P.7 SCIENCE LESSON NOTES TERM 1

(LESSON ONE)

Topic 1: MUSCULAR – SKELETAL SYSTEM

VOCABULARY / New words.

- **Skeleton**
- **Posture**
- **Bones**
- **joint**

Muscular – Skeletal System (lesson one)

It is a system that gives animals the ability to move. It is a composition of bones and muscles

A SKELETON

It is the body part that forms the supporting structure of an organism.

HUMAN SKELETON**:** It is the frame work of bones in the human body.

An adult human being has about 206 bones. Babies have more bones than adults.

TYPES OF SKELETONS.

1. **Exoskeleton**. The hard material is formed on the outside part of the body.
   Examples of organisms with exo skeleton are: insects and crustaceans.
   These animals grow by **ecdysis / moulting.Moulting allows organisms to increase in size**
2. **Endoskeleton**. The animals have bony skeletons within their bodies.
   Examples of organisms with endo skeleton are: people, cows, goats etc.
3. **Hydrostatic skeleton**. This is where the pressure of the fluid andaction of the surrounding muscles are used to change the shape of an organism and produce movement.

Examples of organisms with hydrostatic skeleton:

snails, **earth worms**, **slugs, star fish, jelly fish, sea urchins** etc.

Exercise

1. **What name is given to a frame work of bones in humans?**
2. **How is ecdysis important to insects?**
3. **What type of skeleton do the following have:**
   a) a slug b) a tortoise
4. **How can you care for your bones?**

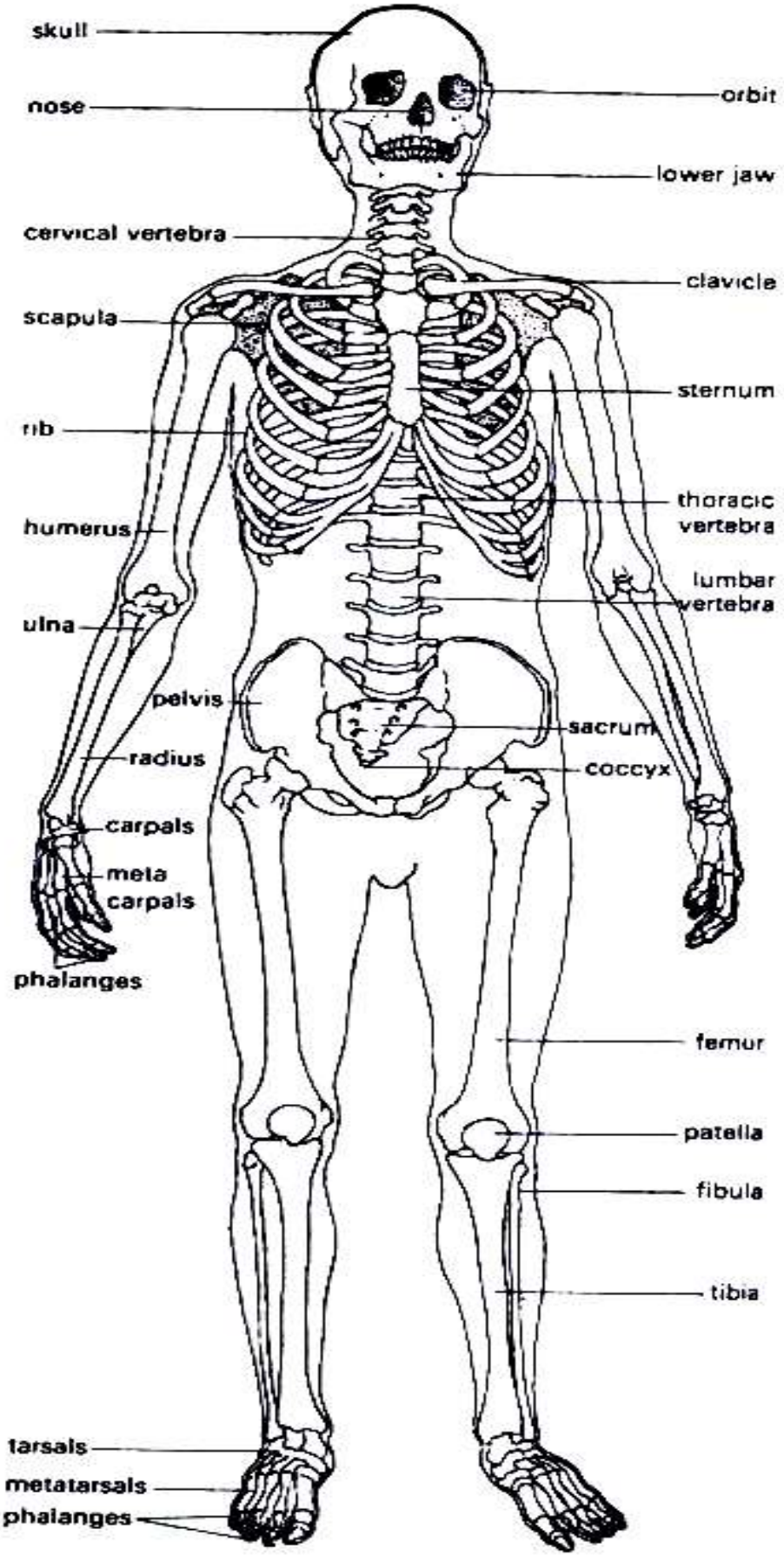
THE HUMAN SKELETON

This is the framework of bones in the human body.

Composition of the human skeleton

- The back bone
- The skull
- The limbs (legs and arms)
- The limb girdles (pelvis and shoulder blade)

STRUCTURE OF HUMAN SKELETON



Identify the parts of the skeleton.

Exercise

1. Name the bones found in the following parts
   i) Thigh
   ii) Upper arm

2. Which body organs are protected by the following?
   a. Skull
   b. Ribcage
   c. Draw the femur bone

Classifications of bones.

1. **Long bones**-e.g.**femur**, **tibia**,fibula,**humerus, radius, ulna**, clavicle, metacarpals, metatarsals

They contain the **white** bone marrow used to produce **white blood cells.**

2. **Short bones**- e.g. tarsals, carpals, patella

They contain **red bone marrow** usedto produce **red blood cells.**

Red blood cells are **destroyed** in the **liver or spleen**.

3. **Flat bones** -e.g. **pelvis, sternum**, **cranium (skull),rib and scapula.**

4. **Irregular bones -**Bones of the neck **vertebr**a, sacrum, maxilla, mandibles, temporal bones

Note:-

i) The class of food that helps in the formation of strong bones is mineral salts.

ii) The mineral salts that help in the formation of strong bones are calcium and phosphorus.

Activity

1.Why do babies have many bones than adults?

2.State any two examples of each of the bones below:

a) Long bones b) irregular bones

LESSON THREE:**JOINTS**

Key words:

- ✓ Cartilage
- ✓ Synovial fluid
- ✓ Movable
- ✓ Immovable

Classes of joints

1.Movable joints
2.Immovable joints

Immovable joints

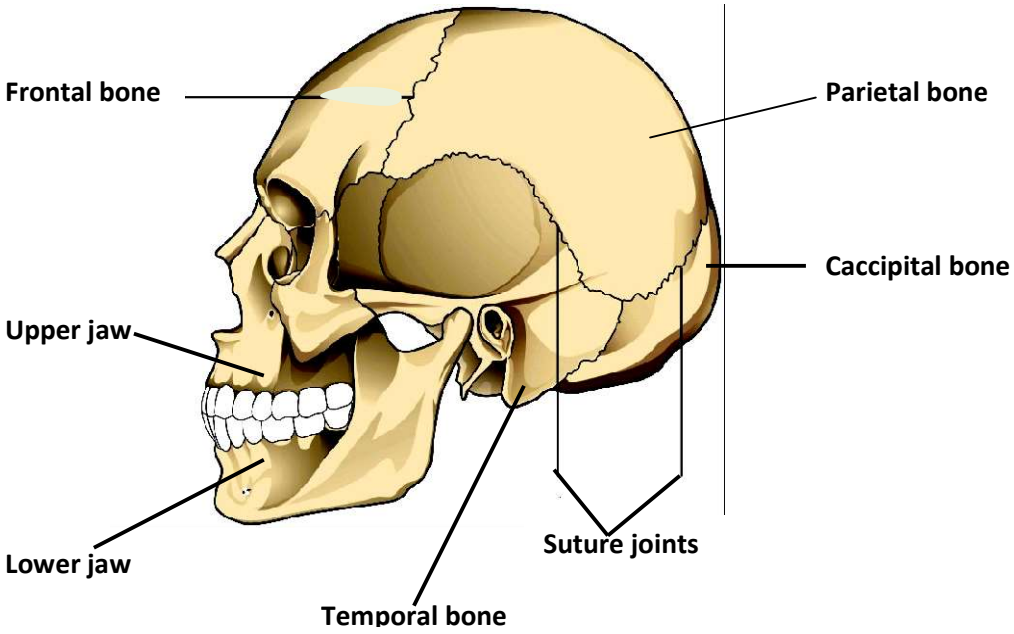
These are joints which do not allow movement in the body.

