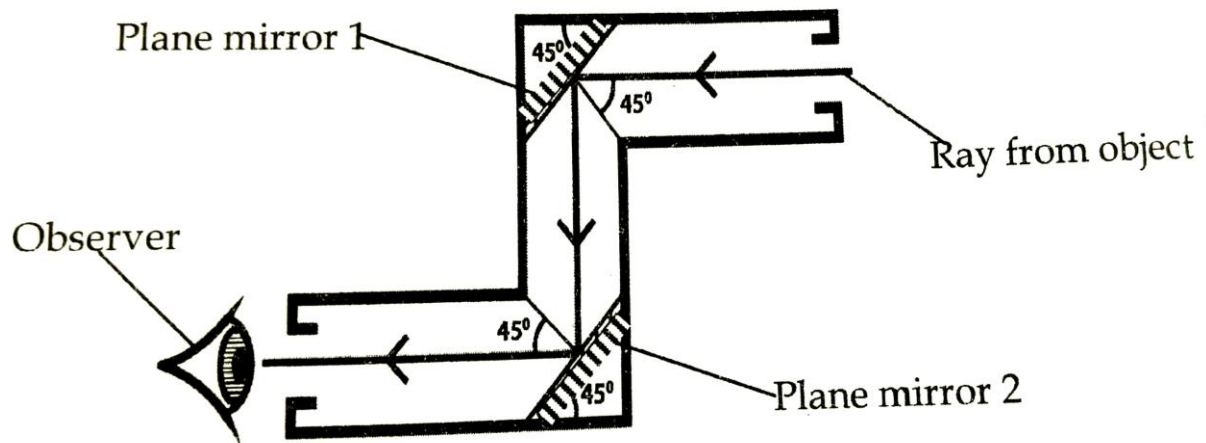
**On which principle does a periscope work?**

- It works on the principle of reflection of light

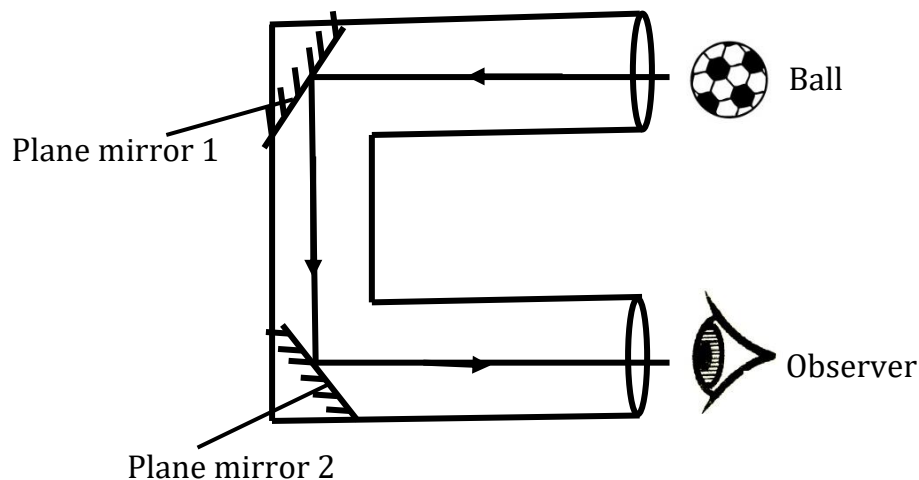
**Why are we able to see around corners using a periscope?**

- It is due to reflection of light

### A DIAGRAM SHOWING A PERISCOPE



Below is an optical instrument. Use it to answer the following questions below.



a) Name the above optical instrument.

- Periscope

b) What role is played by the plane mirrors in the above device?

- They reflect light

c) How is the observer able to see the ball?

- By reflection of light

d) At what angle are the plane mirrors inclined?

- At 45°

### USES OF A PERISCOPE

- It is used to see around corners
- It is used by soldiers in trenches to see the enemies on ground
- It is used to see objects ahead
- It is used by marines to see over the water surface
- It is used by spectators to watch overhead the crowd
- They are used by security guards to watch over tall fences at night

### Groups of people who use periscopes

- |            |                   |
|------------|-------------------|
| ▪ Soldiers | ▪ Security guards |
| ▪ Marines  | ▪ Spectators      |

### CURVED (SPHERICAL) MIRRORS

- These are mirrors with a curved reflecting surface.

### **How are curved mirrors made?**

- By silvering either the inside or outside surface of the sphere

### **Types of curved mirrors**

- Concave (converging) mirrors
- Convex (diverging) mirrors

### **CONVEX (DIVERGING) MIRRORS**

- These are mirrors made by silvering the inside surface of the sphere.

### **Why is a convex mirror also called diverging mirror?**

- Light rays spread/scatter after reflection by a convex mirror

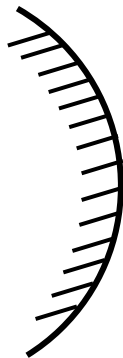
### **What happens to light rays when they strike a convex mirror?**

- They are diverged

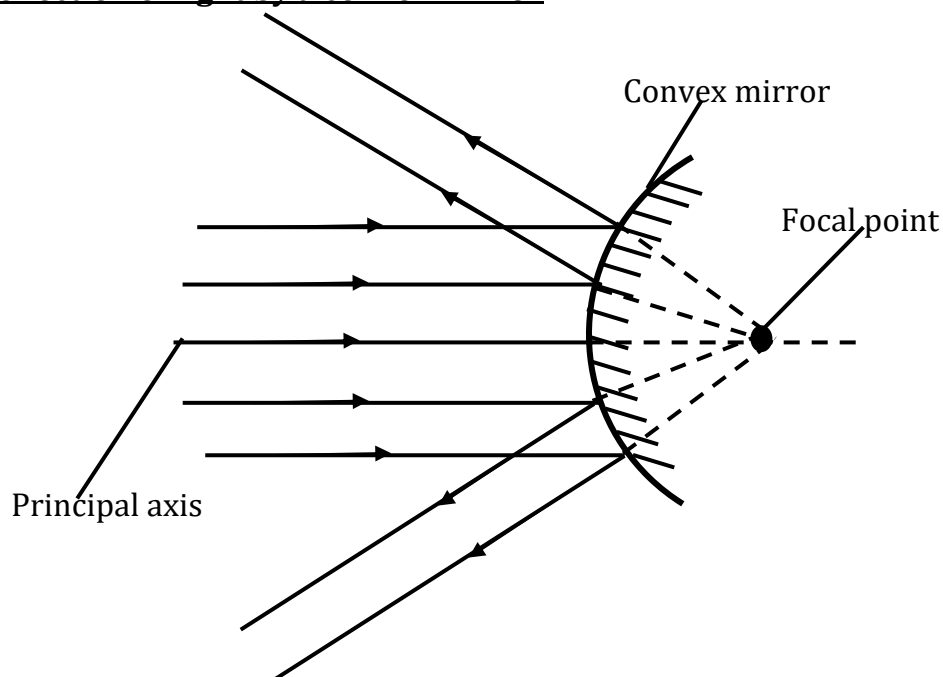
### **How does a convex mirror affect the beam of light?**

- It diverges light rays after reflection

### **A diagram to show convex mirrors**



### **Reflection of light by a convex mirror**



### **Characteristic of images formed by convex mirrors**

- The image is diminished (smaller than the object)
- The image is upright (erect)
- The image is laterally inverted
- The image is virtual (formed behind the mirror)



## **USES OF CONVEX MIRRORS**

- They are used as rear view mirrors (driving mirror/side mirrors) on vehicles.
- ✓ They give a wider field of view
- They are used as security mirrors in shops and buses
- They are used in making lenses of sunglasses
- They are used in magnifying glasses

## **Difference between images formed by convex mirrors and plane mirrors**

- Images formed by convex mirrors are diminished while images formed by plane mirrors are equal to the object in size

## **CONCAVE (CONVERGING) MIRRORS**

- These are mirrors made by silvering the outside surface of the sphere.

## **Why is a concave mirror also called converging mirror?**

- Light rays meet at a point after reflection by a concave mirror

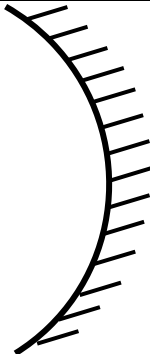
## **What happens to light rays when they strike a concave mirror?**

- They converge after reflection

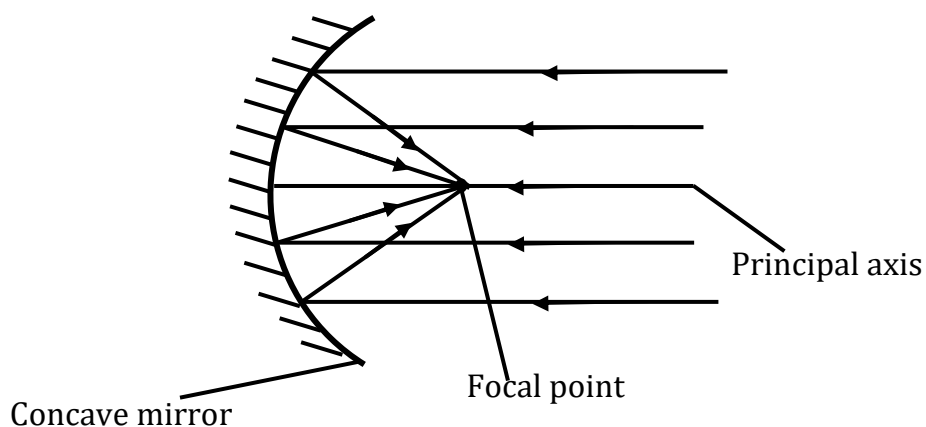
## **How does a concave mirror affect the beam of light?**

- It converges light rays after reflection

## **A diagram to show concave mirrors**



## **Reflection of light by a concave mirror**



## **Characteristics of images formed by concave mirrors**

- The image is magnified (larger than the object)
- They are erect (upright)
- They are laterally inverted.
- They are virtual (cannot be cast on the screen)

### **Differences between images formed by concave mirrors and plane mirrors**

- Images formed by concave mirrors are magnified while images formed by plane mirrors are equal to the object in size

### **Uses of concave mirrors**

- They are used as shaving mirrors e.g by barbers
- ✓ They form enlarged erect image of the face
  - They are used by dentists to examine teeth
- ✓ They form enlarged images of teeth
  - They are used in solar ovens
- ✓ They converge sun rays to produce heat (high temperature)
  - They are used in search-lights and torches
  - They are used in car headlights to reflect light
- ✓ They produce a powerful parallel beam of light
  - They are used at airports to guide landing aeroplanes
  - They are used in electron microscope
  - They are used in satellite dishes
  - They are used in visual bomb detectors
  - They are used in telescopes

### **REFRACTION OF LIGHT**

- This is the bending of light as it moves from one transparent medium to another

### **What causes refraction of light?**

- Change in speed of light as it moves from one transparent medium to another

### **Why does light bend as it moves from one transparent medium to another?**

- Due to change in speed of light

### **THE SPEED OF LIGHT IN DIFFERENT MEDIA**

Medium	Speed of light
Vacuum	300,000 Km/s
Air	299,700 Km/s
Water	225,000 Km/s
Glass	200,000 Km/s
Diamond	12,400 Km/s

Light travels faster in a rarer (less dense) medium

Light travels slower in a denser medium

### **Why does light travel fastest in vacuum?**

- There is no matter

### **Why does light travel faster in air than in glass?**

- Air is less dense than glass

### **Explain the meaning of the following terms as used in refraction of light?**

#### **i) Rarer (less dense) medium**

- This is the medium in which the speed of light is more

#### **ii) Denser medium**

- This is the medium in which the speed of light is less

## **NOTE**

1. When a ray of light is moving from a rarer (less dense) medium to a denser medium (e.g from air to glass), the refracted ray bends towards the normal

### **Why?**

- The speed of light reduces

2. When a ray of light is moving from a denser medium to a rarer (less dense) medium (e.g from glass to air), the refracted ray bends away from the normal

### **Why?**

- The speed of light increases

3. When a ray of light falls normally (perpendicularly) on a medium, it is not refracted (it goes straight)

## **PRINCIPLES OR LAWS OF REFRACTION (SNELL'S LAW)**

- The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane.
- The ratio of sine angle of incidence to sine angle of refraction is constant
- A ray of light travelling along the normal is not refracted

### **When does refraction occur?**

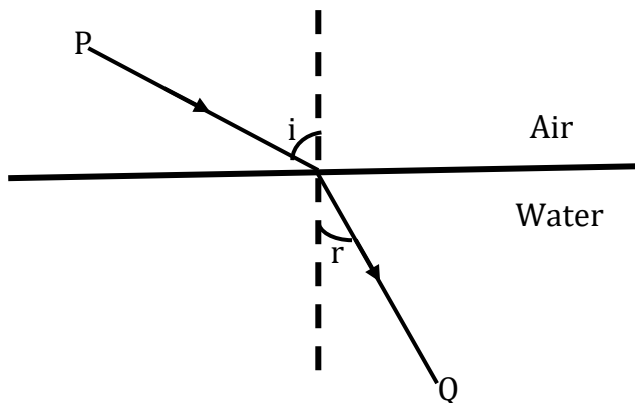
- When the incident ray strikes the boundary of another medium at an angle

### **When does no refraction of light occur?**

- When the incident ray strikes the boundary of other medium normally
- When the refractive indices of two media in contact is equal

## **DIAGRAMS SHOWING REFRACTION OF LIGHT**

### **a) Refraction in water**



### **Naming the rays of light**

P ---- Incident ray

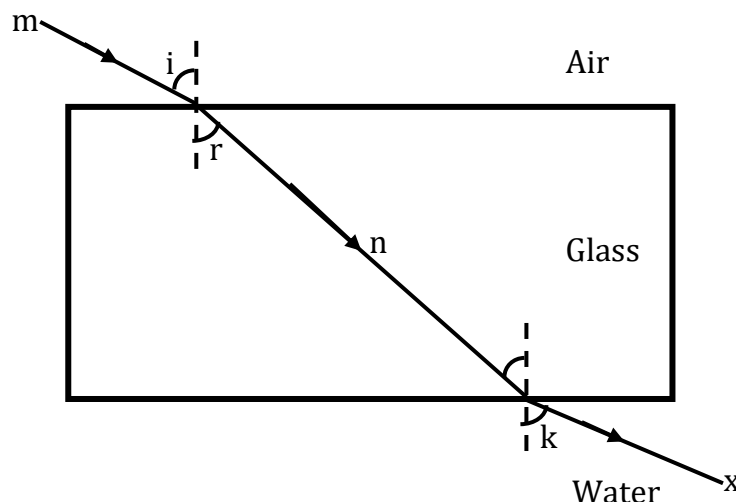
Q ---- Refracted ray

### **Naming the angles**

i ---- Angle of incidence

r ---- Angle of refraction

### **b) Refraction in a rectangular glass block**



### Naming the rays of light

- m ---- Incident ray
- n ---- Refracted ray
- x ---- Emergent refracted ray

### Naming the angles

- i ---- Angle of incidence
- r ---- Angle of refraction
- k ---- Angle of emergence

### Why does a ray of light bend as it moves from air to glass?

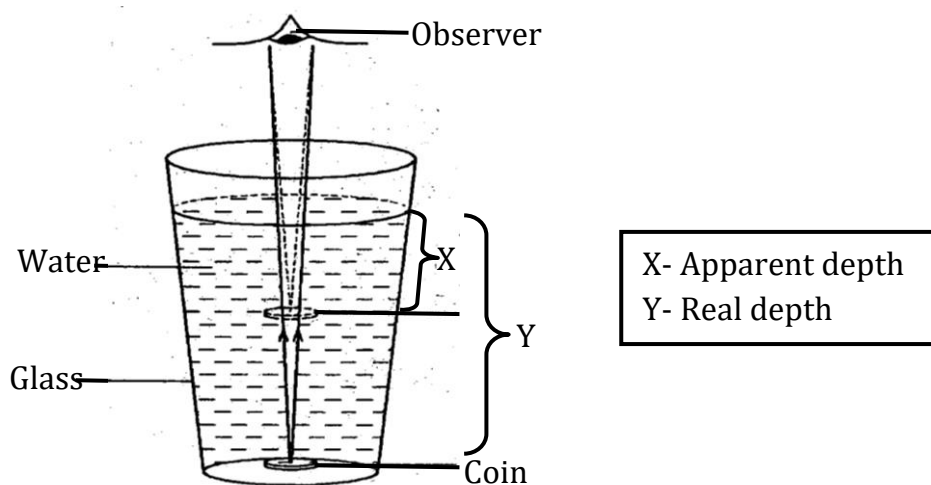
- Due to change in speed of light

### EFFECTS OF REFRACTION

- It makes a swimming pool to appear shallower than its real depth
- It makes a coin or stone at the bottom of water in the container to appear raised
- It makes a ruler or stick partly dipped in water at an angle to appear bent or broken
- It makes a fish appear to be nearer the water surface than its real depth
- It makes a line or words on a paper to appear raised when seen through a glass block
- It causes dispersion of light
- It makes a lemon put in a glass of water to appear bigger when seen from the sides of a glass
- It forms optical illusions e.g mirage and looming
- It makes stars to appear twinkling at night

### DIAGRAMS SHOWING EFFECTS OF REFRACTIONS

#### Illustration 1



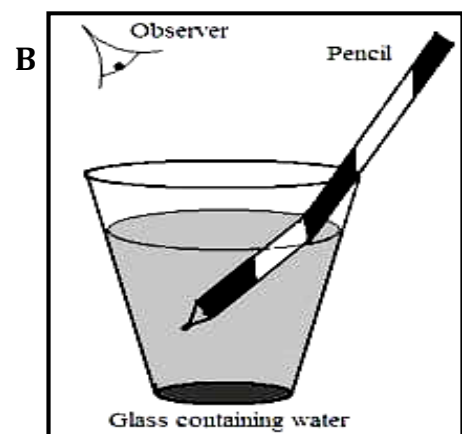
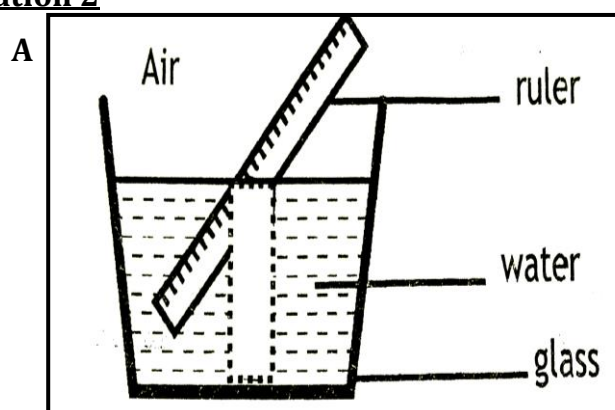
#### Qn. Why does the observer see the coin as if it's in the middle of the bucket?