Examples of immovable joints

- Suture joints

Suture joints are joints found in the skull

A diagram showing a suture joint



Movable joints

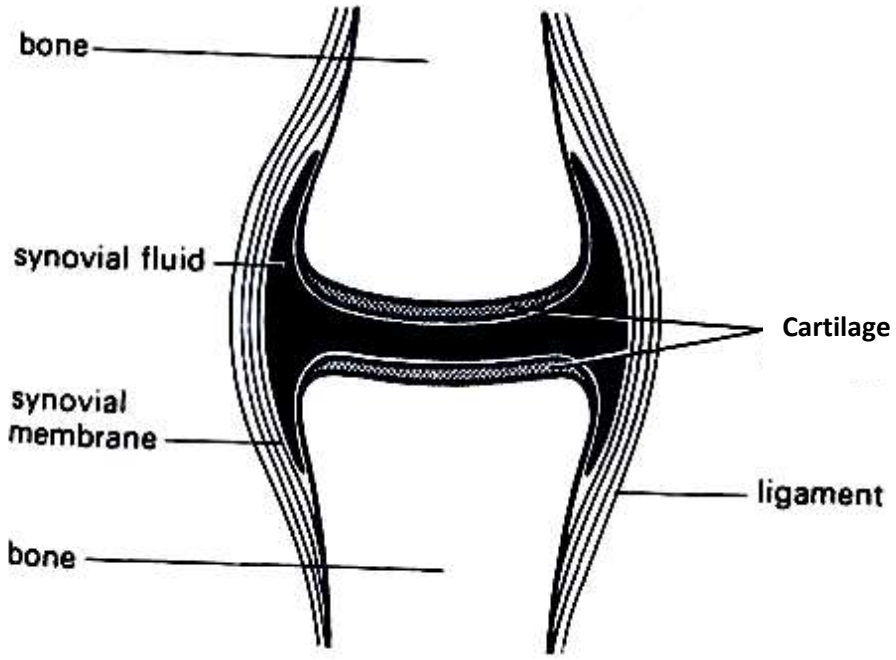
These are joints which allow movement in the body.

Types of movable joints.

1.Ball and socket joints
2.Hing joints
3.Glioding joints
4.Pivot joints

Hinge joint-It allows movement in one plane e.g. knee, elbow, knuckle

Joint in the knee

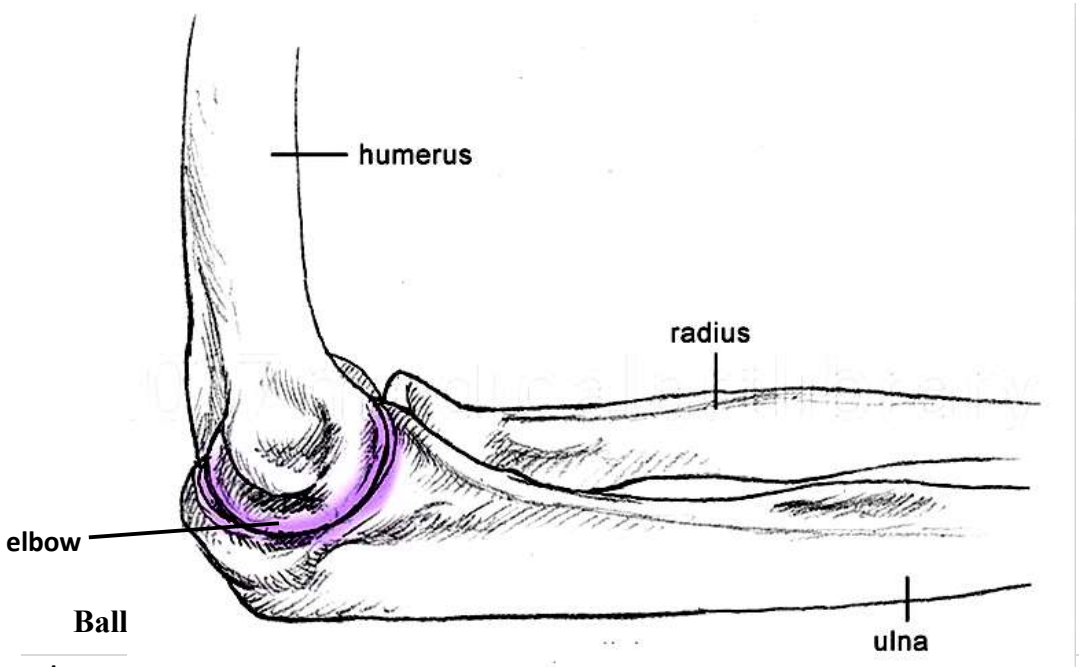


Joints comprise of**: tendons, ligaments, cartilage and Synovial fluid**

A Tendonis a tough fibrous tissue that connects muscles to bones.
A Ligament is a fibrous elastic tissue that joins a bone to a bone.

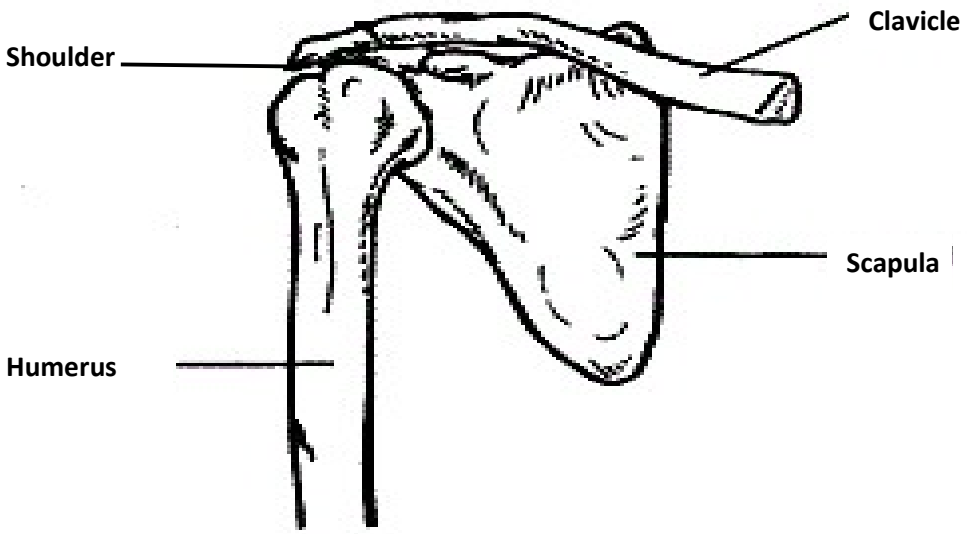
Cartilage prevents the bone ends from frictional damage after rubbing directly onto each other.
Inside a joint is **a lining of synovial membrane** which secretes **synovial fluid.**
Synovial fluid reduces **friction** in a joint and allows free movement of bones.

Joint in the elbow

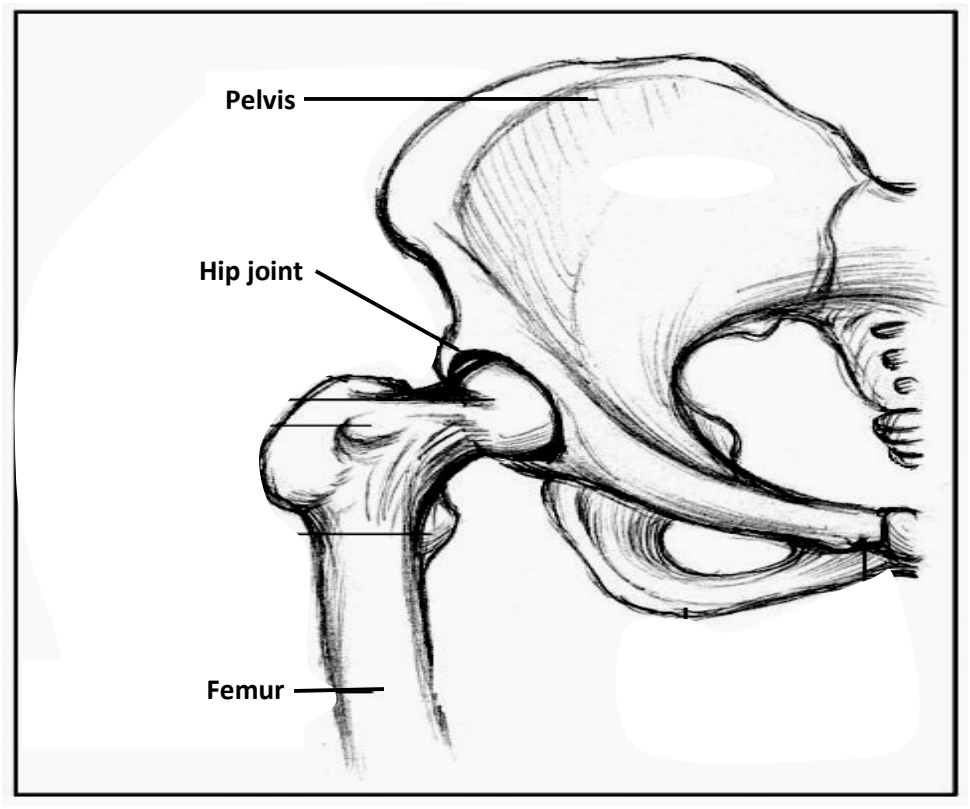


Ball

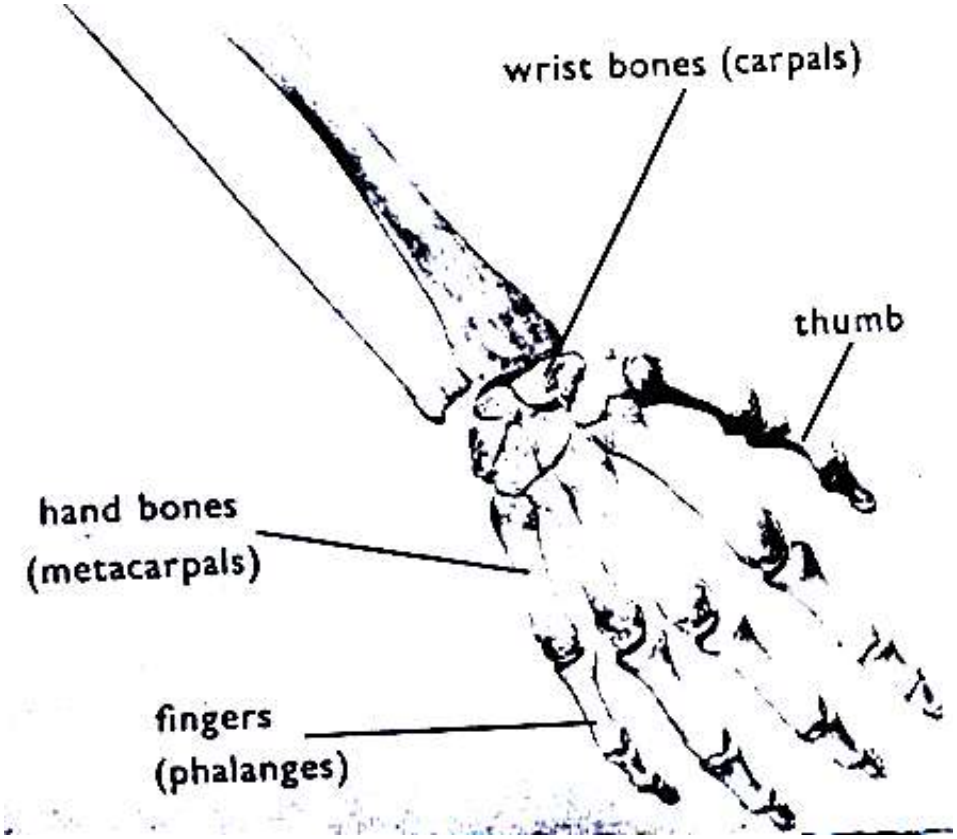
Joint in the shoulder



Joint in the hip



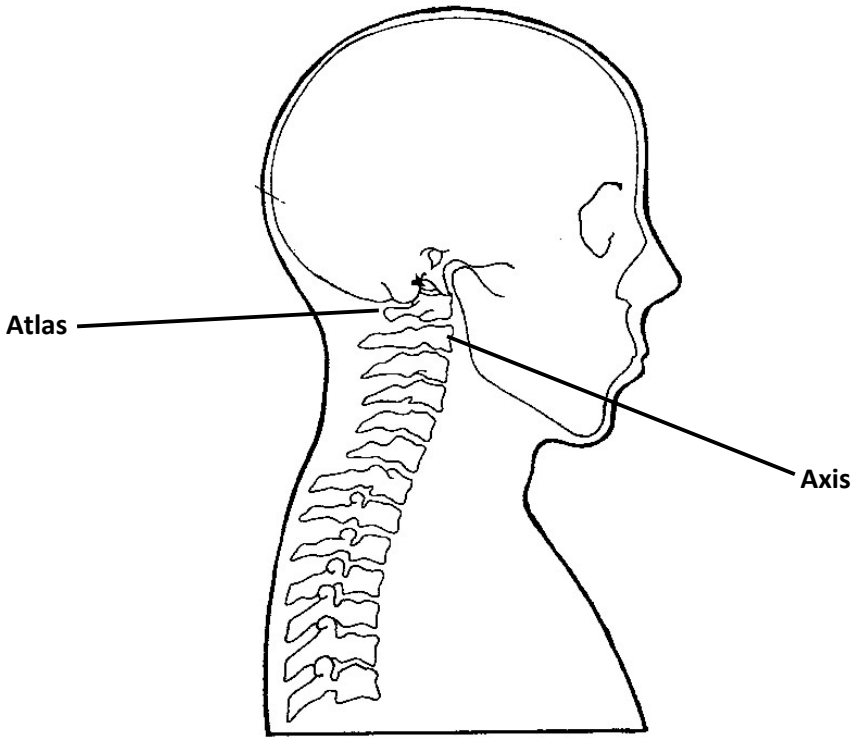
Gliding joint- They allow flat bones to slide over one another.eg wrist/ ankle



Pivot joint

This is a type of joint that allows rotation of certain bones in the body on another fixed bone e.g. the neck

Joint in the neck



How is a joint adapted to a friction free movement?

-It contains synovial fluid which reduces friction at the joint.

-The bones are covered with cartilage at the ends.

Activity

1. Identify the parts of the body where joints are found.
2. How are joints important to a boy of 4 years?
3. What name is given to a place where two bones meet in the human body?
4. Write down any one example of a hinge joint.
5. Why is a shoulder joint said to be a movable joint?
6. Name the substance in the human body that helps to reduce friction.

LESSON FOUR:MUSCLES

New words

- Muscles
- Voluntary
- Joint
- Skeleton

- A muscle is an elastic bundle of flesh under the skin that is attached to bones.
- A muscle is a special elastic tissue that contracts and relaxes to produce movement.

Types of muscles

There are three types of muscles;

These are;
i. skeletal muscles

ii. smooth muscles

iii) cardiac muscles

Skeletal muscles

These are muscles which are attached to the skeleton. They allow movement in the body

Examples of skeletal muscles

i) Biceps muscle
ii) Triceps muscle
iii) Calf muscle

Smooth muscles

These are muscles that make up different internal body organs

Examples

i) Muscles of the intestines
ii) Sphincter muscles
iii) Ciliary muscles of the eyes

Cardiac muscles

These are muscles of the heart

Note:

They are thick and harder tissues that pump blood out of the heart.

Note:-

Muscles are classified into two major groups i.e.

i) Voluntary muscles
ii) Involuntary muscles

Voluntary muscles

These are muscles whose movements can be controlled by one's will.

Examples

- Biceps muscles
- Triceps muscles

Involuntary muscles

These are muscles whose movement cannot be controlled by one's will.