- Due to refraction

#### Qn. What causes real and apparent depth?

- Refraction

#### Illustration 2



**Qn. Why does a pencil appear bent in diagram B?**

- Due to refraction

**MIRAGE**

- This is an optical illusion of water in a desert and on a hot road caused by refraction of light from the sky by hot air near the ground.

**Effects of mirage**

- It leads to accidents on highways (on tarmac roads)
- It causes false images along high ways in deserts.

**Name any two places where mirages are common during sunny weather?**

- Highways (tarmac roads)
- Deserts

**DANGERS OF REFRACTION OF LIGHT**

- It can lead to near drowning and drowning in swimming pools
- It makes harvesting of fish difficult
- It forms mirages which can lead to road accidents

**DISPERSION OF LIGHT**

- This is the splitting of white light into the seven colours.

**What causes dispersion of light?**

- Refraction of light

**Light spectrum**

- This is a band of seven distinct colours that make up white light
- This is the arrangement of the seven colours that make up white light

**How is a light spectrum formed?**

- It is formed when white light is split by a prism.

**What is a prism?**

- This is a transparent glass that splits white light into seven colours.

**Who discovered that white light is made up of seven colours?**

- Sir Isaac Newton

**THE ORDER OF LIGHT SPECTRUM FROM TOP TO BOTTOM**

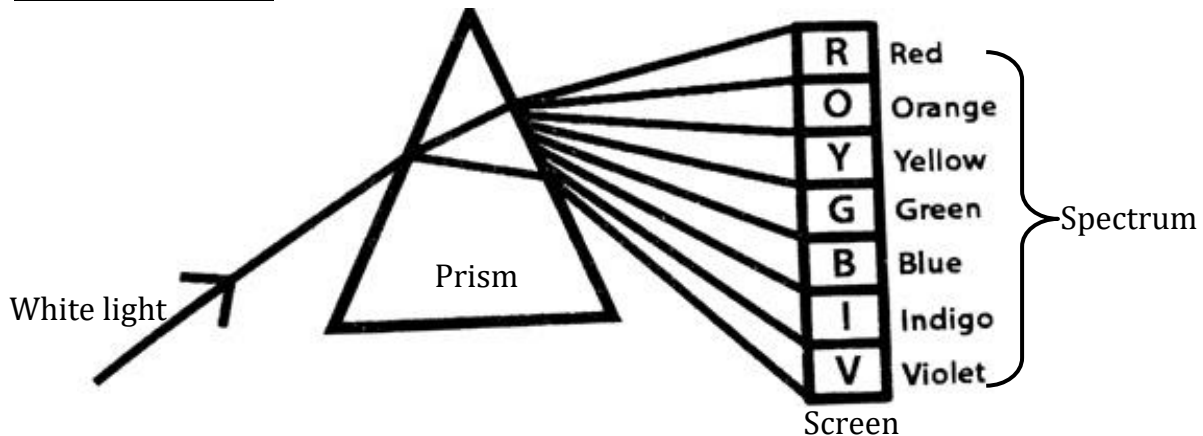
- Red
- Orange
- Yellow
- Green
- Blue
- Indigo
- Violet

**MNEMONICS FOR THE ORDER OF SPECTRUM**

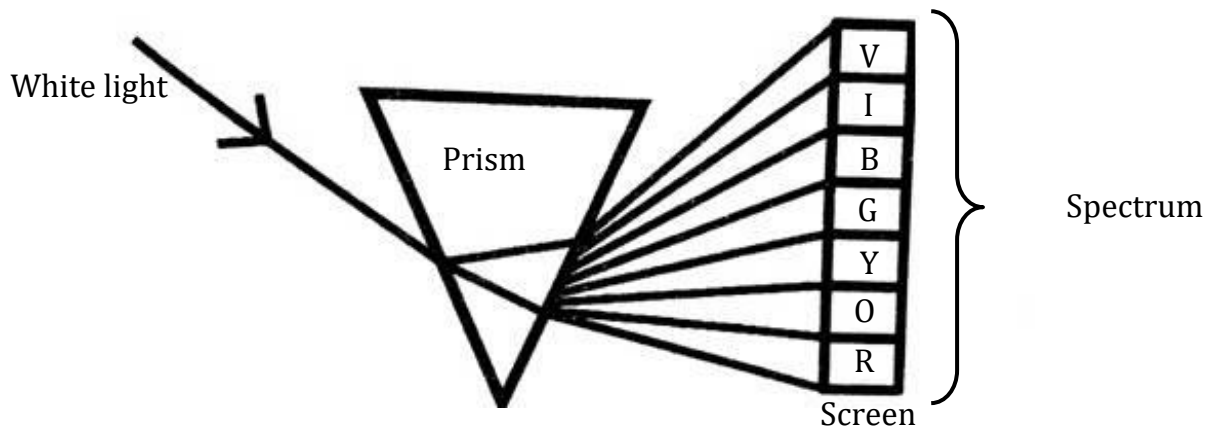
1. Richard Okello Your Girl Betty Is Vomiting
2. Richard Of York Gave Birth In Vain
3. Read Only Your Golden Book In Venus

## DIAGRAMS TO SHOW DISPERSION OF WHITE LIGHT

### 1. ILLUSTRATION 1



### 2. ILLUSTRATION 2

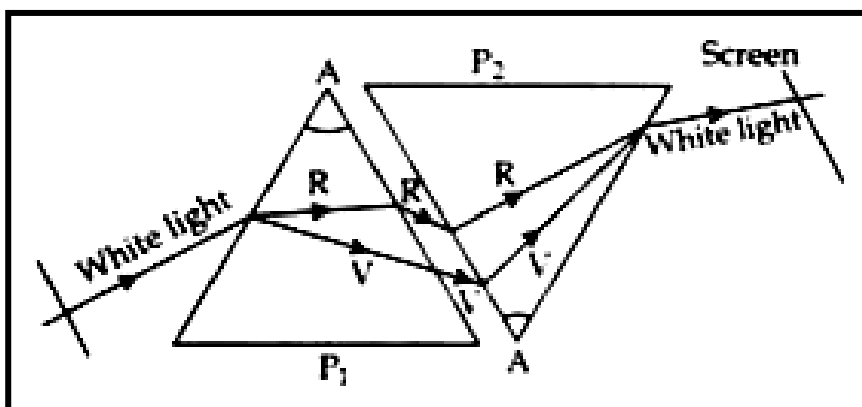


- Light rays in the prism bend at different angles because they move at different speed
- The fastest ray of light bends most and it has the shortest wavelength
- The slowest ray of light bends least and it has the highest wavelength
- **Red** colour bends the least and **violet** bends most.

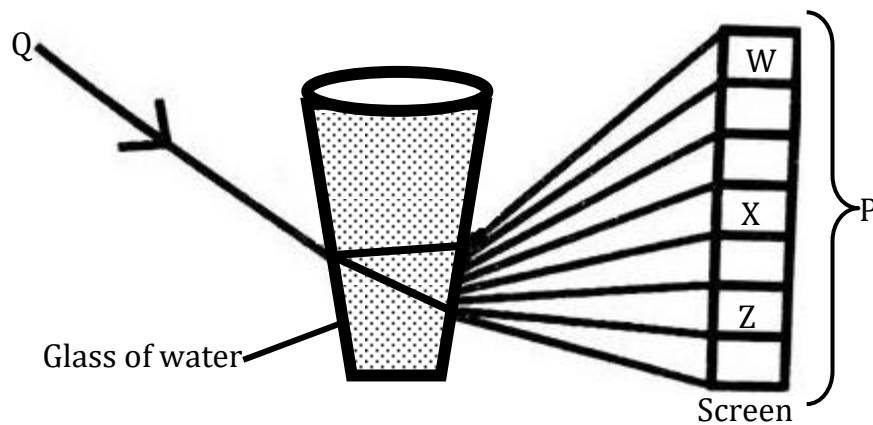
### NOTE

- The seven colours of light spectrum can be recombined to form white light by arranging the second prism to deviate light in the opposite direction

### Illustration



**Study the diagram below and answer the questions about it.**



**What does the diagram above illustrate?**

- Dispersion of light

**Name the parts marked Q and P**

- Q is white light
- P is spectrum/light spectrum

**Name the colours marked W, X and Z**

- W is Violet
- X is Green
- Z is Orange

**What role does a glass of water play in the experiment above?**

- It splits white light into seven colours (it causes dispersion of light)

**Give any one source of white light**

- Sun
- Torch
- Fluorescent light bulb
- White LED

**Why is a laser light not dispersed/spread when passed through a prism?**

- It has perfectly parallel rays with only one colour

**RAINBOW**

- This is a natural light spectrum

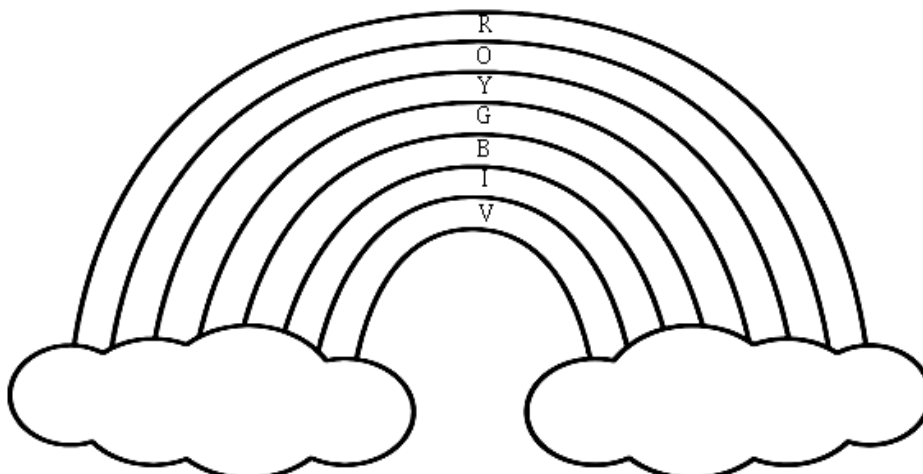
**How is a rainbow formed?**

- When sunlight is split by raindrops

**Why does a rainbow appear in the morning and evening (late afternoon) only?**

- The sun is at an angle to the earth's surface

**A DIAGRAM SHOWING A RAINBOW**



- The outer (top most) colour of rainbow is red and Violet is at the bottom

### Why is the rainbow seen with red on top and violet at bottom?

- Red bends the least and violet bends the most

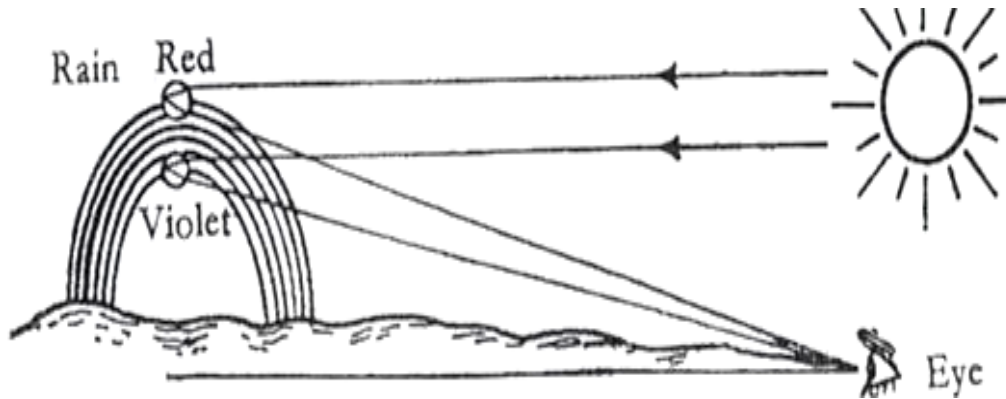
### Why is red bent the least in a rainbow?

- Red travels slowest

### Why is violet bent the most?

- Violet travels fastest

### An illustration showing the formation of a rainbow



### PRIMARY, SECONDARY AND COMPLEMENTARY COLOURS OF LIGHT

#### 1. PRIMARY COLOURS

- These are colours that cannot be got by mixing other colours.

Primary colours exist on their own

#### Examples of primary colours

- Red
- Blue
- Green

#### NOTE

- **Primary colours** absorb other colours and reflect themselves.
- When all primary colours are mixed, we get **white**.
- **White** is a universal colour
- **Red + Blue + Green = White**

### Who is a colour blind person?

- This is a person who cannot see any of the primary colours.

#### 2. SECONDARY COLOURS

- These are colours got by mixing two primary colours

#### Examples of primary colours

- Yellow
- Magenta
- Cyan (peacock blue)

Mixture of primary colours	Secondary colour
Red + Green	Yellow
Blue + Green	Cyan (peacock blue)
Red + Blue	Magenta

#### 3. COMPLEMENTARY COLOURS

- These are any two colours that mix to form white
- This is a pair of colours that mix to form white

One colour must be a primary colour and another is a secondary colour mixing that primary colour.

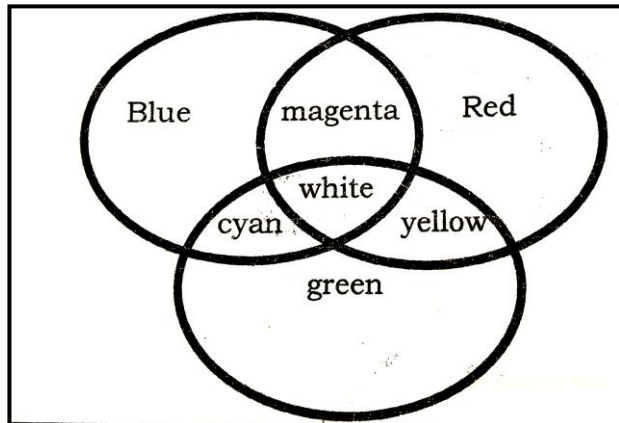


### Examples of complementary colours

- Blue and yellow
- Green and magenta
- Red and cyan

COMPLEMENTARY COLOURS	PRODUCT
Blue and yellow	White
Red and cyan	
Green and magenta	

### An illustration showing colour chart



### What is observed when the colour wheel (Sir Isaac Newton's colour Disc) is rotated at high speed?

- White light is observed

### LENSES

- This is a transparent glass or plastic material with curved sides that refract light.

### What is the use of the curved sides of a lens?

- They refract light passing through the lens.

### Name any two materials from which lenses are made.

- Glass
- Plastic

### Types of lenses

- Convex (converging) lens
- Concave (diverging) lens

### CONVEX LENS (CONVERGING LENS)

- This is a lens which is thicker in the middle but thinner at the edges.

### An illustration of convex lens



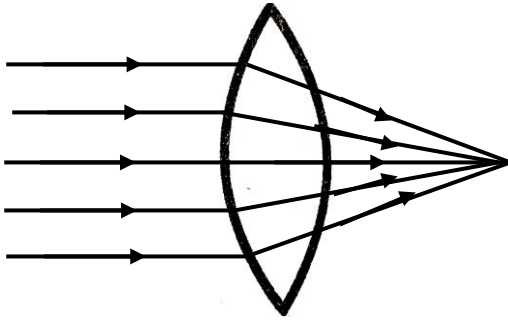
### Why is a convex lens also called a converging lens?

- It refracts parallel light rays to meet at a focal point

**What happens to parallel light rays when they strike a convex lens?**

- They converge at a focal point (they bend and meet at a focal point)

**A diagram to show the effect of light rays on a convex lens.**



**Characteristics of an image formed by a convex lens**

- It is real
- It is inverted
- It is magnified

**Uses of convex lenses**

- They are used in some optical instruments e.g magnifying glasses, light microscopes, eyeglasses, lens cameras and human eye
- They are used to correct long sightedness

**CONCAVE LENS (DIVERGING LENS)**

- This is a lens which is thinner in the middle but thicker at the edges.