Examples

i) Muscles of the intestines
ii) Ciliary muscles of the eye
iii) Cardiac muscles
iv) Sphincter muscles

Importance of muscles

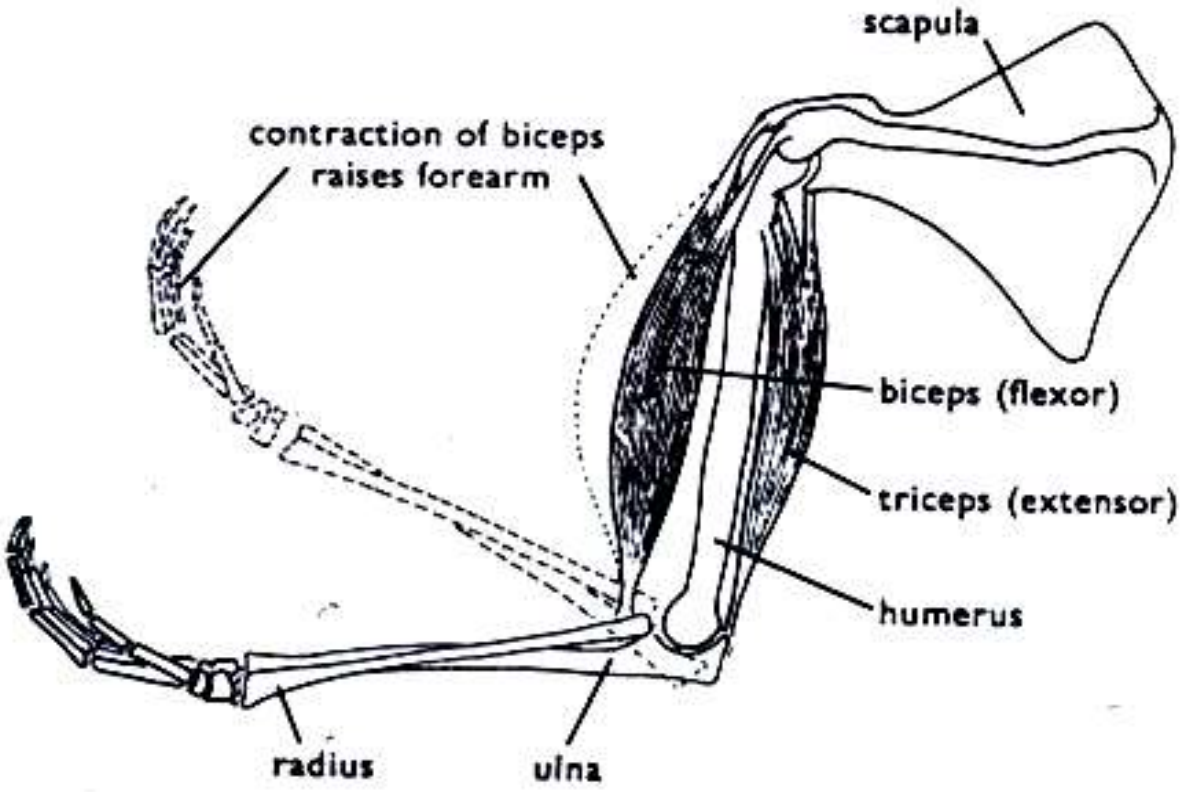
- They help the body in movement
- They are used in the storage of oxygen by the help of myoglobin
- Heart muscles pump blood in the body.
- They aid in breathing (intercostal muscles).
- Muscles of the alimentary canal aid in peristalsis

Antagonistic muscles

These are muscles that work in pairs but have an opposite effect to each other.

Examples of antagonistic muscles include;

i. Biceps (flexor) ii.Triceps (extensor)



Activity

1.Identifying the muscles of the arm.
2.Moving the hand to observe contraction and relaxation of the muscles.

Questions

1.What is a muscle?
2.State any two types of muscles in our bodies.
3.Why arethe triceps and biceps muscles referred to as antagonistic muscles?
4.How are muscles useful in our bodies?
5.Cite any one disorder to the body muscle.
6.How can you care for your muscles?

LESSON FIVE: FUNCTIONS OF THE SKELETAL& MUSCULAR SYSTEM

Vocabulary

- spinal cord
- Vertebral column
- Deficiency

1. Protects the delicate body organs

- The **skull** protects the **brain,** the **eyes**, and the **middle** and **inner ears.**
- The **vertebrae** (backbone) protect the**spinal cord**.
- The **rib cage**, **spine,** and **sternum** protect the **lungs, heart**.

2. Itprovides supports to the body.
3. It helps in movement.
4. It gives the body shape.
5.It manufactures blood cells.
6.It provides room for attachment of muscles.

Protective functions of the skeleton

- The skull protects the brain, eyes and inner ear.
- The ribcage protects the lungs and the heart.
- The pelvis protects the female reproductive system.

LESSON SIX: DISEASES AND DISORDERS OF BONES, MUSCLES AND THE SYSTEM

Disease of the skeleton

- ✓ Polio
- ✓ Tuberculosis
- ✓ Cancer of the bones
- ✓ Rickets
- ✓ Arthritis

Diseases of the muscles

- ✓ Tetanus
- ✓ Leprosy

Polio

- ✓ It is caused by a virus
- ✓ It is also called poliomyelitis

How it is spread

- ✓ Through drinking contaminated water.
- ✓ Through eating contaminated food

Effects of polio

- ✓ Paralysis of limbs
- ✓ Weakness of the limbs
- ✓ Fever

Control of polio

- ✓ Immunize using polio vaccine
- ✓ Drink boiled water
- ✓ Wash hands with soap and water before eating food
- ✓ Proper use of latrines

Tuberculosis

- ✓ It is caused by bacteria

How it spreads

- ✓ Breathing in contaminated air
- ✓ Drinking unboild milk.

Signs and symptoms

- ✓ Paralysis of the legs
- ✓ Pain in the back bone
- ✓ Long lasting painful backache

Control of tuberculosis

- ✓ Immunize using BCG vaccine
- ✓ Early treatment of the infected person
- ✓ Drinking boiled milk

Rickets

- ✓ It is caused by lack of vitamin D, calcium or phosphorus in the body.

Signs and symptoms of rickets

- ✓ Weak bones
- ✓ Poor teeth development
- ✓ Bow legs / knock knee legs

Prevention of rickets

- ✓ Eating food rich in vitamin D, calcium and phosphorus.
- ✓ Exposure to morning sunshine.

Tetanus

- ✓ It is caused by bacteria
- ✓ The bacterium enters the body through fresh cuts or wounds.
- ✓ It attacks the muscles

Signs and symptoms of tetanus

- ✓ Stiff muscles allover the body
- ✓ Spasm (pain) allover the body

Control of tetanus

- ✓ Immunize using DPT vaccine
- ✓ Early treatment of the infected person.

Leprosy

- ✓ It is caused by bacteria.
- ✓ It affects the skin

Effects of leprosy

- ✓ It can cause loss of toes, fingers, hands and feet.

Control of leprosy

- ✓ Early treatment

Disorders of the skeleton

- ✓ Fractures
- ✓ Sprain
- ✓ Dislocation

Disorders of the muscles

- ✓ Cuts
- ✓ Strains
- ✓ Hernia
- ✓ Prolapse
- ✓ Muscle wasting

Prevention of diseases and disorders of bones, muscles

i. Boil water for drinking to prevent polio.
ii. Prepare and eat a balanced diet**.**
iii. Do physical exercises.
iv. Keep sharp cutting objects far from children's reach.
v. Go for dental checkups *regularly.*
vi. Put on shoes while walking.

Health habits that help to keep the system in a healthy working condition

1. Do daily physical exercises.
2. Eat a balanced diet.
3. Ensure proper body posture.
4. Brush and floss your teeth twice a day.

Exercise

1. Which part of the skeleton is protected by the eyes?
2. How is the skeleton important to the circulatory system?
3. Which immunizable disease attacks both bones and muscles?
4. Apart from immunization, , how else can the disease in (3) above be prevented?
5.

LESSON SEVEN:POSTURE

Vocabulary

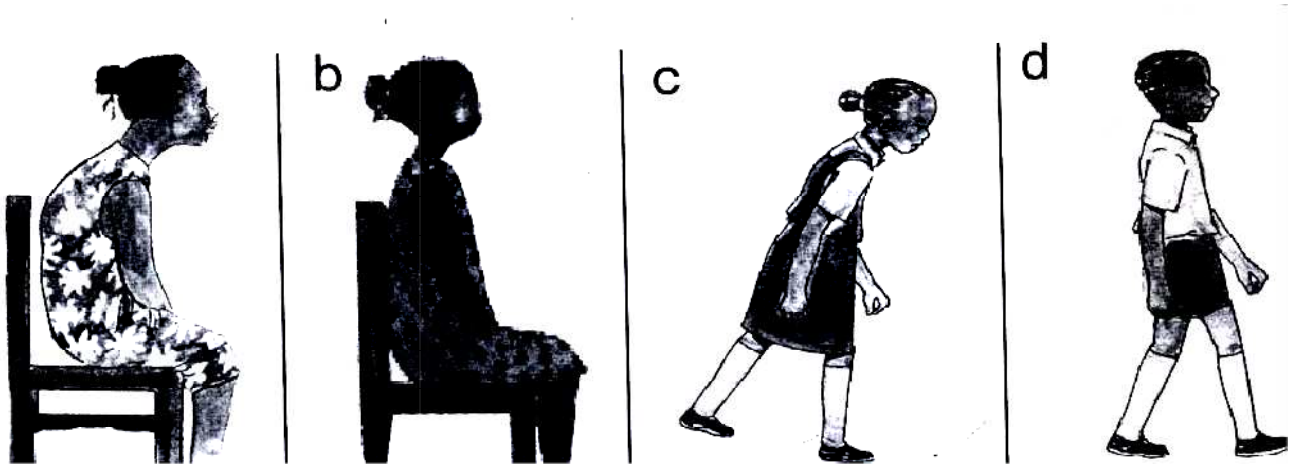
- **Posture**

Posture

It is a way a person positions his body when sitting, standing or walking

The correct sitting Posture

- ✓ Sit up straight on the chair.
- ✓ Place both feet on the floor.
- ✓ Put all your weight on both bottoms.
- ✓ Do not tighten your ankles and knees.



Importance of correct posture

I. Promotespropergrowth of bones and muscles
II. Itaidsproperfunctioning of bodysystem

Dangers of badposture

1.Leads to poor growth of bones and muscles.
2.Leads to deformation of bones
3.Prevents body systems from functioning well.
4.Causes back and chest pain.

TOPICAL QUESTIONS

1. Which class of food is necessary for proper growth of bones?

2. Write down one example of each of the following

a) Skeletal muscles b) Smooth muscles

3. What is the functional difference between ligaments and tendons?

4. State one disorder to each of the following

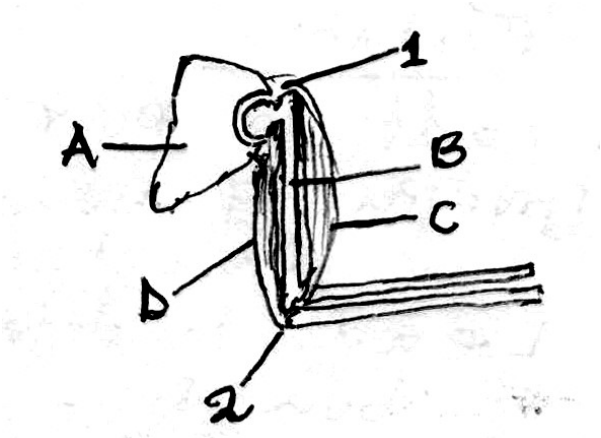
a) Ligaments b) tendons.

5. Which part of the skeleton protects the following?

a) Brain b) tendons

6. State one health habit that can keep one's skeleton in a healthy working condition.

TOPICAL TEST

1. In one sentence, give the meaning of a skeleton.
2. What type of skeleton is common to a tortoise?
3. Give two importance of askeleton to the circulatory system.
4. Which part of the skeleton protects the spinal cord?
5. How is a sprain different from a strain
6. Name two body parts where gliding joints are found
7. 

a) What type of bone is marked A?
b) Name the bones A and B
c) How is joint 1 different from Joint 2?
d) What happens to muscle C when the arm is bent upwards?

8. a) Identify any disease which attacks both the bones and muscles
   b) Write the cause of the above disease
   c)State any two ways of controlling tuberculosis
   d)Give the main functions of the following:-
      i) Tendon
      ii) Cartilage
      iii) ligament
9. State any two dangers of bad posture
10. Name two bones that form a Joint at the elbow.

TOPIC 2: ELECTRICITY AND MAGNETISM (week two)

VOCABULARY

- **Electricity**
- **Circuit**
- **Insulator**
- **Dynamo**
- **Device**
- **-Fuse**
- **-Switch**
- **-Magnet**
- **-Electro – magnet**

Electricity

This is the form of energy associated to the presence of electric charges.

Sources of electricity

- Cells i.e. Dry cell, Simple cell, chemical batteries, solar cell accumulators
- Running water
- The sun
- Fossil fuels
- Wind

Note:
Electrical energy is the form of energy carried by electric currents.

ELECTRIC CELLS

Types of cells

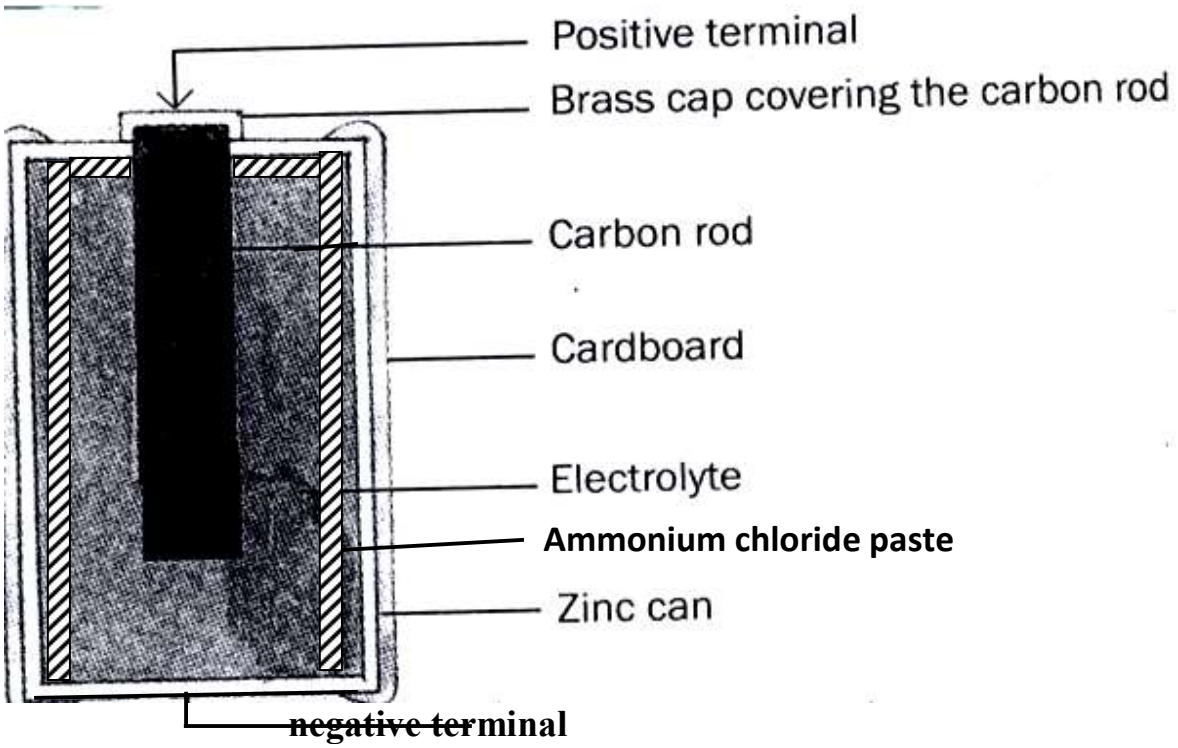
1. **Primary cells** e.g.), Dry cells, a simple cells (wet cell)
2. **Secondary cells/accumulators/storage cells.** E.g. lead batteries, solar cells.

The dry cell

Dry cell
A dry cell is an electric cell.

- It stores chemical energy.
- It changes chemical energy to electrical energy.
- It produces electrical energy.

Structure of a dry cell



Functions of each parts of a dry cell

1.Bras cap: It acts as the positiveterminal and contact.

2. Carbon rod: It is a non metallic conductor of electricity.

3. Electrolyte: A liquid that conducts electricity.

4. Zinc can: A container in which the dry cell content is put and it acts as a negative terminal.

5.Insulating top seal: It prevents the jelly from drying up.

Note:

- A dry cell has voltage of 1.5 volts
- The energy needed to push an electric current through a electric circuit is called **voltage**. Voltage is measured in volts.

Calculating voltage

Exercise:

1.Juliet's radio uses seven dry cells. How many volts are needed if he is to use it to listen to news.

Solution:

2.Identify any one source of electricity.

3.Suggest any one cause of dry cells losing their energy.

4.How is the carbon rod useful in a dry cell?

5.What is the difference between electricity and electric energy

LESSON TWO: SIMPLE CELL/ WET CELL

Vocabulary

- Electricity
- Carbon rod
- electrodes

Simple Cell

It consists of a zinc plate and a copper plate dipped in dilute sulphuric acid.

The zinc plate acts as the **negative**terminal.