**An illustration of a concave lens**



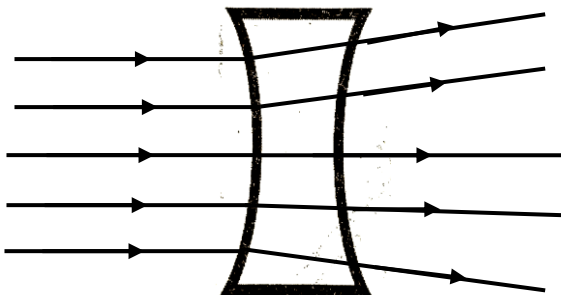
**Why is a concave lens also called a diverging lens?**

- It refracts parallel light rays to spread out in different directions

**What happens to parallel light rays when they strike a concave lens?**

- They diverge ( they bend and spread out in different directions)

**A diagram to show the effect of light rays on a concave lens.**



**Characteristics of an image formed by a concave lens**

- It is virtual
- It is diminished
- It is erect (upright)

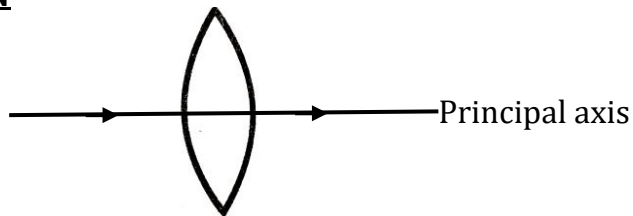
### Uses of concave lenses

- They are used in some optical instruments like telescopes, binoculars, eyeglasses and TV projectors
- They are used to correct short sightedness

### NOTE:

- A ray of light travelling along the normal is not refracted

### ILLUSTRATION



### EXPLAIN THE MEANING OF THE FOLLOWING TERMS

#### Principal axis of the lens

- This is the line passing through the centre of the lens

#### Focal point (principal focus)

- This is the point at which light rays converge

#### Focal length

- This is the distance between the centre of the lens and the focal point

### GENERAL USES OF LENSES

- They are used in optical instruments
- They are used to correct eye defects

### OPTICAL INSTRUMENTS

- These are instruments which use light to work
- These are instruments whose proper working depends on presence of light

### How do optical instruments form images?

- They use mirrors and lenses to reflect and refract light and form images

### Examples of optical instruments that use lenses.

- **Telescopes (refracting telescopes)**

They are used to see magnified image of very distant small objects e.g stars

- **Binoculars**

They are used to see magnified images of distant objects

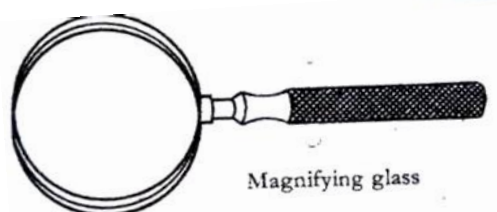
- **Projectors**

They are used to focus magnified images onto a screen

- **Magnifying glasses**

They are used to produce a magnified image for clear vision

### An illustration showing a magnifying glass



- **Light microscopes**

They are used to magnify germs or tiny objects

- **Lens camera**

They are used to take photographs or videos

- **Eyeglasses (spectacles)**

They act as vision aids

- **Human eyes**

They enable us to see

**Examples of optical instruments that use plane mirrors.**

- Periscopes
- Kaleidoscopes

**Examples of optical instruments that use concave mirrors**

- Telescopes (reflecting telescopes)
- Electron microscope

**An example of optical instrument that uses convex mirrors**

- Magnifying glasses

**Optical instruments that form real images**

- |               |             |
|---------------|-------------|
| ▪ Camera      | ▪ Telescope |
| ▪ Convex lens | ▪ Human eye |
| ▪ Projector   |             |

**Optical instruments that form virtual images**

- |              |                |
|--------------|----------------|
| ▪ Periscope  | ▪ Mirrors      |
| ▪ Microscope | ▪ Concave lens |

**Characteristics of images formed by projectors**

- They are real
- They are magnified
- They are inverted

**CAMERAS**

- These are optical devices used to capture still images (pictures)

**Types of cameras**

- Pinhole camera
- Lens camera (photographic camera)

**A PINHOLE CAMERA**

- This is a device that forms images by allowing light through a very small hole.

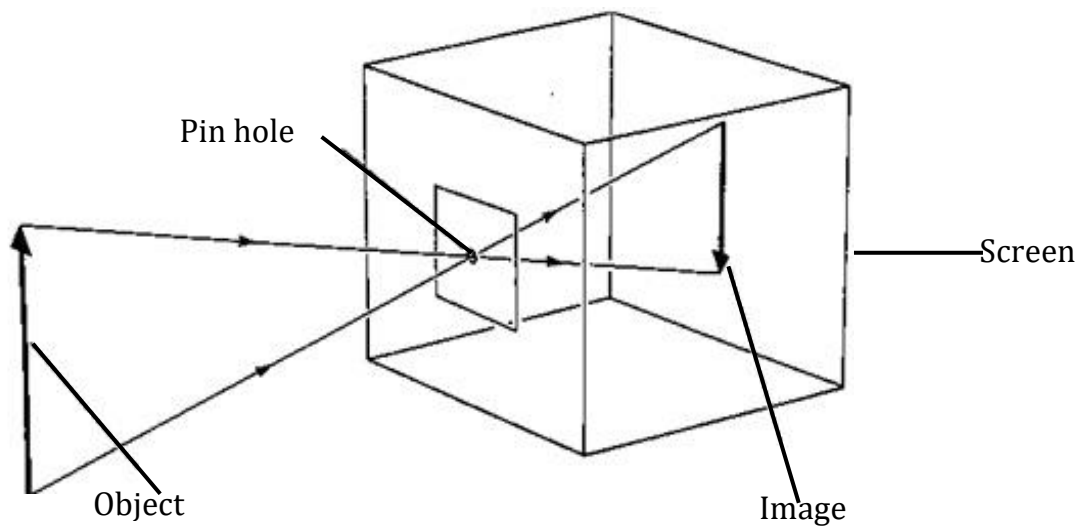
**On which principle does a pinhole camera work?**

- It works on the principle that light travels in a straight line (rectilinear propagation of light)

**Why does a pinhole camera form an inverted image?**

- Light travels in straight line (due to rectilinear propagation of light)

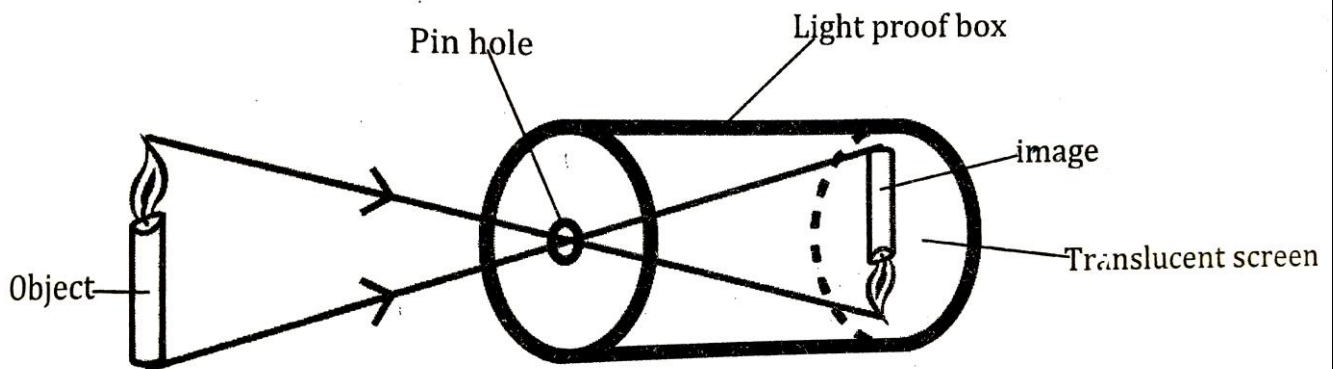
### A diagram showing a pinhole camera



### NOTE

- You can make your own pinhole camera using a cylindrical tin

### Illustration



### Characteristics of the image formed by a pinhole camera

- It is real
- It is inverted
- It is diminished

RID

### Why is an image formed by a pinhole camera real?

- The image is formed (cast) on the screen

### Why is (the light proof box) the inside of a pinhole camera painted black?

- To prevent internal reflection/to prevent unwanted reflections inside

### Why is the image formed by a pinhole camera sharp but not bright?

- The pinhole allows in little light

### State the importance of a screen in a pinhole camera?

- It is where the image is formed

### State the importance of the translucent paper (e.g oiled paper) on a pinhole camera?

- It acts as a screen on which an image is formed

### **Note**

- The **screen** in a pinhole camera acts as the **retina** in the eye or the **film** in the lens camera

### **FACTORS THAT AFFECT THE SIZE OF AN IMAGE FORMED BY PINHOLE CAMERA**

- Length of the pinhole camera (distance from the pinhole to the screen)
- Distance of an object from the pinhole

#### **Length of the pinhole camera**

- Longer pinhole camera forms bigger images while a shorter one forms smaller images

#### **Distance of an object from the pinhole**

- An object nearer to the pinhole camera has a big and clear image while an object far from the camera has a small and blurred image

#### **When does a pinhole camera form a blurred image?**

- When the pinhole is made larger (When the size of pinhole is increased)
- When the object is far from the camera

### **Note**

- A smaller pinhole makes the image sharper (clear)

### **THE LENS CAMERA (PHOTOGRAPHIC CAMERA)**

- This is an optical instrument used to take photographs and videos

#### **Why is a photographic camera called an optical instrument?**

- It uses light to work

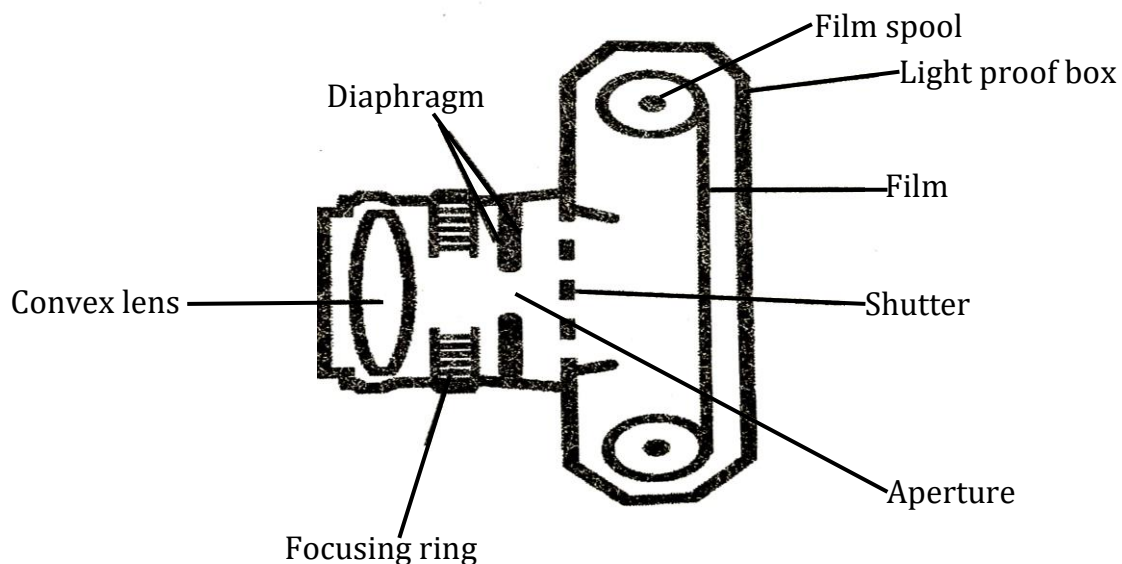
#### **Name the type of lens used in a lens camera?**

- Convex lens

### **Note**

- A photographic camera consists of a light proof box with a glass lens, diaphragm, shutter, film and focusing ring.

### **THE STRUCTURE OF A PHOTOGRAPHIC CAMERA (LENS CAMERA)**



## **FUNCTIONS OF EACH PART**

### **Glass lens (convex lens)**

- It focuses light onto the film
- It refracts light and focuses a real image on the film

### **Film**

- It is where the image is formed.

### **Why are images formed on the film?**

- ✓ It has light sensitive silver halide crystals

### **Diaphragm**

- It regulates (controls) the amount of light entering the aperture

### **How?**

- ✓ By regulating the size of the aperture

### **Aperture**

- It allows light into the camera

### **Shutter**

- It exposes the film to light
- It keeps out light when it is not needed
- It opens or closes the aperture

### **Focusing ring (screw mounting)**

- It adjusts the distance of the lens from the film to produce a sharp image

### **Why?**

- ✓ To produce a sharp image (for accommodation)

### **How does a focusing ring adjust the distance of the lens from the film?**

- By moving the lens forward and backward

### **How is focusing (accommodation) made in a lens camera?**

- By adjusting the distance of the lens from the camera using a focusing ring

### **Which part of a photographic camera determines accommodation?**

- Focusing ring

### **Why is the inside of a light proof box of a photographic camera painted black?**

- To prevent internal reflection/to prevent unwanted reflections inside

### **Characteristics of images formed by a lens camera (photographic camera)**

- They are real.
- They are inverted.
- They are diminished.

RID

### **How does a photographic camera work?**

- The film is exposed to light
- It is removed from camera and treated with chemicals in a darkroom to produce a negative image. This is called **developing**.
- A negative image has the bright parts of the photographed object appear dark and the dark parts appear bright.
- The negative is printed to give a positive image which has the same colour as the object.

## **THE HUMAN EYE**

- The eye is an organ of sight
- It is a receptor organ for light
- It is an optical organ
- It is spherical in shape and enclosed in **the orbit (eye socket)**

**In which part of the skull are the eyes fixed?**

- In the orbit (eye socket)

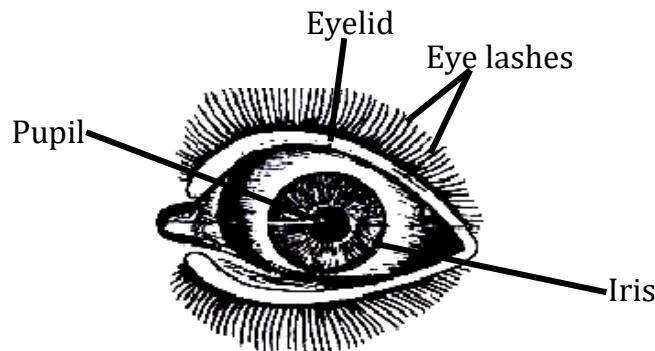
**How are eyes protected from mechanical injury?**

- They are enclosed in the orbits of the skull

**Why is the human eye called an optical organ?**

- ✓ It requires light to work

**FRONT VIEW OF THE EYE**



**Eyelids**

- They protect the eye from foreign bodies e.g dust, small stones and small insects
- They close and keep out light when it is not needed

**Blinking**

- This is the closing and reopening of the eye quickly

It can be voluntary or involuntary (reflex) action.

**Importance of regular blinking to the eye**

- It provides the eye with protection from foreign bodies
- It spreads tears over the surface of the eye

**Tear glands (lacrimal gland).**

They are located on the outer corner of each eye

- They produce tears

**USES OF TEARS**

- They kill some germs (bacteria) on the eye
- They clean the eye (wash away dust from the eye)
- They keep the eye moist (prevent the eye from drying up)
- They lubricate the surface of the eye
- They heal damage on the surface of the eye

**Sclera**

It is the white part of the eye

It acts as a protective outer coat for the eyeball.