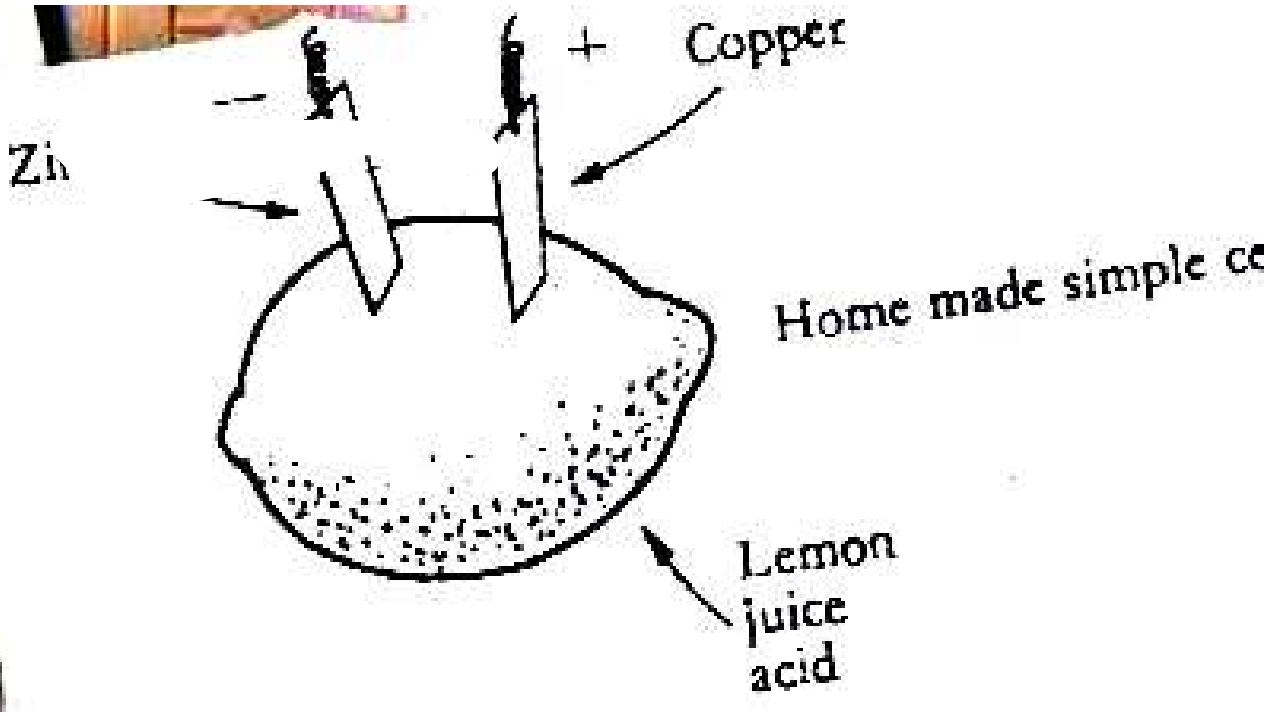
The copper plate acts as the **positive**terminal.

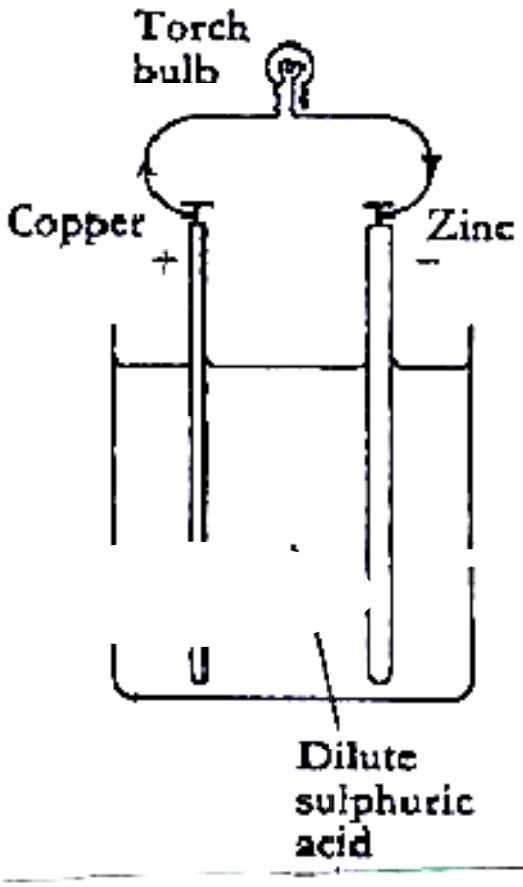
Sulphuric acid acts as the **electrolyte**.

The zinc and copper rods are called **electrodes**

An electrode is a piece of metal that allows electric current to pass through it when placed in an electrolyte.

HOME MADE SIMPLE CELL





Note: Conventionally current is taken as flowing from positive to negative but actually electrons flow from negative to positive

The simple cell

The bulb connected across the cell, begins to glow but after only a few minutes it becomes dimmer until it finally lights off.

Disadvantages of using a wet cell.

i. It is not very efficient.

ii.It can only be used in an upright position.

iii. It works for a short time

factors that affect the proper functioning of a wet cell

- Polarisation
- Local action

Exercise

1.What is the importance of the dilute sulphuric acid in a wet cell?
2.Why do wet cells lose their electricity?
3.State one disadvantage of using wet cells
4.What acts as the electrolyte in a locally made wet cell?

LESSON THREE: CHEMICAL BATTERY (week 2)

New words

- Anode
- Electrodes
- Electrolytes
- Fossil fuels

Chemical Battery

A Car battery is anexample of chemical batteries.
It has the positive terminal**(+) {anode}** and negative **(-)**terminal {cathode}. Cathodes and anodes are called **electrodes.**
Chemical batteries convert **chemical energy** into **electric energy.**

A diagram of a car battery

Advantage of using a chemical battery

i. It can be recharged and used again when it has run down.

Note :

It produces electricity in a car.

Running water

It produces hydro electric power {H.E.P} or hydro electricity
For example electricity produced at Nalubaleand BujagaliDams in Jinja.

The sun

The sun produces light which is converted into solar electricity using solar cells.
A number of solar cells put together form a solar battery.
Solar electricity is used for lighting, charging phones and cooking.

Diagram of a solar panel

Diagram of a solar drier

Fossil Fuels

Fossil fuels used in production of electricity are coal, petrol and diesel.
Coal / oil can be burnt to produce Thermal electricity.

Coal stores chemical energy.
Petrol and diesel are used to run fuel generators.

Uranium
It is burnt to produce nuclear energy.
Uranium stores chemical energy.
Wind
The wind turns windmills to produce electricity.
Questions

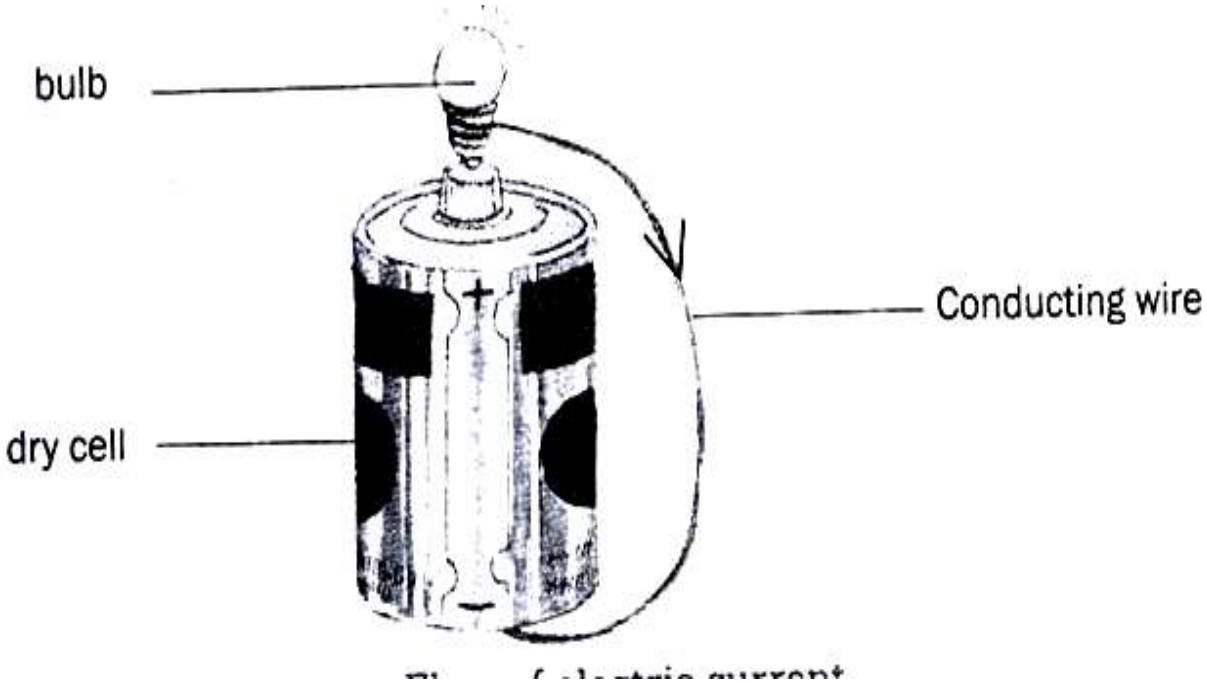
1. Cite any three sources of electricity.
2. How is the sun useful in the environment?
3. How is wind able to produce electricity?
4. Give one difference between wind and air
5. State any one example of a fossil fuel.