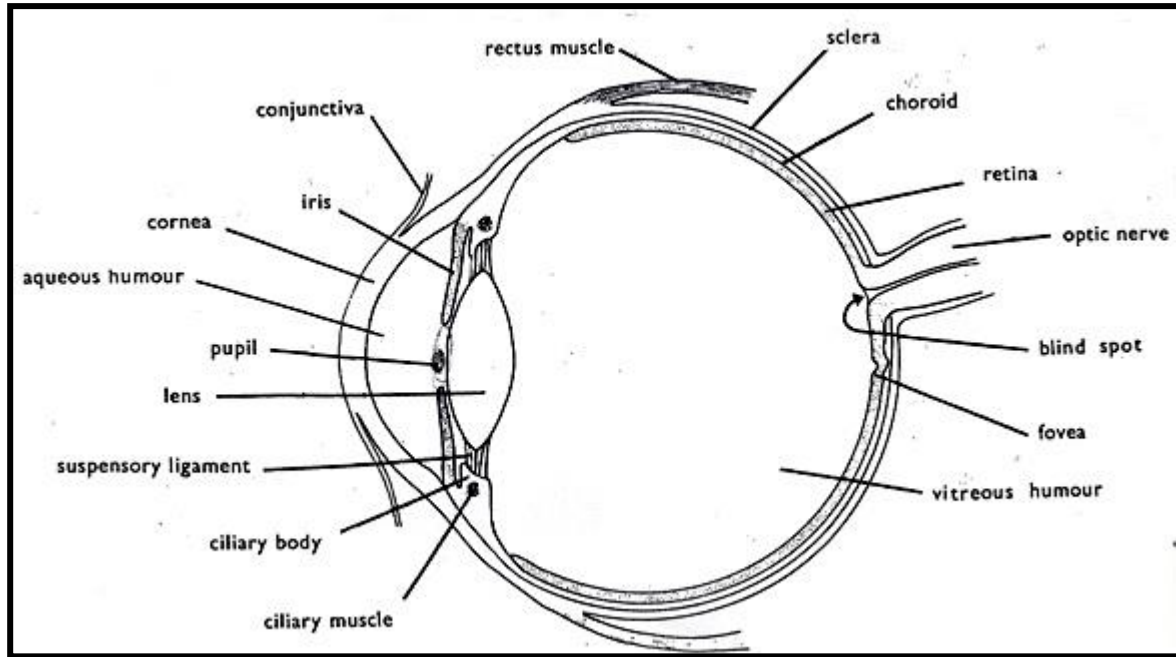
- It protects the inner parts of the eye
- It maintains the shape of the eyeball

**Name the diseases that can make the sclera turn:**

- i) **Yellow** --- yellow fever, liver cirrhosis, malaria, sickle cell anaemia, pancreatitis, hepatitis A, B and C
- ii) **Pink** --- conjunctivitis
- iii) **Red** --- trachoma



## THE STRUCTURE OF THE HUMAN EYE



### FUNCTIONS OF EACH PART OF THE EYE

#### Cornea

It is a transparent part of the eye

- It refracts light
- It protects the iris and pupil

#### Pupil

It is the small hole in the middle of the iris of the eye

It is the darkest part in the centre of the eye

- It allows light into the eye.

#### Iris

It is the coloured part of the eye

The iris has the pigment which determines the colour of the eyes

- It regulates the amount of light entering the eye

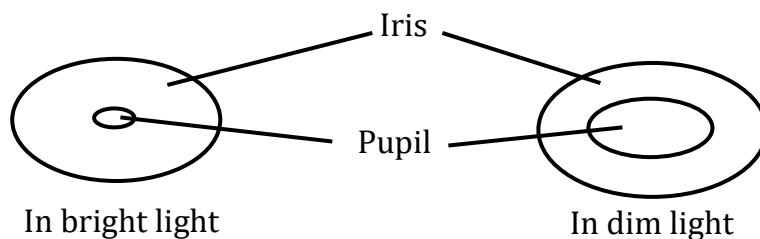
#### How does the iris regulate the amount of light entering the eye?

- By regulating the size of the pupil

#### How does the iris regulate the size of the pupil in different light intensities?

- It widens the pupil in dim light to allow more light enter the eye
- It constricts the pupil in bright light to allow little light enter the eye

#### Diagrams showing the human eye in bright light and dim light



#### Eye lens (crystalline lens)

It is convex in nature

- It focuses light onto the retina.

## **Retina**

- It is where the images are formed.

## **Why are images formed on the retina?**

- It has light sensitive cells (**rod cells** and **cone cells**)

## **Cone cells and rod cells**

- **Cone cells** are nerve cells in retina that are sensitive to bright light.

Cone cells help in day light and colour vision.

- **Rod cells** are nerve cells in retina that are more sensitive to dim light.

Rod cells help in dim light and night vision.

## **Why do human beings see more clearly during day than at night?**

- They have more cone cells than rod cells

## **Why do cats see more clearly at night than during day time?**

- They have more rod cells than cone cells

## **Fovea**

This is a small depression on the retina

- It is where the sharpest image is formed.
- It helps to give a very clear vision.

## **Why is the fovea called the most sensitive part of the retina?**

- It has the highest concentration of cone cells

## **Blind spot (optic disc)**

- It is where the optic nerve connects to the retina
- It is the entry of blood vessels that supply the retina
- It is where the optic nerve leaves the eye.

## **Why is the optic disc also called the blind spot?**

- It has no light sensitive cells

## **Optic nerve**

- It transmits nerve signals from the eye to the brain for interpretation

## **Conjunctiva**

This is a thin mucous membrane which lies inside the eyelid

- It has mucus which keeps the eye moist

## **Choroid**

It is located between the retina and sclera

It is pigmented black and has a dense network of blood capillaries

- It supplies food and oxygen to the eye.
- It prevents internal reflection of light in the eye

## **Suspensory ligament**

- It holds the lens in one position by connecting it with the ciliary muscle

## **Ciliary muscle**

- It controls the shape of the eye lens
- It controls the accommodation of the eye

## **Explain the meaning of the term "Accommodation of the eye."**

- This is the ability of the eye lens to focus near and distant objects

## **How do ciliary muscles control accommodation of the eye?**

- By contracting and relaxing to change the shape of the lens

### **Aqueous humour and vitreous humour**

**Aqueous humour** is a watery liquid between the eye lens and the cornea

**Vitreous humour** is a clear gel (jelly-like liquid) between the eye lens and the retina

- They maintain the shape of the eye
- They refract light

**Besides refracting light and giving the eye its shape, give other two functions of aqueous humour.**

- It maintains eye pressure
- It provides nutrients to the cornea and eye lens

### **Eyelashes**

- They prevent foreign bodies from entering the eye

### **Eyebrows**

- They prevent sweat from falling down into the eye socket

### **Rectus muscle**

- It holds the eyeball in the orbit

### **Characteristics of images formed by the eye**

- The images are real
- The images are inverted
- The images are diminished

RID

### **PARTS OF THE HUMAN EYE AND LENS CAMERA WITH SIMILAR FUNCTIONS**

HUMAN EYE	LENS CAMERA	FUNCTION
Convex lens	Convex lens	Focus light
Iris	Diaphragm	Regulate the amount of light that enters
Pupil	Aperture	Allow in light
Eyelids	Shutter	Keep out light (prevent light from entering)
Ciliary muscle	Focusing ring	Determine accommodation
Retina	Film	They are where images are formed

### **SIMILARITIES BETWEEN THE EYE AND LENS CAMERA**

- Both have light sensitive parts where images are formed
- Both have convex lenses
- Both form real, inverted and diminished images
- Both are black inside to prevent internal reflection of light

### **DIFFERENCES BETWEEN A HUMAN EYE AND LENS CAMERA**

The human eye	The photographic camera
<ul style="list-style-type: none"><li>▪ The distance between the lens and retina is fixed.</li></ul>	<ul style="list-style-type: none"><li>▪ The distance between the lens and film changes.</li></ul>
<ul style="list-style-type: none"><li>▪ The iris adjusts itself.</li></ul>	<ul style="list-style-type: none"><li>▪ The diaphragm is adjusted physically.</li></ul>
<ul style="list-style-type: none"><li>▪ The eye lens is soft and elastic.</li></ul>	<ul style="list-style-type: none"><li>▪ The lens is a hard glass.</li></ul>
<ul style="list-style-type: none"><li>▪ Image is focused by making lens thicker.</li></ul>	<ul style="list-style-type: none"><li>▪ The image is focused by moving lens.</li></ul>
<ul style="list-style-type: none"><li>▪ The lens, aqueous and vitreous humour refracts light.</li></ul>	<ul style="list-style-type: none"><li>▪ Only the lens refracts light</li></ul>
<ul style="list-style-type: none"><li>▪ The thickness of the lens changes.</li></ul>	<ul style="list-style-type: none"><li>▪ Thickness of the lens is constant</li></ul>
<ul style="list-style-type: none"><li>▪ The eye has a wider view</li></ul>	<ul style="list-style-type: none"><li>▪ The camera has a narrow view</li></ul>

## **DIFFERENCES BETWEEN THE HUMAN EYE AND A PINHOLE CAMERA.**

<b>Eye</b>	<b>Pin hole camera</b>
Focusing is done by changing the shape of the lens.	Focusing is done by moving the camera forward or backward
Image is formed on the retina.	Image is formed on the screen
Iris controls light entering the eye	No control of light.
The eye can be covered by eyelids.	The pinhole is always exposed to light

## **SIMILARITIES BETWEEN THE EYE AND PINHOLE CAMERA**

- Both have light sensitive parts where images are formed
- Both form real, inverted and diminished images
- Both are black inside to prevent internal reflection of light

## **NORMAL EYESIGHT**

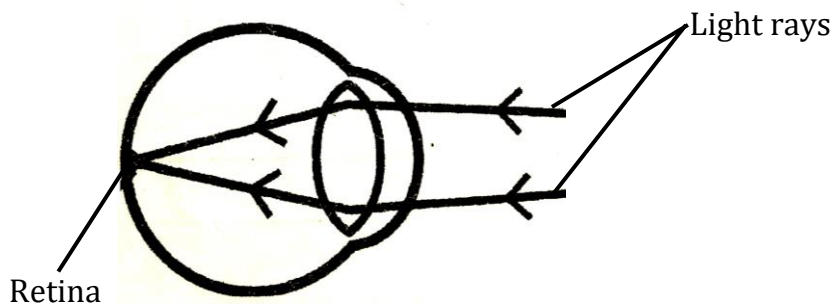
- During normal vision, both near and distant objects can be focused on the retina.

The normal eyesight acuity is 20/20 vision or 6/6 vision mean?

## **What does 20/20 vision or 6/6 vision mean?**

- A person is able to see clearly at 20 feet or 6 metres what should normally be seen at that distance

## **An illustration showing normal vision (normal eyesight)**



## **EYE DEFECTS (REFRACTIVE ERRORS/EYE DISORDERS)**

- An eye defect is the inability of an eye to focus certain distances normally.

## **Causes of eye defects (refractive errors)**

- Eye strain
- Abnormal shape of the eyeball
- Abnormal shape of the eye lens
- Aging (old age)

## **EXAMPLES/TYPES OF EYE DEFECTS (REFRACTIVE ERRORS/EYE DISORDERS)**

- Short sightedness (myopia)
- Long sightedness (hyperopia)
- Old age sight (presbyopia)
- Astigmatism

### **1. Short sightedness (myopia)**

- This is the condition when a person can only see near objects clearly but cannot see distant objects

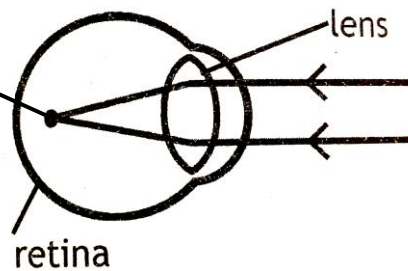
Images from distant objects are focused in front of the retina.

## **Causes of short sightedness**

- Very thick eye lens
- Very long eyeball (elongated eyeball)

### An illustration showing myopia

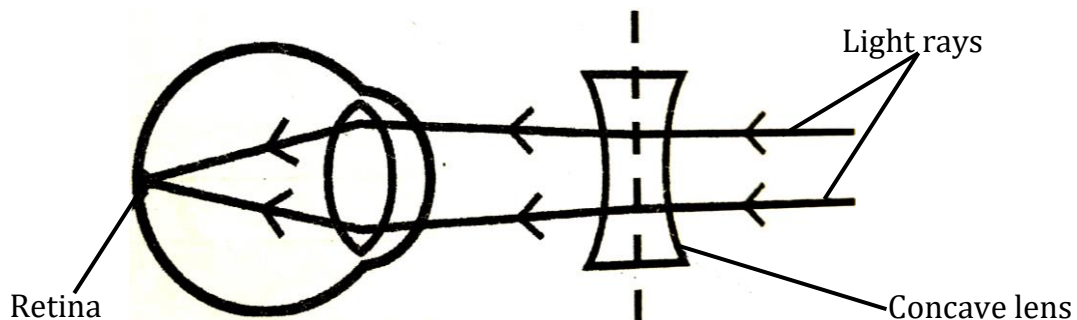
The image is focused in front of (before) the retina



### How is short sightedness corrected?

- By wearing spectacles with concave lenses (diverging lenses)

### A diagram showing correction of short sightedness



### How does a concave lens help to correct short sightedness?

- It slightly diverges light rays

### 2. Long sightedness (hyperopia):

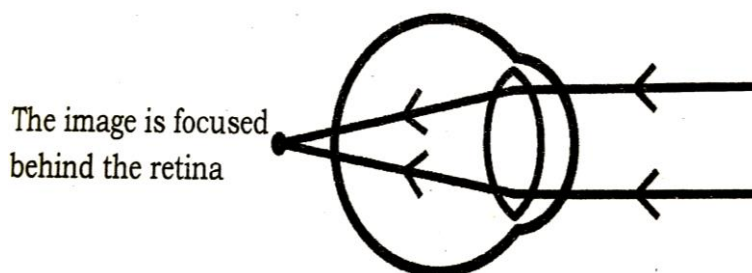
- This is a condition when a person can see distant objects clearly but cannot see nearby objects.

Images from nearby objects are focused behind the retina.

### Causes of long sightedness

- Very thin eye lens
- Very short eyeball

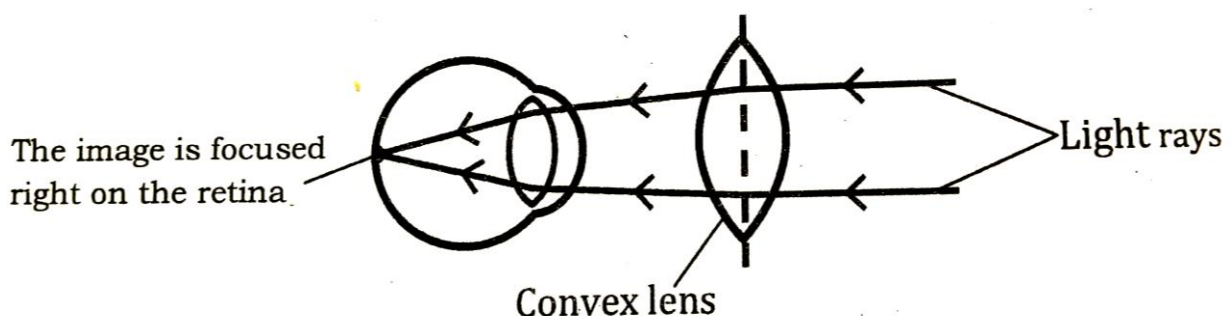
### An illustration showing hyperopia



### How is long sightedness corrected?

- By wearing spectacles with convex lenses (converging lens)

### A diagram showing correction of long sightedness



### **How does a convex lens help to correct long sightedness?**

- It slightly converges light rays

### **3. Old age sight (presbyopia)**

- This is the loss of focusing power for near objects that occurs naturally with age as eye lens loses its elasticity

It occurs in old age above 60 years

A person with presbyopia can clearly see only distant objects and has poor vision for objects that are up close, such as; reading from books and computers

### **How is presbyopia corrected?**

- By wearing reading eyeglasses with convex lenses

### **4. Astigmatism**

- This is the condition in which light fails to come to a single focus on the retina hence blurred vision (distorted vision)

Here light rays are not focused on the fovea resulting into blurred vision

Astigmatism is the most common of all eye defects

### **Causes of astigmatism**

- Unevenly curved cornea
- Rough cornea

### **How is astigmatism corrected?**

- By wearing spectacles with cylindrical lenses
- By refractive surgery

## **DISEASES OF THE HUMAN EYE**

### **Major eye diseases**

- Trachoma
- Night blindness (xerophthalmia)
- River blindness (onchocerciasis)
- Conjunctivitis

### **Other eye diseases**

- Blepharitis
- Keratitis
- Cataracts
- Sty (sty)
- Glaucoma
- Leucoma

### **TRACHOMA**

- It is a bacterial eye disease
- It is caused by a bacterium (germ) called **chlamydia trachomatis**
- It is spread by **houseflies**
- It is common in places with poor sanitation
- It is a water cleaned disease which affects the eyes

### **How does trachoma spread?**

- When infected houseflies land on our eyes
- Through sharing face towels with an infected person.
- Through sharing the same basin with an infected person.
- Through shaking hands with an infected person and then touch your eyes
- Through sharing handkerchiefs with an infected person

### **Signs of trachoma**

- Eyes turn red
- Watery discharge from the eyelids
- Swollen eyelids

### **Symptoms of trachoma**

- Pain while looking at light
- Itching of the eyes

### **Control of trachoma**

- Always wash eyes with enough clean water
- Avoid sharing face towels with an infected person
- Always wash and iron handkerchiefs
- Avoid touching your eyes with dirty hands
- Avoid places with a lot of houseflies

### **NIGHT BLINDNESS**

- It is a **deficiency eye disease** common in children between 2 – 5 years
- It is caused by **lack of vitamin A** in the diet

### **Signs of night blindness**

- Poor sight at night (poor night vision)
- Dry eyes

### **Prevention of night blindness**

- Feeding children on food rich in vitamin A

### **RIVER BLINDNESS**

- It is caused by a filarial worm (nematode) called **onchocerca volvulus**
- It is spread by a small humped fly called **blackfly (Simulium fly/Jinja fly)**
- A black fly breeds in rapidly flowing rivers
- Female blackflies usually bite during **day time** as they suck blood to develop their eggs

### **Why a blackfly lays its eggs in fast flowing rivers?**

- Water in fast flowing rivers has a lot of oxygen

### **Signs of river blindness**

- Bumps under the skin (nodules in the skin)
- Swelling of the lymph nodes
- Tough rough skin
- Red watery eyes

### **Symptoms of river blindness**

- Itching skin rashes
- Severe skin itching
- Itching of the eyes

### **Prevention and control of river blindness**

- Spraying adult blackflies with insecticides
- Avoid sleeping near rivers or streams during day time
- Early treatment of an infected person

### **CONJUNCTIVITIS**

- This is the swelling (inflammation) of conjunctiva
- It is caused by **virus, bacteria** or **chemicals**
- It is also known as **pink eyes**

### **Mention three types of conjunctivitis**

- **Bacterial conjunctivitis**

It is caused by eye contact with bacteria for gonorrhoea or chlamydia

- **Viral conjunctivitis**

It is caused by eye contact with viruses for common colds

- **Allergic conjunctivitis**

It is caused by eye contact with chemicals (e.g air irritants **or** Chlorine in swimming pools)

**How do newly born babies get infected with bacterial conjunctivitis?**

- When gonorrhoea or chlamydia germs come into contact with the baby's eyes at birth

**Signs of conjunctivitis**

- The white of the eye (sclera) becomes pink
- Watery discharge from the eyes with pus
- Swollen eyelids

**Symptoms of conjunctivitis**

- Itchy eyes
- Pain when looking at light

**BLEPHARITIS**

- It is an inflammation of the eyelids
- The eyes itch, burn and swell

**CATARACT**

- This is when the eye lens becomes grey and opaque.
- It is caused by diabetes or continued exposure of the eyes to high temperature.

**GLAUCOMA**

- It is caused by increased internal pressure of fluids.
- It damages the optic nerve

**KERATITIS**

- This is the inflammation of the cornea
- It is caused by virus or bacteria or fungus

**STYE**

- This is a small inflammation of the eyelid
- It is caused by bacteria
- It is usually a sign of poor health, anaemia or diabetes.

**LEUCOMA**

- This is where an opaque white spot on the cornea.

**CARE FOR OUR EYES**

- Always wash your eyes with clean water and soap
- Never look directly at the sun
- Do not touch your eyes with dirty fingers
- Do not share face towels with a person who has sick eyes
- Feed on food rich in vitamin A
- Avoid staying in smoky and dusty places
- Read books in enough light
- Never use eyeglasses without health worker's advice



# **TOPIC 3: INTERDEPENDENCE OF THINGS IN THE ENVIRONMENT**

## **ENVIRONMENT**

- Environment refers to all things that surround an organism

### **Main components of the environment**

- |           |        |
|-----------|--------|
| ▪ Plants  | ▪ Air  |
| ▪ Animals | ▪ Soil |
| ▪ Water   | ▪ Sun  |

Plants and animals are the main **organic components** of the environment

## **TYPES OF THE ENVIRONMENT**

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| ▪ Biotic (biological) environment | ▪ Abiotic (physical) environment |
|-----------------------------------|----------------------------------|

### **Biotic (biological) environment**

- This is the type of environment made up of living things

### **Components of biotic environment (living components of the environment/groups of living things)**

- |            |            |
|------------|------------|
| ▪ Plants   | ▪ Fungi    |
| ▪ Animals  | ▪ Protists |
| ▪ Bacteria |            |

### **Abiotic (physical) environment**

- This is the type of environment made up of non-living things

### **Components of abiotic environment (non-living components of the environment)**

- |         |       |
|---------|-------|
| ▪ Soil  | ▪ Air |
| ▪ Water | ▪ Sun |

## **INTERDEPENDENCE**

- This is the way how things depend on each other in the environment.

### **How do animals depend on plants?**

- Some animals (herbivores) get food from some plants.
- Some animals get shelter from plants
- Animals get herbal medicine
- Animals get oxygen for respiration
- People get plant fibres from plants (e.g cotton wool, sisal, jute, flax, hemp, raffia and ramie)
- People get wood fuel from plants
- People get wood for timber from plants
- Animals get shades from plants

### **How do plants depend on animals?**

- Plants get carbon dioxide from animals to make glucose (starch)
- Plants get farmyard manure from animals
- Some animals help in pollination of flowers
- Some animals help in seed dispersal
- Carnivorous plants feed on some insects

### **Examples of carnivorous plants**

- Venus flytrap
- California pitcher plant (Cobra lily)
- Sundew (Drosera)
- Nepenthes
- Bladderwort

### **How do animals depend on other animals?**

- Some animals provide food to other animals
- Some animals provide protection (security) people and other animals
- Some animals provide transport to people (e.g donkey, camel and horse)
- Some animals provide animal labour to people (e.g oxen)
- Some animals (hosts) provide shelter to other animals (parasites)
- Some animals provide animal fibres to people (e.g mohair, wool, silk, Angora hair and Chiengora)

### **Examples of guard animals**

- Dogs
- Donkeys
- Dolphins
- Llamas
- Geese

### **How do plants depend on other plants?**

- Some plants climb others to get enough sunlight and extra support
- Plants depend on other plants as habitat
- Tall plants provide shade to short plants
- Strong plants protect weak plants from strong wind
- Leguminous plants fix nitrogen in the soil which is used by other plants.
- Parasitic plants-get nutrients from other plants

### **How do animals depend on non-living things?**

- Animals use oxygen for respiration
- Animals drink water to survive
- Some animals use soil as their habitat
- Some animals use sand soil and stones for construction
- People use clay soil for brick making and pottery
- People use water for bathing and cooking food
- Animals use heat and light from the sun

### **How do plants depend on non-living things?**

- Plants get water and mineral salts from the soil
- Plants use carbon dioxide and water to make glucose (starch)
- Sunlight helps plants to make glucose (starch)
- Wind helps in pollination.
- Plants use oxygen for respiration at night
- Wind aids in seed and fruit dispersal

### **How do non-living things depend on living things?**

- Trees act as windbreaks to control soil erosion
- Bacteria and fungi help in soil formation
- Plants help in water cycle
- Soil organisms improve soil aeration
- Animal wastes act as manure to improve soil fertility
- Plants purify air during photosynthesis

## **FOOD CHAIN**

- This is the feeding relationship among organisms (living things)
- This is the linear sequence for the transfer of food energy from one organism to another

## **Ecosystem**

- This is a community of organisms in a habitat

## **Habitat**

- This is a natural home of an organism (living thing)

## **Biodiversity**

- This is the variety of living things in an ecosystem

## **Trophic level**

- This is the position that an organism occupies in a food chain

## **Components of a food chain (trophic levels in a food chain)**

- Producer
- Consumers
- Decomposer

## **Groups of consumers in the food chain**

- Primary consumer
- Secondary consumer
- Tertiary consumer

## **AN ILLUSTRATION SHOWING A FOOD CHAIN**



## **EXPLANATION OF THE FOOD CHAIN**

### **The arrow** →

- The arrow **shows** the direction of energy flow
- The arrow in a food chain points from the food to the organism that eats it

## **Producer**

- This is an organism that makes food

They are usually **plants, algae and cyanobacteria**

## **Why are plants regarded as producers?**

- They make their own food

## **Of what use is the sun in a food chain?**

- It provides solar energy (sunlight) for plants to make their own food

## **Primary consumer**

- This is an organism that feeds directly on a producer

They are mainly **herbivores** because **they feed on plants**

## **Secondary consumer**

- This is an organism that feeds on a primary consumer.

These are mainly **carnivores** because **they feed on flesh (meat)**

### Tertiary consumer

- This is an organism which feeds on a secondary consumer.

They are mainly **scavengers** because **they feed on abandoned meat**

### What do we call the “Apex predator” in a food chain?

- This is an animal at the top of a food chain, preying but not prey.
- It is a tertiary consumer

### Decomposer

- This is an organism that causes decay or rotting

They are mainly **bacteria** and **fungi** because **they break down dead organic matter**

### Why do decomposers have the highest population in a food chain?

- They do not have any organisms that depend on them.

### EXAMPLES OF FOOD CHAINS

1. Ground nuts → Rat → Cat → Bacteria
2. Maize → Grasshopper → Hen → Eagle → Fungi
3. Leaves → Caterpillar → Bird → Dog → Bacteria
4. Algae → Fish → Man → Bacteria

### What happens to the food chain when all producers become extinct (die off)?

- The food chain collapses (the food chain undergoes population crash)

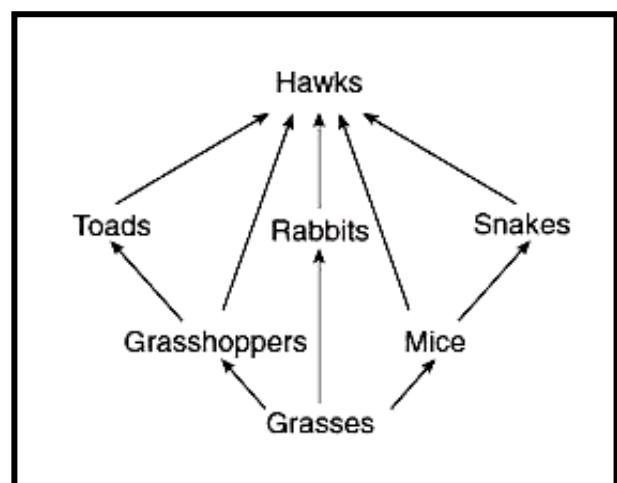
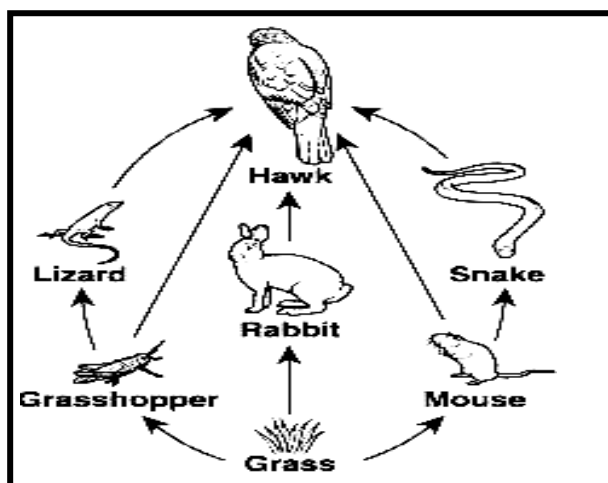
### What happens to producers when primary consumers reduced?

- The population of producers increases

### FOOD WEB

- This is a connection of multiple food chains

### Illustrations showing food web



### GROWING CROPS AND TREES

#### A crop

- This is a plant grown for a purpose
- This is a plant grown and cared for

### **Reasons why people grow crops**

- To get food (to promote food security)
- To get money after selling harvested crops
- To get raw materials for agro based industries
- To get plant fibres

### **Importance of a school garden**

- It enables school children to practise crop growing
- It helps in agriculture practical lessons
- It is a source of food for the school
- The school gets money after selling excess food

### **Factors to consider when plan starting a school garden.**

- |           |                                |
|-----------|--------------------------------|
| ▪ Capital | ▪ Availability of seeds        |
| ▪ Land    | ▪ Availability of garden tools |
| ▪ Labour  | ▪ Well drained soil            |

### **GROUPS OF CROPS**

- Annual crops
- Biennial crops
- Perennial crops

#### **Annual crops**

- These are crops that take one year to mature

#### **Examples of annual crops**

- |                 |            |
|-----------------|------------|
| ▪ Beans         | ▪ Soybean  |
| ▪ Tomato        | ▪ Eggplant |
| ▪ Maize         | ▪ Millet   |
| ▪ Cowpeas       | ▪ Rice     |
| ▪ Groundnut     | ▪ Cassava  |
| ▪ Bitter tomato | ▪ Simsim   |

#### **Biennial crops**

- These are crops that take two years to mature

#### **Examples of biennial crops**

- |           |         |
|-----------|---------|
| ▪ Onions  | ▪ Beets |
| ▪ Carrots |         |

#### **Perennial crops**

- These are crops that take more than two years to mature.
- These are crops that are planted once and harvested year after year.

#### **Examples of perennial crops**

- |             |            |
|-------------|------------|
| ▪ Coffee    | ▪ Banana   |
| ▪ Tea       | ▪ Cocoa    |
| ▪ Sugarcane | ▪ Oil palm |
| ▪ Vanilla   | ▪ Mango    |

#### **Note**

- Cotton and tobacco are perennial crops in nature but always grown as **annual crops**.

### **TYPES OF CROPS**

#### **Food crops**

- These are crops grown for food like legumes, vegetables, cereals and fruits

#### **Cash crops**

- These are crops grown for sale like rubber tree, coffee and tea

### **Spice crops**

- These are crops that give our food taste and sweet aroma like tomatoes, ginger, pepper and onion

### **Tuber crops**

- These are crops with swollen edible underground stems or roots like cassava, carrot, Irish potato, white yam and sweet potato

### **Why is a sugarcane not a stem tuber yet it stores its food in the stem?**

- ✓ It does not have a swollen underground stem

### **Oil crops**

- These are crops grown for oil like oil palm, coconut and groundnut

### **Drug crops**

- These are crops used to cure diseases and wounds like Neem tree and eucalyptus

### **Forage crops**

- These are crops grown for feeding animals like guinea grass and elephant grass

### **Fibre crops**

- These are crops that provide materials for weaving clothes, ropes, bags and sacks like sisal, cotton and jute

### **Ornamental crops**

- These are crops grown to beautify the surroundings

Ornamental crops include; rose flower and hibiscus flower

### **Vegetable crops**

- These are crops grown for some of their edible parts such as leaves, roots, fruits and flowers

### **TYPES OF VEGETABLES AND THEIR EXAMPLES**

Type of vegetables	Examples
Leafy vegetables	Cabbage, spinach, lettuce, pigweed, sukuma wiki
Root vegetables	Carrot, beet
Fruit vegetables	Eggplant, bitter tomato, tomato, green pepper, red pepper
Flower vegetables	Cauliflower

### **AGROFORESTRY**

- This is the growing of crops and trees together in the same garden
- This is the growing of productive trees alongside crops in the same garden

### **Importance of agroforestry**

- Trees provide shade to the crops
- Trees provide extra support to weak stems like passion fruits.
- Trees control soil erosion
- Trees help in water cycle (rain formation)
- A farmer gets double income e.g crops and trees
- Shady trees prevent growth of some weeds
- Tree leaves form manure when they rot

### **Advantages of combining agroforestry with animal husbandry**

- Trees provide shade to animals
- Trees act as live fences on livestock farms
- Trees and crops provide oxygen to animals for respiration
- Trees provide natural habitat to animals
- Some crops act as food for animals

## **GROWING OF TREES**

- Trees are either grown (propagated) by using **seeds** or **stem cuttings**

### **Groups of trees**

- Local (indigenous trees)
- Exotic trees

### **Examples of indigenous (local) trees**

- Mvule
- Mangoes
- Avocado
- Jackfruit
- Musizi
- Acacia
- Mahogany
- Natal fig (mutuba)

### **Characteristics of local trees**

- They produce hard wood
- They mature slowly
- They are resistant to bad weather conditions

### **Examples of exotic trees**

- Cypress
- Gingko
- Pine
- Cedar
- Podo
- Spruce
- Eucalyptus
- Fir

### **Characteristics of exotic trees**

- They produce soft wood
- They mature quickly
- They are vulnerable to bad weather

## **IMPORTANCE OF TREES**

- Trees provide shade to people
- Trees control soil erosion
- Trees help in water cycle (rain formation)
- Trees act as windbreaks
- Trees provide wood fuel
- Trees provide wood for timber
- Some trees provide us with fruits
- Some trees provide herbal medicine
- Some trees act as live fences
- Trees purify air

### **How do trees purify air?**

- ✓ By using carbon dioxide and producing oxygen during photosynthesis

## **DANGERS OF TREES**

- They hide dangerous animals like snakes
- Thorny trees skin injuries
- They shed leaves which make the compound dirty

## **QUALITIES OF GOOD PLANTING MATERIALS (GOOD SEEDS FOR PLANTING)**

- They should have a high germinating rate
- They should be free from pest damages
- They should be free from diseases
- They should be mature
- They should be of a right variety
- They should not be broken
- They should be obtained from healthy parent plant
- The cereals should not have overstayed
- They should be of a suitable size

### **STARTING A TREE NURSERY BED**

- Tree seeds can be planted into seedbeds, nursery beds or polypots
- Most tree have very small seeds which are first planted in a seedbed or nursery bed

### **Why is it difficult to grow cassava and banana using seeds?**

- Their seeds may not be viable ( seeds do not germinate)

### **Why can't cassava be propagated by use of root tubers?**

- Cassava root tubers do not have buds

### **SEEDBED**

- This is a small garden where seeds are planted to make them germinate.

### **NURSERY BED**

- This is a small garden where seedlings are raised before transplanting.

### **Advantages (importance) of a nursery bed**

- It protects seedlings from harsh weather
- It helps a farmer to select good seedlings for transplanting
- It helps a farmer to provide extra care to the seedlings
- It gives a farmer enough time to prepare the main garden

### **PROCEDURES (STEPS) FOR PREPARING A NURSERY BED**

- Clear the weeds and plough the land
- Break the big soil lumps and make the soil surface smooth and fine.
- Mix the manure well with soil and plant the seeds
- Apply some mulch and construct a shade about one metre high.