LESSON FOUR: TYPES OF ELECTRICITY (week 2)
Vocabulary

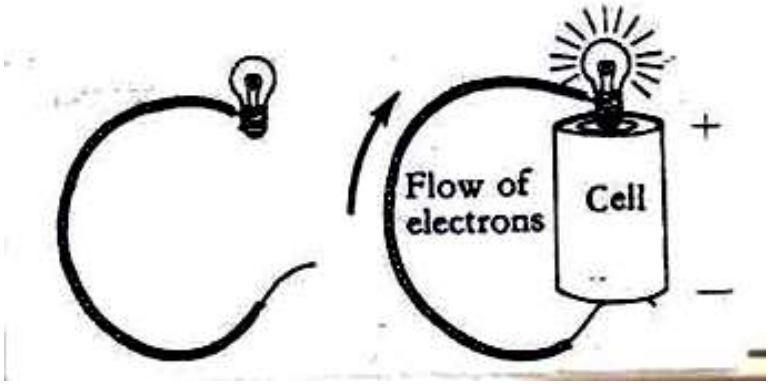
- Electrons
- Current
- Static
- Uranium

Types of electricity
There are two main types of electricity;
1. Current electricity
2. Static electricity

Current electricity
This is the electricity where there is flows of electrons.
The diagram showing theflow of current/ electricity/ electric current.



The diagram showing the flow of electrons



Types of current electricity

1.Direct current (DC) -The current flows in one direction. I e from the source to the appliance.**Sources**:chemicalbatteries anddry cells.

2.Alternating Current (AC) -current flows in two directions. I e from the source to the appliance and the back.e.g.that one produced at **Nalubale dam in Jinja, generator**

Forms of electricity.

a) **Hydro electricity**; produced from water turning turbines at a dam.
b) **Thermal electricity;** Produced from fossil fuels.
c) **Solar electricity;** Produced from the sun.
d) **Nuclear electricity;** Produced from nuclear power stations**.**
e) **Geo thermal electricity;** Produced from hot rock in the earth.
f) **Tidal electricity produced from tidal waves.**

QUESTION

1. **Write down the types of electricity**
2. **State any two forms of electricity**
3. **Draw a diagram to show flow of electricity**
4. **What type of electricity is commonly used in most urban areas in Uganda?**
5. **Briefly explain the term alternating current.**

LESSON FIVE: TRANSMISSION OF ELECTRICITY (week 2)

Vocabulary

- Conductors
- Electrolytes
- Insulators
- Non metallic

Conductors of electricity

Conductors are materials that allow electricity to pass through them.

Examples of conductors of electricity

- Carbon {non metallic conductor)
- Salt solution.
- Wet wood.

Metallic conductor s

- Iron
- Tin
- Zinc
- Lead
- Brass
- Silver

Non – metallic conductors

- Carbon rod
- Lemon juice
- Acids
- Wet wood
- Un-distilled water
- Salty solution

Electrolytes

Electrolytes are liquid conductors of electricity.

Examples of electrolytes include: **acids, Un-distilled water, Salt solution**etc

Note:

1. Wet wood is a good conductor of electricity because it contains water that has minerals.
2. Pure water does not conduct electricity because it doesn't contain minerals.
3. **Silver** is the best conductor of electricity.
4. We use aluminum to make electric wires because silver is expensive and rare.

Insulators of electricity

These are materials that do not allow electricity to pass through them easily.

Examples of insulators;

They include**: Rubber, plastic, dry wood, dry paper, dry cloth, air and porcelain**

porcelain is a white clay like substance. It is used to make some electrical plugs and handles of electric kettles.

Importance of insulators of electricity

1. Are used to insulate flat irons to prevent electric shocks.

2. Prevent conductors from meeting to cause short circuits.

Note:-

Electric wires are covered with insulators to prevent electric shocks.

Exercise

1.Give the meaning of the following ;
   a) Conductors
   b) Insulators
   c) Electrolyte
2.Why does un-distilled water conduct electricity?
3.Why is silver not commonly used to make electric wires?
4.Why do people working on electric wires put on protective gears?
5.How does electricity generated in Jinja reach Mukono?
6.State any one use of electric insulators.

LESSON SIX: ELECTRIC CIRCUITS (week 2)

Vocabulary

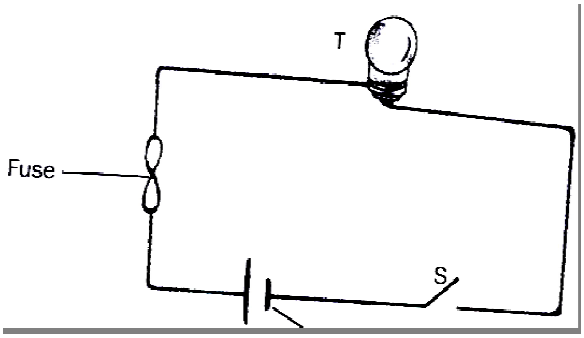
- Appliance
- Conductor
- Insulator
- Fuse

Meaning of electric circuit

An electric circuit is a path through which an electric current flows.

Components of an electric circuit

- A switch.
- A torch bulb
- A conductor (wire)
- Dry cells
- The conducting wire.



In diagram form

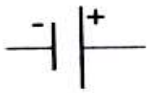
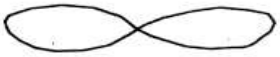


Uses of parts of an electric circuit.

1. Switch: This breaks and completes the circuit at the users wish.
2. Battery/dry cells: These provide electric energy in the circuit.
3. Conducting wire: Transmits electric energy through the circuit.
4. Fuse: It breaks the circuit when there is too much current flowing.

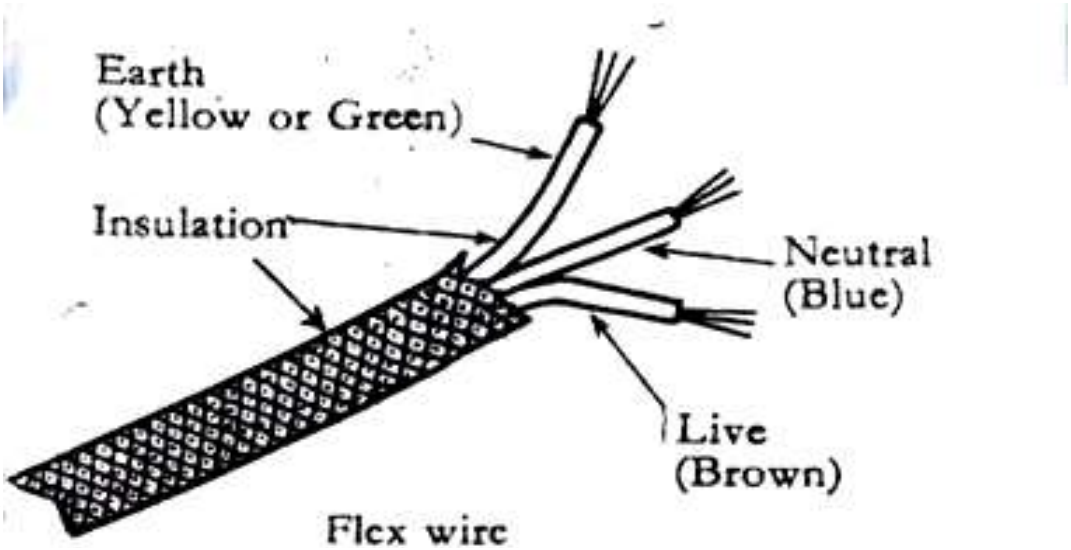
It is a thin wire (alloy) with a low melting point.
5. Bulb: It is an alloy of lead and tin. It gives out light.