### **Why should watering should be done every evening and morning?**

- To keep the soil moist for a longer time.

### **Why are some seeds first planted in a nursery bed or seedbed?**

- They are very small
- They cannot withstand conditions in the main garden

### **Examples of crops whose seeds are first planted in a seedbed (nursery bed)**

- |                 |                 |
|-----------------|-----------------|
| ▪ Tomato        | ▪ Eucalyptus    |
| ▪ Coffee        | ▪ Red pepper    |
| ▪ Cabbage       | ▪ Bitter tomato |
| ▪ Passion fruit | ▪ Egg plant     |

### **What is pricking out?**

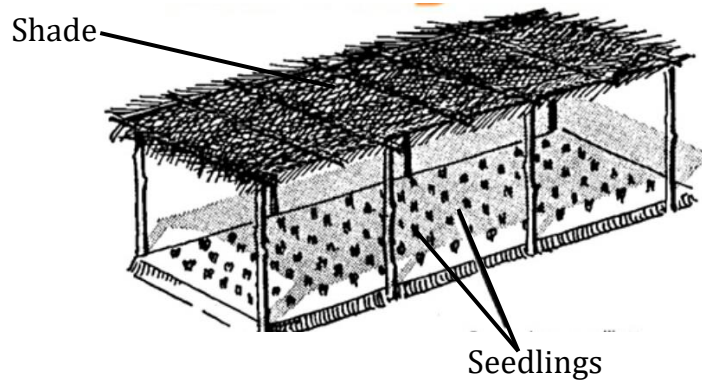
- This is the removal of seedlings from the seedbed and put each into a polypot

### **REQUIREMENTS FOR STARTING A NURSERY BED**

- Wooden poles; for building shelter
- Hoes; for weeding/ploughing/harrowing
- A rake; for leveling soil
- Watering can; for watering crops
- Polythene papers; for making polythene polypots
- Mulches (e.g dry grass); for mulching
- Water source; to provide water for irrigation
- Panga
- Dibber; for making holes where seeds are planted
- Manure; for making the soil fertile
- Seeds or stem cuttings
- Hand fork ;for light weeding in a nursery bed



## **A DIAGRAM SHOWING A NURSERY BED**



## **CARE FOR SEEDLINGS IN A NURSERY BED (ACTIVITIES DONE IN A TREE NURSERY)**

- By watering
- By weeding
- By spraying with pesticides
- By thinning
- By mulching
- By manuring
- Providing them with a shade
- By fencing the nursery bed
- By hardening off

## **Importance of a shade on a nursery bed**

- To protect seedlings from strong sunshine and heavy rainfall

## **HARDENING OFF**

- This is the process of gradually exposing seedlings to outdoor conditions

Hardening off should be done when about to transplant the seedlings

## **Ways (methods) of hardening off**

- Reducing watering
- Removing the shade gradually (exposing of seedlings to sunshine gradually)
- Exposing of seedlings to wind gradually
- Placing the seedlings in a cold frame

## **Advantages of hardening off**

- It encourages the seedlings to withstand the conditions in the main garden
- It prevents transplant shock (reduces plant stress)

## **Steps for hardening off**

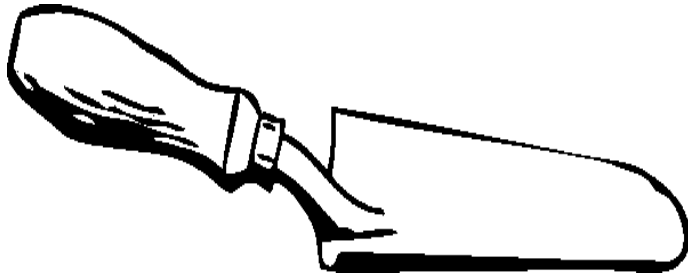
- Place seedlings outside in the shade for sometime
- Gradually lengthen exposure daily
- Monitor seedlings for wilting
- Finally leave seedlings out overnight

## **TRANSPLANTING**

- This is the transfer of seedlings from the nursery bed to the main garden.

It is done using a **garden trowel**

### A drawing showing a garden trowel



- A **garden trowel** is used for transplanting seedlings

### Why is the garden trowel the suitable garden tool for transplanting seedlings?

- It does not damage the root system of the seedling

### Reasons why transplanting seedlings is done in the evening or on a cloudy day

- To reduce the rate of transpiration (to reduce much water loss through the leaves)
- To prevent wilting of seedlings

### What is a seedling?

- This is a young plant raised from a seed

### PLANTING

- This is putting of planting materials in the soil

It is done during **wet season**

### Reasons for planting crops in wet season

- There is enough rainfall to support plant growth
- There is enough water for seed germination
- The soil is soft for easy growth of roots

### METHODS OF PLANTING

- Row planting
- Broadcasting

#### **1. ROW PLANTING**

- This is the planting of crops in lines giving proper space among plants.
- It is done using a **garden line**

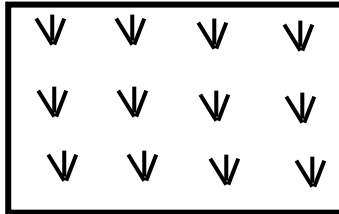
### A diagram showing a garden line



### How is a garden line useful to a crop farmer?

- It is used to make straight lines during row planting

### **An illustration showing row planting**



### **Advantages of row planting**

- It makes weeding easy
- It makes harvesting easy
- It makes spraying easy
- It controls over crowding of crops
- It controls pests and diseases
- It prevents wastage of planting materials (e.g seeds)
- It enables crops to get enough sunlight

### **Disadvantages of row planting**

- It needs much labour
- It is time consuming
- It requires a large piece of land

### **Example of crops planted by row planting**

- Maize
- Cassava
- Beans
- Potatoes
- Coffee
- Pineapples

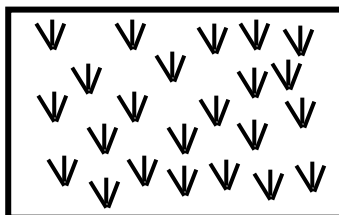
## **2. BROADCASTING METHOD**

- This is the method of planting by scattering seeds over a large area

### **Advantages of broadcasting methods**

- It saves time
- It needs less labour
- It prevents wastage of soil nutrients

### **An illustration showing broadcasting**



### **Disadvantages of broadcasting methods**

- It makes weeding difficult
- It makes harvesting difficult
- It makes spraying difficult
- Seeds may be eaten by birds
- Seeds may be removed by agents of erosion
- It encourages easy spread of crop diseases
- There is competition for nutrients and sunlight

### **Examples of crop seeds planted by broadcasting**

- Carrots
- Lettuce
- Millet
- Sorghum
- Rice
- Beets

## **WAYS OF CARING FOR PLANTS (TREES) IN THE MAIN GARDEN**

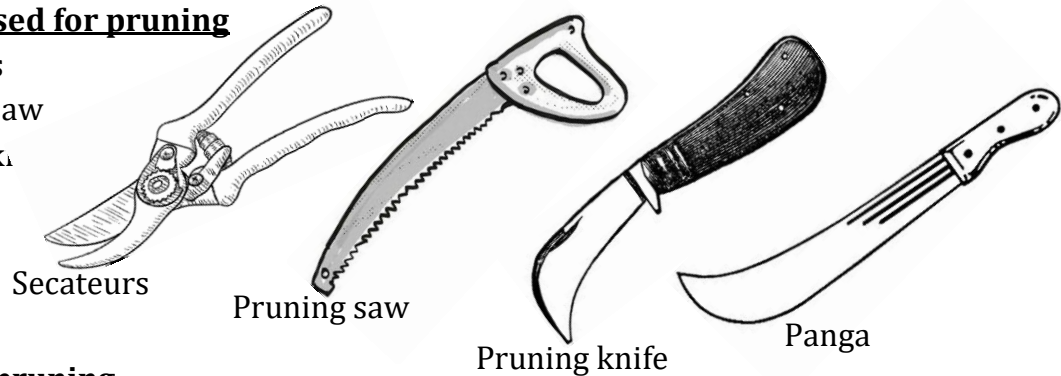
- Weeding
- Pruning
- Thinning
- Roguing
- Plant training
- Mulching
- Spraying with pesticides

### **PRUNING**

- This is the removal of some parts of a plant
- This is the cutting of excess branches or leaves from a plant.

#### **Garden tools used for pruning**

- Secateurs
- Pruning saw
- Pruning knife
- Panga



#### **Advantages of pruning**

- It reduces hiding places for pests
- It reduces weight of the plant
- It allows plants to get enough sunlight
- It improves crop yields
- It prevents easy spread of crop diseases
- It creates space in the garden
- It makes weeding easy
- It makes spraying easy
- It makes harvesting easy

#### **Why should pruning be done towards the end of a dry season?**

- To allow easy recovery of the plant during wet season

#### **Name the crop growing practice that reduces the rate of transpiration.**

- Pruning

### **THINNING**

- This is the removal of excess plants from the garden or nursery bed.

#### **Why should thinning be done when the plants are still young?**

- To prevent them from taking a lot of nutrients from the soil

#### **Why are stems of banana suckers cut in a slanting form?**

- To prevent water logging on top of them that would cause rotting

#### **Advantages of thinning**

- It reduces hiding places for pests
- It reduces competition for nutrients and sunlight
- It reduces overcrowding of plants
- It improves on crop yields
- It makes weeding, spraying and harvesting easy

#### **Examples of crops which are thinned**

- Banana
- Sorghum
- Maize
- Millet

## **ROGUING**

- This is the removal of plants with undesirable characteristics from the garden

### **What is a rogue?**

- This is a plant with unwanted characteristics in the garden

### **Examples of rogues**

- Off-type plants
- Diseased plants

### **Advantages of roguing**

- It prevents easy spread of crop diseases
- It improves the quality of crop yields

## **PLANT TRAINING**

- This is the way of making a plant to grow in a certain direction or shape

### **Methods of plant training**

- Staking
- Propping
- Trellising

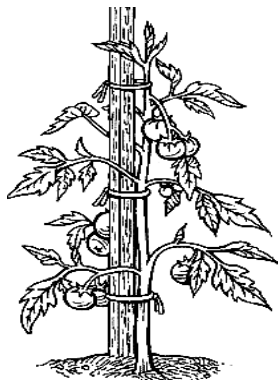
#### **1. Staking**

- This is the giving of extra support to a weak stem using a strong stick pointed at one end driven into the ground

### **Examples of plants that can be staked**

- Tomatoes
- Vanilla
- Garden peas

### **A diagram showing staking in tomatoes**



#### **2. Propping**

- This is the giving of extra support to a plant with much weight by leaning a forked pole against it.

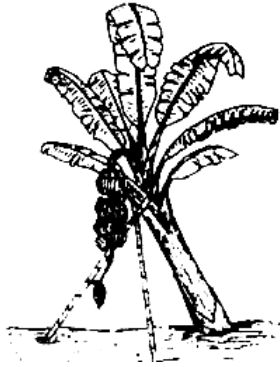
### **Reasons why banana plants with heavy bunches should be propped**

- To protect banana plants from falling down due to strong wind
- To reduce the weight put on the plant stem

### **Examples of plants that can be propped**

- Banana
- Coffee
- Mango
- Avocado

### A diagram showing propping in banana



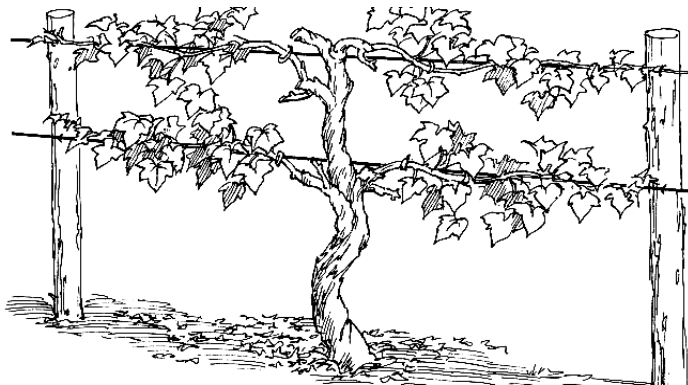
### **3. Trellising**

- This is the practice of providing support to crops with weak stems using a wire held between poles.

#### Examples of plants that can be trellised

- Passion fruit
- Gourd
- Cucumber

#### A diagram showing trellising in passion fruits



### **ADVANTAGES OF PLANT TRAINING**

- It enables a farmer to harvest clean fruits
- It enables all parts of the plant to get enough sunlight
- It makes harvesting easy
- It makes pruning easy
- It makes spraying easy
- It makes weeding easy
- It prevents rotting of fruits as the plant grows above the ground

### **WEEDING**

- This is the removal of unwanted plants from the garden

#### **Advantages of weeding**

- It reduces hiding places for pests
- It reduces the competition for nutrients and sunlight
- It makes harvesting easy
- It makes spraying easy
- It creates space in the garden
- It improves crop yields

### **WEEDS**

- These are unwanted plants in the garden
- These are unwanted plants that grow in-between crops

Weeds are classified as **annual, biennial or perennial weeds** basing on their lifespan

## **Examples of weeds**

### **i) Annual weeds**

- Black jack (*Bidens pilosa*)
- Common chickweed
- Pigweed
- Crabgrass
- Foxtail millet

### **ii) Biennial weeds**

- Wild carrot
- Common burdock
- Moth mullein

### **iii) Perennial weeds**

- Elephant grass
- Star grass
- Dandelion
- Wandering jew
- Common thorn apple
- Guinea grass
- Couch grass
- Spear grass
- Poison ivy
- Pampas grass

## **Advantages (uses) of weeds**

- Some weeds are used as vegetables
- Some weeds act as food to wild animals
- Some dry weeds can be used as mulches
- Some weeds are used as herbal medicine
- Weeds control soil erosion
- Some weeds are used as animal feeds
- Leguminous weeds improve soil fertility

## **Disadvantages of weeds (dangers of weeds)**

- They hide crop pests
- They compete with crops for nutrients and sunlight
- They lead to poor crop yields
- Some weeds are poisonous when eaten
- They make harvesting difficult
- They increase the cost of production since herbicides are expensive

## **METHODS (WAYS) OF CONTROLLING WEEDS**

### **a) Mechanical weed control methods**

- Slashing/mowing
- Tillage/Ox cultivation (using tractors)
- Uprooting
- Digging with hoes
- Burning the weeds

### **b) Cultural weed control methods**

- Crop rotation
- Mulching
- Timely planting
- Proper spacing of crops
- Planting shady trees in the garden

### **c) Chemical weed control method**

- Spraying with herbicides

### **d) Biological weed control method**

- Use of livestock to graze on weeds

## **MULCHING**

- This is the covering of top soil with dry plant materials

### **Mulches**

- These are dry plant materials used to cover top soil

### **Examples of mulches**

- Dry grass
- Coffee husks
- Dry banana leaves
- Chopped banana stems
- Dry maize stalks

### **Advantages of mulching**

- It keeps water/moisture in the soil
- ✓ By preventing evaporation of soil water in the soil
  - It controls soil erosion.
- ✓ By reducing the speed of running water
- ✓ By protecting soil from direct raindrops
- ✓ By preventing strong wind from blowing away top soil
- ✓ By preventing moving animals from carrying away top soil
  - It controls the growth of weeds
- ✓ By preventing weeds from getting sunlight
  - It improves soil fertility
- ✓ Mulches rot to form humus
  - It increases infiltration of water into the soil.

### **State the main reason for mulching**

- To keep water/moisture in the soil.

### **Disadvantages of mulching**

- Mulches hide pests
- Undried/wet mulches can grow into weeds
- Mulches can be fire hazards
- It is tiring
- Some mulches are expensive to buy

## **CROP PESTS**

- These are organisms (living things) that destroys crops

### **Vermis**

- These are small animals that destroy crops or spread diseases to animals

### **GROUPS OF PESTS**

- Field pests (garden pests)
- Storage pests

#### **1. Field pests**

- These are organisms that destroy crops in the garden.

### **Examples of field pests**

- Locusts
- Caterpillars
- Crickets
- Aphids
- Armyworms
- Sweet potato weevil
- Banana weevil (banana root borer)
- Termites
- Monkeys
- Rats
- Squirrels
- Moles
- Nematodes
- Warthogs
- Maize stalk borer
- Whitefly; a pest that spreads cassava mosaic disease
- Coffee twig borer
- Cotton bollworm
- Weaverbirds



## **2. Storage pest**

- These are organisms that destroy stored crops

### **Examples of storage pests**

- Bean weevil
- Maize weevil
- Rats

### **Examples of crops and pests which attack them**

<b>CROPS</b>	<b>CROP PESTS</b>
Pineapples	Pineapple mealy bug
Tomato	Nematodes
Bananas	Banana weevils (banana root borer), nematodes, banana thrips
Sweet potato	Caterpillars, mole rats, rats
Irish potato	Potato aphid, potato tuber moth, nematodes
Maize	Maize stalk borer, armyworm, weaverbirds, monkeys, maize weevils, rats
Coffee	Coffee berry borer, mealy bug
Beans	Bean aphids, American ball worm, bean fly, bean bruchids, cut worm, thrips, spotted borer, bean weevils
Sorghum	Sorghum shoot fly, stem borer, sorghum midge
Cotton	American ball worm, spring ball worm, cotton strainers, aphids
Tobacco	Termites, cutworms, ants, millipedes, crickets
Cow peas	Pod borer, blossom beetles
Ground nuts	Thrips, millipedes, ants, termites, weevils, aphids, squirrels, rats
Cassava	Rats, squirrels, millipedes, nematodes, whitefly

### **SIGNS OF PESTS AND DISEASE DAMAGE IN CROPS**

- Rotting of tubers
- Drying of the crop
- Eaten parts of the crop
- Wilting of the crop
- Holes on fruits, leaves and stems
- Premature ripening of fruits
- Yellowing of leaves
- Spots on the leaves
- Poor growth (stunted growth)

### **METHODS (WAYS) OF CONTROLLING CROP PESTS AND DISEASES**

#### **a) Mechanical methods**

- By trapping some pests
- By fencing the garden
- By chasing away some pests (e.g rodents)
- By removing and burning infected plants

#### **b) Chemical methods**

- By poisoning some pests
- By spraying with pesticides and fungicides
- By seed dressing
- Dusting crop stores with chemicals to avoid infections

**c) Cultural methods (traditional methods)**

- By crop rotation
- Regular weeding
- Pruning
- By early planting
- By early harvesting
- Roguing
- Proper spacing of crops
- Putting scarecrows in the garden
- Planting resistant varieties
- Storing harvested crops in a granary

**d) Biological methods**

- By rearing cats to eat rats
- By using dogs to hunt squirrels
- By using predator insects to feed on insect pests (e.g using ladybirds to feed on aphids)

**What is meant by seed dressing?**

- This is the applying of chemicals on seeds to prevent infections and pests

**Of what use is a scarecrow in a maize garden?**

- It helps to frighten (scare away) pest birds

**Of what importance are ladybirds to crop farmers?**

- They help in pollination
- They feed on some insect pests like aphids

**How does early planting control pests?**

- Crops mature before pests multiply

**DISADVANTAGES OF CROP PESTS**

- Pests eat leaves, roots and stems
- Some pests spread diseases to plants
- They reduce the quality of yields
- They lead to stunted growth of the plants
- They lead to low crop yields
- They increase the cost of production since a farmer buys pesticides

**CROP DISEASES**

- These are diseases that affect crops

**Signs of diseased crops**

- Stunted growth
- Poor quality of yields
- Yellowing of leaves
- Black patches on the leaves
- Wilting of the plant
- Crinkled leaves

**A TABLE SHOWING CROP DISEASES AND THE PART OF CROP MAINLY AFFECTED**

CROP	DISEASES	CROP PART AFFECTED
Bean	Bean rust, Halo blight, Angular leaf spot	Leaves
Groundnut	Groundnut rosette, Leaf spot disease, Leaf blight, Bacterial wilt	Leaves
Cowpeas	Zonate leaf spot, Bacterial blight	Leaves
Tomato	Tomato blight, Bacterial wilt	Leaves
Cassava	Cassava mosaic	Leaves
	Brown streak	Root tubers

Maize	Maize rust, White leaf blight, Maize streak disease	Leaves
	Corn smut	Leaves, ear, tassel and stalk
Banana	Panama disease	Leaves
	Cigar end rot	Banana fingers (fruit)
	Banana Bacterial Wilt	Flower (blossom) and fruit
Sweet potato	Potato blight	Leaves
	Bacterial wilt (Brown rot)	Leaves and stems
Irish potato	Potato blight, Bacterial wilt	Leaves
	Black scurf	Stem tuber
Coffee	Coffee berry disease, Coffee leaf rust	Leaves
Sorghum	Leaf blight, Zonate leaf spot, Sorghum downy mildew	Leaves
	Scott stripes	Fruit
Sugarcane	Sugarcane smut, Red rot	Stem (internodes)
	Red leaf spot	Leaves
	Yellow leaf disease, Leaf scald disease	Leaves
Tobacco	Black spot disease, Blue mould, Frog-eye leaf spot, Brown spot, Bacterial wilt	Leaves
	Black shank	Stalk

### **DANGERS (EFFECTS) OF PESTS AND DISEASES**

- They lead to poor yields
- They lead to wilting and drying of crops
- They lead to rotting of tubers
- They lead to curling (deformation) of leaves
- They lead to stunted growth of the crops

### **WOOD LOT:**

- This is a small area set aside for growing trees

### **Importance of the wood lot project**

- Trees provide firewood
- Trees provide timber
- Trees provide poles for building and electricity installation
- Trees control soil erosion
- Trees help to purify air
- Trees help in rain formation

### **Factors to consider when starting a wood lot project**

- |  |                  |
|--|------------------|
| ▪ Selection of multipurpose trees (MTPS)   | ▪ Land           |
| ▪ Drought resistant varieties of trees     | ▪ Capital        |
| ▪ Trees that mature faster in a short time | ▪ Labour         |
|  | ▪ Market         |
|  | ▪ Record keeping |

### **Records to keep on a woodlot project**

- Date of making seedbed
- Period spent by seedlings in the nursery bed
- Date of transplanting
- Type of crops grown with trees
- Type of trees planted
- Number of trees planted
- Spacing of trees and crops
- Possible date for harvesting
- Date of weeding, pruning and spraying

**An inventory** is a detailed list of farm tools and equipment and their value.

**Silviculture** is the cultivation of trees for forests

### **METHODS OF HARVESTING TREES**

- Pollarding
- Lopping
- Coppicing

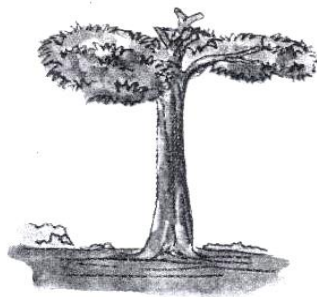
#### **Pollarding**

- This is the cutting of the top part of a tree.

#### **Importance of harvesting trees by pollarding**

- It enables fruit trees to produce more and better fruits e.g mangoes
- It keeps fruits trees short for easy harvesting of fruits.

#### **An illustration showing pollarding**



#### **Lopping**

- This is the cutting of side branches of a tree.

Mature side branches are harvested as the tree continues to grow

#### **Importance of lopping**

- It enables the tree to grow taller
- It enables the tree to continue growing after harvesting firewood

#### **An illustration showing lopping**



## **Coppicing**

- This is the cutting of the whole tree leaving a stump to develop new shoots

## **Importance of coppicing**

- It allows growth of new shoots
- It provides good wood for timber

## **An illustration showing coppicing**



- **Sprouting** means to develop new shoots

## **Why is pollarding or coppicing not done on some trees (e.g pine, podo and cypress)?**

- Some trees cannot not grow new branches

## **USES OF WOOD**

- It is used as fuel
- It is used as timber
- It is a source of income after sale
- It is used for fencing
- It is used for installing electric wires
- It is used for making papers and soft boards

## **PREPARATIONAND STORAGE OF WOOD**

### **a) Wood for charcoal**

- It can be harvested by lopping, pollarding or coppicing, packed into a heap and covered with soil

## **Why is wood for charcoal covered with soil?**

- To limit the supply of oxygen

## **How is charcoal formed?**

- By burning wood in limited supply of oxygen

## **How is ash formed?**

- By burning wood in full (excess) supply of oxygen

## **How does charcoal burning affect the environment?**

- It increases the rate of deforestation for wood fuel

### **b) Wood for firewood**

- It can be harvested by lopping, pollarding or coppicing
- After cutting, wood is split and put under sunshine **to dry**
- Dry wood burns very well and can be used for cooking
- Wood stores **chemical energy**

## **Why is it not good to use wet wood for cooking?**

- It does not burn well
- It produces a lot of smoke

## **Why do people split firewood?**

- For quick drying
- For easy usage

### **Which energy change occurs when wood is burnt?**

- Chemical energy changes to heat and light energy.

### **c) Wood for poles (fencing, electricity and house construction)**

- It is mainly harvested using **coppicing**
- The bark is removed and the wood surface is smeared with wood preservatives (e.g Used engine oil)

### **Importance of treating wood/poles with preservatives**

- It prevents termites destroying the poles
- It prevents poles from rotting
- It makes poles resistant to fire

### **d) Wood for timber**

- Wood for timber is harvested by **coppicing**
- The felled tree is cut into pieces after removing the side branches
- Wood for timber is cut (split) into pieces using a **hand saws** or **chainsaws**

### **Timber seasoning**

- This is the controlled removal of moisture content from timber

### **Importance of seasoning of timber (drying of timber)**

- It prevents bending (warping) of timber
- It prevents timber from cracking
- It reduces weight of the timber
- It increases durability of timber
- It prevents timber from rotting
- It increases the strength of timber

### **Reasons why natural seasoning (drying) of timber should be done in a shade but not in direct sunshine**

- To prevent warping (bending) of timber
- To prevent cracking of timber

### **Why should seasoning of timber be done on a flat surface?**

- To enable the timber remain straight (to prevent bending/warping of timber)

### **Why is wet timber not good for use?**

- It bends on drying (it changes its shape on drying)
- It develops cracks easily
- It is not strong
- It is not durable
- It can rot easily

### **Of what use is a hand plane to a carpenter?**

- For flattening timber (for shaping timber)
- For reducing thickness of timber
- For smoothing the surface of timber

### **STORAGE OF WOOD**

- It should be stored in a well roofed place **to protect it from rain**
- It should be kept on a dry raised platform **to prevent dampness of firewood**

### **INSECT PESTS FOR HARVESTED WOOD**

- Powder-post beetles
- Termites
- Carpenter bees
- Carpenter ants
- Woodworms
- Sawflies

### **PRESERVATION OF WOOD AND TIMBER**

- Applying coal tar on wood
- Smearing wood with used engine oil
- Soaking wood in kerosene
- Wood charring timber (half-burning the timber)
- Smearing wood with ash or cow dung

### **SCIENCE ORIENTED CLUBS**

- These are clubs that are formed on science basis

#### **Examples of science oriented clubs**

- Young farmers' club
- School health club
- Wildlife club
- Environmental conservation clubs
- Science and technology clubs

#### **Objectives of science oriented clubs**

- To enable children acquire science skills
- To make children pick interest in science subjects
- To enable children discover science facts

### **YOUNG FARMERS' CLUB**

- This is a group of young people in a community who have interest in farming

#### **Importance of young farmers' club in a school**

- It grows food crops for the school
- It teaches good farming methods to school children
- It organizes study tours to farm schools
- It helps school children to pick interest in agriculture

### **EXAMPLES OF SCIENCE PROJECTS IN SCHOOLS**

- Piggery project
- Cuniculture project
- Apiculture project
- Woodlot project
- Poultry keeping project

# **TOPIC 4: POPULATION AND HEALTH**

## **Population**

- This is the total number of organisms in an area

## **Human population**

- This is the total number of people living in an area

## **Health**

- This is the state of complete physical, mental and social well being
- This is the state of being free from illness or injury

## **Components (aspects) of health**

- Physical health
- Mental health
- Social health

## **Ways of promoting good health**

- Proper sanitation
- Feeding on balanced diet
- Proper personal hygiene
- Performing regular body exercises
- Proper food hygiene
- Drinking safe water
- Avoiding drug abuse
- Having enough rest

## **SICKNESS**

- This is the unhealthy condition of the body or mind
- This is the state of not well-being physically, mentally, socially and spiritually

## **Common sickness in a home**

- Dysentery
- Cholera
- Malaria
- Kwashiorkor
- Typhoid
- Diarrhoea
- Measles
- Poliomyelitis

## **Causes of common sickness at home**

- Poor sanitation
- Poor personal hygiene
- Malnutrition (poor feeding)
- Inadequate water supply
- Lack of physical exercises
- Drinking contaminated water
- Smoking
- Alcoholism
- Drug abuse
- Air pollution
- Lack of immunisation

## **Signs and symptoms of sickness**

- Vomiting
- Diarrhoea
- Loss of body weight
- Jaundice
- Runny nose (stuffy nose)
- Chronic cough

## **Symptoms of sickness**

- Nausea
- Loss of appetite
- Fever
- Headache
- Body weakness



## **Ways of preventing and controlling common sicknesses at home and school**

- By feeding on a balanced diet
- By immunisation
- By proper disposal of human wastes
- By sleeping in treated mosquito nets
- By drinking safe water
- By avoiding drug abuse
- By performing regular body exercises
- By living in well ventilated houses
- By draining still water near our homes
- By slashing bushes around our homes

## **DISEASES**

- A **disease** is an abnormal condition of the body that causes discomfort

### **Groups (types) of diseases**

- Communicable diseases
- Non-communicable diseases

## **COMMUNICABLE DISEASES**

- These are diseases that can spread from one person to another

They are caused by germs (pathogens)

### **Germs (pathogens)**

- These are tiny organisms that cause diseases

### **Types of germs**

- Bacteria
- Fungi
- Protozoa
- Virus

## **Ways through which communicable diseases spread (how do germs enter our bodies?)**

- Through vector bites (animal and insect bites)
- Through using contaminated water
- Through inhaling contaminated air
- Through contact with an infected person
- Through open cuts and wounds

### **Groups of communicable diseases**

- Water associated diseases
- Airborne diseases
- Vector-borne diseases
- Contagious diseases

## **WATER ASSOCIATED DISEASES**

- These are diseases which are spread through contaminated water

### **Groups (classes) of water associated diseases**

- Water borne diseases
- Water contact diseases
- Water cleaned diseases
- Water habitat vector diseases

## **WATER BORNE DISEASES**

- These are diseases spread through drinking contaminated water.

### **Examples of waterborne diseases:**

- Cholera
- Typhoid fever
- Bilharziasis (schistosomiasis)
- Poliomyelitis
- Dysentery
- Hepatitis A
- Diarrhoea
- Guinea worm disease

### **WATER CONTACT DISEASES**

- These are diseases spread through direct body contaminated water

### **Examples of water contact diseases**

- Bilharziasis
- Swimmer's itch
- Swimmer's ear (otitis externa)

### **WATER CLEANED DISEASES**

- These are diseases spread due to lack of clean water to promote personal hygiene

### **Examples of water cleaned diseases.**

- Scabies
- Impetigo
- Trachoma
- Ringworm
- Athlete's foot
- Conjunctivitis

### **WATER HABITAT VECTOR DISEASES**

- These are diseases spread by vectors that breed in water

### **Examples of water habitat vector diseases**

- Bilharziasis (schistosomiasis)
- River blindness (onchocerciasis)
- Malaria
- Elephantiasis (filariasis)
- Dengue fever
- Yellow fever
- Zika fever
- Chikungunya fever

### **AIRBORNE DISEASES**

- These are diseases that spread through inhaling contaminated air

### **Examples of airborne diseases:**

#### **i) Bacterial airborne diseases**

- Tuberculosis
- Whooping cough/pertussis
- Diphtheria
- Pneumonia
- Meningitis

#### **ii) Viral airborne diseases**

- COVID-19
- Influenzae
- Measles
- Mumps
- Chicken pox

### **CONTAGIOUS DISEASES**

- These are diseases that spread through direct body contact with an infected person

### **Examples of contagious diseases**

- |  |   |      |  |
|--|---|------|--|
| <ul style="list-style-type: none"><li>▪ AIDS</li><li>▪ Syphilis</li><li>▪ Gonorrhoea</li><li>▪ Chancroid</li></ul> | } | STDS | <ul style="list-style-type: none"><li>▪ Leprosy</li><li>▪ Ebola</li><li>▪ Ringworm</li><li>▪ Scabies</li></ul> |
|--|---|------|--|

### **VECTORBORNE DISEASES**

- These are diseases that are spread by vectors

**EXAMPLES OF VECTOR BORNE DISEASES**

<b>VECTOR BORNE DISEASE</b>	<b>GERM</b>	<b>VECTORS</b>
<b>Insect vector borne diseases</b>		<b>Insect vectors</b>
Sleeping sickness (African Trypanosomiasis)	Trypanosomes	Tsetse fly
River blindness	Onchocerca volvulus	Blackfly
Malaria	Plasmodium	Female anopheles mosquito
Elephantiasis (Filariasis)	Filarial worm	Culex mosquito
Yellow fever Dengue fever Zika fever Chikungunya fever	Flavivirus Dengue virus (DENV) Zika virus Chikungunya virus (CHIKV)	Aedes mosquito/Tiger mosquito
Typhus fever Louse-borne relapsing fever	Rickettsia Borrelia	Body Louse
Poliomyelitis Leprosy (Hansen's Disease) Amoebic dysentery (Amoebiasis) Typhoid Food poisoning	Poliovirus Mycobacterium leprae Entamoeba histolytica  Salmonella typhi Salmonella/Norovirus	Cockroach
Cholera Typhoid Trachoma Bacillary dysentery Amoebic dysentery Diarrhoea	Vibrio cholerae Salmonella typhi Chlamydia trachomatis Shigella Amoeba (Entamoeba histolytica) Rotavirus/E. coli/Norovirus	Housefly
Bubonic plague	Yersinia pestis	Rat fleas
<b>Non-insect vector borne diseases</b>		<b>Non-insect vectors</b>
Rabies	Rabies virus	Rabid dog/Rabid cat/Rabid fox
Bilharziasis (Schistosomiasis)	Blood flukes (Schistosomes)	Fresh water snail
Lyme disease Tick-borne relapsing fever	Borrelia Borrelia	Tick

**Ways through which vectors spread diseases (How do vectors spread diseases?)**

- Through infected bites
- Through the 4Fs germ path
- Through vomiting on food
- Through defecating on food

**Name any two diseases that can spread through cuts and wounds**

- Tetanus
- AIDS

**NON-COMMUNICABLE DISEASES**

- These are disease that cannot spread from one person to another

**Groups of non-communicable diseases**

- Deficiency diseases
- Hereditary diseases
- Metabolic diseases
- Self-inflicted diseases

**DEFICIENCY DISEASES (NUTRITIONAL DISEASES)**

- These are diseases that are caused by lack of some food values in the diet

## **EXAMPLES OF DEFICIENCY DISEASES**

<b>Deficiency disease</b>	<b>Deficiency (lack of)/food value lacked</b>
Marasmus	Carbohydrates
Kwashiorkor	Proteins
<b>Vitamin deficiency diseases</b>	
Night blindness	Vitamin A
Beriberi	Vitamin B <sub>1</sub>
Pellagra	Vitamin B <sub>3</sub>
Scurvy	Vitamin C
Rickets/osteoporosis	Vitamin D
Infertility	Vitamin E
Hemorrhagic disease/Vitamin K deficiency bleeding	Vitamin K
<b>Mineral salt deficiency diseases</b>	
Anemia	Iron
Rickets/Osteoporosis	Calcium
Goitre	Iodine

### **Malnutrition**

- This is the lack of some food values in the body

#### **Causes of malnutrition**

- Poverty
- Shortage of food
- Ignorance about balanced diet
- Food taboos
- Inadequate breastfeeding

#### **Signs of malnutrition in children**

- Swollen belly
- Reduced night vision
- Swollen moon face
- Stunted growth
- Swollen legs
- Poor healing of wounds
- Swollen moon face
- Little brown hair
- Bleeding gums
- Poor growth of teeth
- Too much sleeping

#### **Symptoms of malnutrition in adults**

- Tiredness/fatigue
- Loss of interest in work
- Low concentration at work

#### **Prevention of deficiency diseases**

- By feeding on a balanced diet

### **HEREDITARY DISEASES**

- These are diseases that are passed on from parents to off springs through defective genes.

#### **Examples of hereditary diseases**

- Sickle cell anemia
- Epilepsy
- Haemophilia
- Hypertension

### **METABOLIC DISEASES**

- These are diseases that disrupt the normal process of converting food into energy in the body cells

#### **Examples of metabolic diseases**

- Diabetes
- Obesity
- Liver cancer

## **SELF-INFLICTED DISEASES**

- These are diseases caused due to poor health life styles

### **Examples of self-inflicted diseases**

- Lung cancer
- Emphysema
- Heart attack
- Kidney stones
- Liver cirrhosis

### **Examples of poor healthy life styles**

- Smoking
- Alcoholism
- Over eating
- Lack of physical exercises
- Inadequate sleep

### **Examples of good healthy life styles**

- Doing regular physical exercises
- Getting immunised
- Resting after meals
- Bathing daily
- Feeding on a balanced diet
- Having enough rest
- Going for regular medical checkups

## **HEALTH CONCERNS**

- These are health problems that affect the community and need immediate solutions

### **Examples of health concerns**

- Poor sanitation
- Inadequate food
- Poor water supply
- Anti-social behavior

## **POOR SANITATION**

- This is the general dirtiness of a place where we stay

### **Causes of poor sanitation**

- Poor disposal of human wastes
- Poor disposal of rubbish
- Sharing a house with domestic animals
- Lack of clean water supply
- Poor drainage in a home
- Bursting of sewage pipes
- Overcrowding in a home

### **Why is it unhealthy practice to defecate in bushes near our homes?**

- It leads to outbreak of faecal diseases

### **Signs (indicators) of poor sanitation**

- Tall grass in the compound
- Poor ventilation of a house
- Bushes around homes
- Sharing houses with animals
- Bad smell in a place
- Many insect vectors in a place
- Still water near our homes
- Rubbish in the compound
- Faeces in the compound
- Dirty water sources

### **Diseases associated with poor sanitation**

- Dysentery
- Malaria
- Cholera
- Typhoid
- Bilharziasis
- Trachoma
- Poliomyelitis
- Diarrhoea
- Leprosy

### **Dangers (effects) of poor sanitation**

- Bad smell in the place
- Outbreak of diarrhoeal and faecal diseases
- Outbreak of mosquito borne diseases
- Easy contamination of water sources
- Multiplication of vectors and germs

### **Solutions/control of poor sanitation (ways of promoting proper sanitation)**

- By proper disposal of rubbish
- By proper disposal of human wastes
- Picking rubbish around homes
- Burning rubbish at home
- Sweeping rubbish in the compound
- Draining still water
- Smoking ordinary pit latrines
- Slashing tall grass in the compound
- Cutting bushes around our homes
- Treating sewage before it is disposed off
- Protecting and sweeping around water sources
- Spraying insect vectors with insecticides
- Avoid sharing a house with domestic animals
- Scrubbing the floor of latrines
- Mopping the floor of the house
- Avoid sharing a living house with domestic animals

### **INADEQUATE FOOD (FOOD INSECURITY)**

- This is the condition when the family or community does not have enough food to eat throughout the year
- This is a condition when the available food is not enough to meet the people's daily nutritional needs

### **Causes of inadequate food**

- |                                |                                 |
|--------------------------------|---------------------------------|
| ▪ Rapid population growth      | ▪ Poverty                       |
| ▪ Crop pests and disease       | ▪ Floods                        |
| ▪ Poor soils (infertile soils) | ▪ Wars                          |
| ▪ Inadequate land for farming  | ▪ Poor attitude towards farming |
| ▪ Poor farming methods         | ▪ Laziness                      |
| ▪ Drought                      | ▪ Low level of technology       |

## **FOOD SECURITY**

- This is the condition when the family or community have enough food to eat throughout the year
- This is a condition when the available food is enough to meet the people's daily nutritional needs

### **Importance of food security**

- It prevents malnutrition
- It prevents deficiency diseases
- It prevents famine

### **Solutions to inadequate food (ways of promoting food security)**

- By growing enough food crops
- By food preservation
- By growing drought resistant food crops
- By promoting family planning
- By proper storing of harvested food crops
- By practising better farming methods
- By growing drought resistant food crops
- By growing food crops that mature faster
- By avoiding the habit of selling food crops for money
- By providing soft loans to farmers
- By providing irrigation facilities to farmers in dry season

## **POOR WATER SUPPLY**

- This is the condition when the community does not have enough clean water to meet their needs

### **Causes of poor water supply**

- Drought
- Floods
- Wars
- Over population
- Silting
- Swamp drainage

### **Solutions/measures on how to overcome poor water supply**

- By extending piped water to rural areas
- By protecting wetlands
- By protecting open water sources from contamination
- By educating people the importance of protecting water sources
- By constructing boreholes and taps

### **Effect of poor water supply**

- It leads to spread of water associated diseases
- It leads to poor sanitation

## **ANTISOCIAL BEHAVIOUR**

- These are habits which are not accepted in the community

### **Examples of antisocial behaviour (social problems in the community)**

- Telling lies (deception)
- Bullying
- Stealing
- Using bad language
- Arson (fire setting)
- Fighting
- Smoking
- Violence and aggression
- Alcoholism
- Truancy
- Child prostitution
- Premarital sex
- Drug abuse
- Raping
- Disobedience
- Wandering (running away from home)
- Abortion

### **Juvenile**

- This is a young person below 18 years.

### **Juvenile delinquent**

- This is a young person who commits a bad act which violates law

### **Juvenile delinquency (delinquency)**

- This is a bad act committed by a young person below 18 years which violates law

### **Criminal**

- This is an adult who commits a bad act which violates law

### **Crime**

- This is a bad act committed by an adult person which violates law

### **Causes of antisocial behaviour and delinquency**

- Peer influence
- Pampering of children
- Media influence
- Over strictness by parents or teachers
- Failure to enforce rules in a community
- Inconsistence on standards of behaviour
- Ignorance of society rules/laws
- Unfulfilled expectations
- Bad teaching by teachers
- Poor social environment

### **Effects of antisocial behaviour and delinquency**

- Dropping out from schools
- Imprisonment
- Young people develop into adult criminals
- Rejection by parents
- Teenage/adolescent pregnancy

### **How to control antisocial behaviors and delinquency in schools**

- Forming health clubs in schools
- Pupils should avoid bad peer groups
- Delinquents should be taken to reformatory schools
- Slightly punish children for wrong behaviour
- Parents must have good morals all the time
- Pupils should not go to discos
- Treating children equally
- Children can participate in religious choirs
- Children should be counselled and guided
- Parents should avoid quarrels and divorce in marriage
- Children should not watch pornographic films
- Children should be engaged in games and sports



## **TRUANCY**

- This is when a school-age child frequently misses school without good reason

### **Causes of truancy**

- Bad teaching by teachers
- Boredom in class
- Overcrowding in classes
- Peer pressure
- Bullying
- Learning difficulties in some subjects
- Attractions from outside the school like discos and cinema halls
- Poor grades
- Teenage pregnancy
- Mental health issues
- Child neglect

## **VIOLENCE**

- This is the intentional use of physical force to self-harm or harm others
- This is the state in which the a person is aggressive and has a destructive behaviour

### **How does masochism differ from sadism?**

- Masochism is the enjoyment of experiencing pain **while** sadism is the enjoyment of causing pain to others

## **SEXUAL DEVIATIONS**

- These are sexual practices that are not accepted in the community

### **Examples of sexual deviations**

- **Bestiality**; sexual activity with a nonhuman animal
- **Masturbation**; touching or rubbing your own genitals for sexual pleasure
- **Homosexuality**; sexual attraction to a person of your own sex e.g lesbianism
- **Oral sex**; using mouth, lips or tongue to stimulate your partner's genitals
- **Anal sex**; putting penis or finger into a person's anus for sexual pleasure
- **Incest**; sexual activity between close relatives
- **Necrophilia**; sexual activity with a corpse (dead body)
- **Pedophilia**; sexual attraction to young children
- **Fetishism**; sexual attraction to non-living objects
- **Bisexuality**; sexual attraction to members of either sex

### **Causes of sexual deviations**

- Peer influence
- Exposure to pornography
- Poverty
- Ignorance on dangers of sex deviations
- Drug abuse
- Greed for money

### **Effects of sexual deviation**

- Contraction of STDs
- Dropping out from schools
- Loss of respect
- Rejection by the community
- Imprisonment
- Rejection by parents
- Family breakup

### **Ways of avoiding sexual deviations**

- Avoid groups that practice sexual deviations (Have good friends)
- Join good productive clubs
- Avoid watching and reading pornographic materials
- Parents should provide proper counseling and guidance to their children
- Encourage sex education to youth in school and at home
- Get advice from respectable people (e.g religious leaders)
- Avoid drug abuse
- Engage in games and sports during your free time

### **Reasons why some societies condemn sexual deviations**

- They oppose religious teachings
- They are a source of some STDs
- They oppose the laws of nature
- They bring a curse to the family

### **Ways of addressing health concerns**

- Constructing pit latrines
- Supply of clean water
- Constructing rubbish pits
- Through healthy surveys
- Draining still water
- Through demography
- Providing good nutrition
- Through health education
- Treating the sick
- Through child to child programme

### **HEALTH EDUCATION**

- This is the way in which community members are informed on how to solve their health problems

### **Importance of health education**

- It helps people to address health concerns
- It helps people to know the value of good health
- It helps people to maintain proper sanitation
- It helps people to promote proper personal hygiene
- It helps people in preventing the spread of some diseases
- It reduces poor traditional beliefs about diseases

### **Ways of providing health education**

- Through health songs
- Through health programmes on media (e.g newspapers, radios and televisions)
- Through health debates and discussions
- Through forming health clubs

### **HEALTH SURVEY**

- This is a way of collecting information about health concerns of a family or community

### **Health data**

- This is the information collected during a health survey

### **Importance of health surveys to the government**

- They help a government to know the population's health status
- They help a government to solve health concerns

### **Ways of making health survey**

- Through interviews
- Through questionnaires
- Through observations

### **Groups of people who carry out health surveys**

- Health workers
- Community leaders
- Members of the media

### **Kinds of information collected during a health survey**

- Health services in an area
- Common sickness in the community
- Ways of preventing common sickness
- Immunization coverage
- Food security in the area
- Housing information

### **Housing information collected during health survey**

- Type of houses
- Size of each house
- Ventilation of the house
- Number of people who live in each house

### **Immunisation information collected during health survey**

- The number of children immunized
- The ages of the children immunised
- Disease immunized

### **Health services information collected during a health survey**

- Number of public health centres and private health centres
- People's response towards medical services and herbal services

### **Examples of health services provided by health centres**

- Family planning
- Ante-natal and post-natal care
- Immunisation
- Oral health care
- Health education
- Counselling and guidance
- Control of diarrhoeal diseases (CDD)
- X-ray

### **Groups of people found in health units**

- Doctors
- Nurses
- Lab technicians
- Midwives
- Clinic officers
- Surgeons
- Pharmacists
- Gynaecologists

### **DEMOGRAPHY**

- This is the scientific study of changes in human populations

### **Importance of demography**

- It helps the government to plan for health services of its population
- It helps the government to determine the population structure of an area
- It helps the government to know the birth and death rates

### **Kinds of information collected during demography**

- Birth rates
- Death rates
- Migration
- Housing information

### **YOUNG PARENTS**

- These are young girls and boys who give birth before the age of consent.

### **Young mother**

- This is the girl who gives birth before the age of consent

### **Young father**

- This is a boy who gives birth before the age of consent

### **Problems faced by young parents**

- Lack of skills to manage the family
- Lack of financial support
- Isolation by friends
- Dropping out from schools
- Ignorance about caring for the baby
- Risks of abortion
- Risks of getting STDs
- Obstructed labour

### **HOW TO AVOID HEALTH AND SOCIAL PROBLEMS**

- Construct latrines for proper disposal of faeces and urine
- Construct rubbish pits for proper disposal of rubbish
- Join good social clubs (e.g young farmers' clubs and sports clubs)
- Provide counselling and guidance to people with health problems
- Get health education about drug abuse and prevention of diseases
- Avoid premarital sex

### **FAMILY BUDGET**

- This is the statement which shows how the expected family income is spent

### **FAMILY BUDGETING**

- This is an advance plan of how the expected family income is to be spent

### **Advantages of family budgeting**

- It prevents debts
- It prevents over spending
- It promotes saving in the family
- It reduces quarrels in a home over money
- It gives priority to essential needs of the family

### **Types of family budgeting (systems of budgeting)**

- Allowance budgeting
- Joint control budgeting
- Handout budgeting

### **Allowance budgeting**

- This is when a money earning family member gives allowances to the house wife and keeps the balance for his own use

### **Joint control budgeting**

- This is when both the wife and husband earn and share expenses of family needs

### **Handout budgeting**

- This is when one family member controls the family income and pays what is on demand

### **Components of family budgeting (ways of managing family budgeting)**

- Planning
- Prioritizing
- Evaluation
- Accounting
- Strict management

**Prioritizing** enables essential family needs to be catered for first

### **SCHOOL HEALTH CLUB/COMMITTEE (COMMUNITY HEALTH COMMITTEE)**

- This is a group of people in a school or community members who work together to promote good health

### **Members of the school health committee**

- School nurse
- Sanitary prefects
- Science teachers
- Senior man and woman
- School cleaners
- Food mess

### **Activities/roles/duties of a school health committee**

- Organizing health parades
- Organizing class health meetings
- Organizing general cleaning activities
- Organizing health education seminars
- Reporting any diseases outbreak
- Discouraging anti-social behaviour
- Designing health rules
- Identifying school children who are not immunised
- Inviting health workers to sensitize school children about health issues

### **HEALTH PARADES**

- This is an assembly done at school to check on children's hygiene

### **Activities carried out at a health parades**

- Checking children with unbrushed teeth
- Checking children with long fingernails
- Checking children with dirty uniforms
- Checking children with uncombed hair
- Checking children with jiggers

### **Why are health parades done? (Importance/reasons for carrying out health parades)**

- To promote personal hygiene among school children
- To promote good health among school children
- They promote child to child programme

### **Which element of Primary Health Care (PHC) is promoted on health parades?**

- Personal hygiene

### **CHILD TO CHILD PROGRAMME**

- This is a programme in communities where older children help the young ones to promote good health

### **A symbol showing child to child programme (approach)**



### **Activities done in child to child programme**

- Older children teach young children how to use a latrine
- Older children teach young children how to brush their teeth
- Older children teach young children to wash hands before meals
- Older children teach young children to wash hands after visiting latrines

### **Importance of child to child programme**

- It prevents the spread of some communicable diseases among children
- It promotes good healthy lifestyles among children
- It improves health among children