Symbols used in an electric circuit

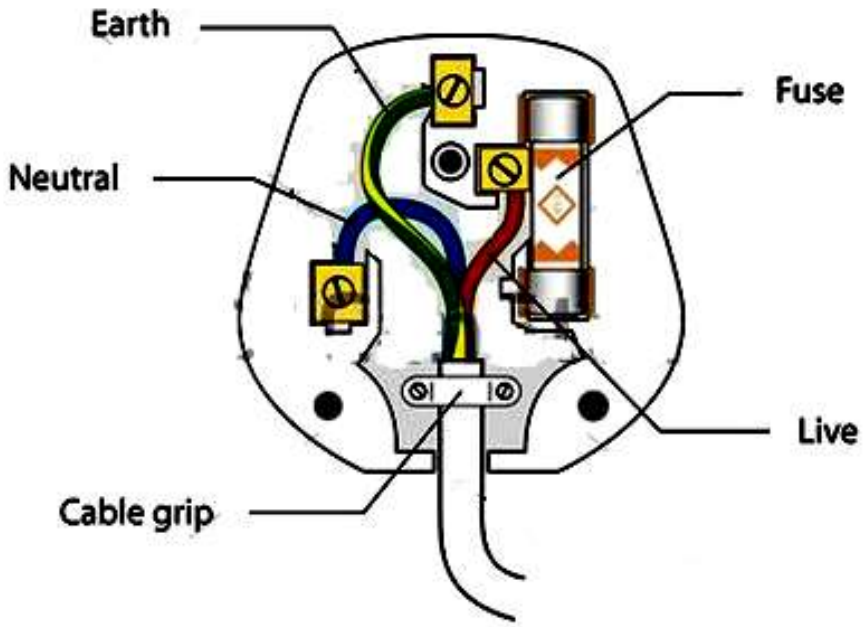
Item	Symbol
Battery	
Light bulb	
Switch	
Fuse	

The conducting wire

m



A Flex wire



Uses of each component of a conducting wire

i. **Earth (yellow or green):** Minimizes excess current that may cause electric shocks
ii. **Neutral (Blue/black):** Takes back current to the source.
iii. **Live (Red/brown):** brings current from the source to the appliance.
iv. **Insulation**: prevent electric shocks.

Exercise

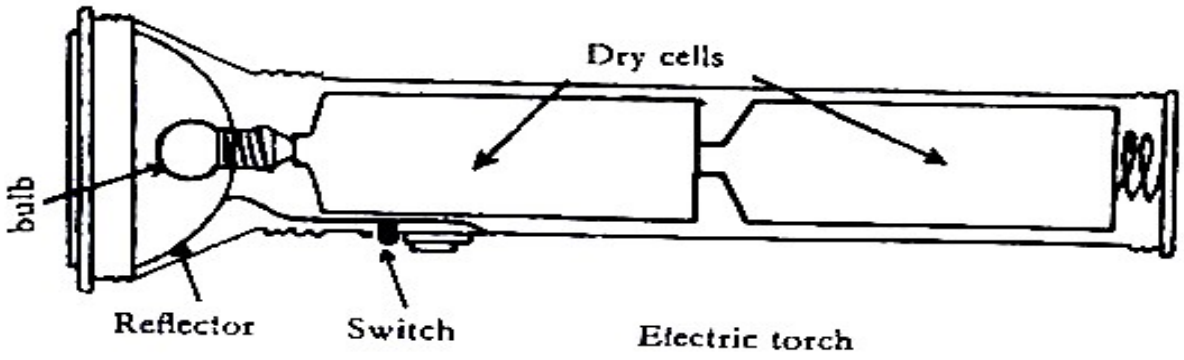
1.How are the following important in a circuit?
   a) Switch
   b) Fuse
2.How is a fuse similar to a switch?
3.How is a red wire useful in an electric circuit?
4.Draw a symbol of a bulb.

LESSON SEVEN: APPLICATION OF ELECTRIC CIRCUITS (week 2)

Vocabulary

- Reflector
- Beam
- Diverging
- Reflector

The torch/flash light



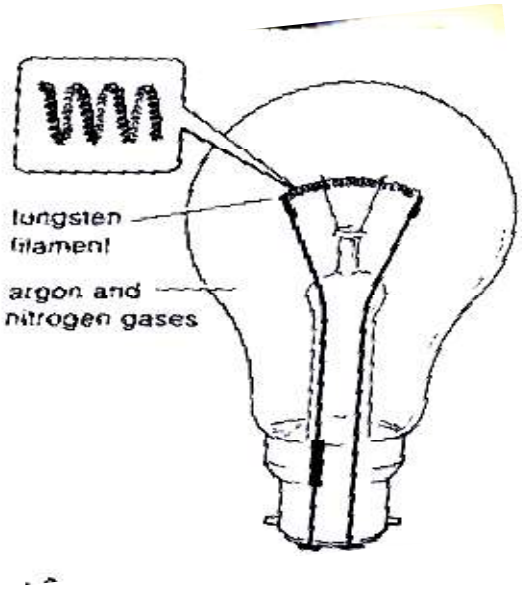
Uses of parts of a torch

1. Reflector: Directs lights into **a parallel**beam of light.
2. Bulb: It produces light.
It changes electric energy to heat energy then to light.
3. Dry cells: It is the source of electric energy.
4. Glass: It protects the bulb and reflector.
5. Switch: Breaks and completes the circuit at the user's wish.
6. Cover and springs: Keep the dry cells tightly together.

The Electric Bulb

Vocabulary

- Tungsten
- Wolfram
- Inert
- Transparent



Uses of parts of a bulb

1.Filament: It produces light.

It is made of **tungsten** formed from a mineral called **wolfram**

Adaptation of the filament to its function

- ✓ It has a high melting point.
- ✓ It is coiled to increase electric resistance

2.**Conducting wire**: It conducts electricity to the filament

3.**Glass**: Protects the inside parts of the bulb.

-It prevents nitrogen and argon gases from escaping.

- It is transparent to allow light to pass through.

4. Filament support: It supports the filament.

5. Contact: It allows electricity into the bulb.

6. Insulating material: It separates the conducting wires.

Note: The fluorescent powder increases the brightness of the light.

Exercise

1.Why is a filament of an electric bulb coiled?

2.State any component of a circuit that isan alloy.
3.How is the reflector important in an electric torch?
4.Which gas is commonly used in electric bulbs?
5.Give one reason why the glass of a bulb is transparent?

LESSON ONE: SHORT CIRCUITS (week 3)

New words

- Circuit
- Over loading
- socket

Meaning of short circuits

A short circuit is a path of low resistance towards flow of current through an electric circuit.

Diagram of a short circuit

Causes of short circuit

- ✓ Poor wiring when installing electricity in buildings.
- ✓ Pushing metallic objects in electric sockets.
- ✓ When bare electric wires get into contact.
- ✓ Wrong connection of wires in electric equipment.
- ✓ Overloading sockets.

Effects of short circuits

- ➢ Destruction of electrical equipment.
- ➢ Leads to fire that may burn buildings and other materials.
- ➢ Lead to death of people and animals.

Signs of short circuits

- ➢ Failure of appliance to work
- ➢ Burning of insulator
- ➢ Smell of burning rubber

How to avoid short circuits

- Electric wires should be covered with an insulating material.
- Installation should be done by experts only.
- Repair of electric appliances should be done by experts.
- Regular replacement of wires

Exercise

1. State the main cause of short circuits.
2. Name two forms of energy produced at the contact of wires.
3. How can short circuits be controlled at home?
4. How can you know the presence of a short circuit?

STATIC ELECTRICITY

- It is the type of electricity where there is no flow of electrons.
- It is formed when two insulators are rubbed against each other.
- In nature static electricity can be seen whenlightning occurs.

Lightning

- This is static electricity in nature.
- When a positively charged cloud meets a negatively charged cloud, a huge spark is formed and may pass to the ground.
- During the passage of lightning, the surrounding air is heated strongly, expands suddenly and then contracts quickly as it cools.
- This air vibrates to produce the sound called **thunder.**

Advantage of lightning

- Lightning converts atmospheric nitrogen into nitrates.

Ways of Preventing negative effects of lightning

- Avoid sitting under tall trees when it is raining.
- Install lightning conductors on buildings.
- Switch off electric appliances during rain
- Never carry sharp metallic objects when it is raining.

Diagram showing a lighting conductor

How lightning conductors reduce risks of lightning

- They provide a route for electrons to pass into the ground without damaging the building.

Differences between static electricity and current electricity

	Static electricity	**Current electricity**
1	Takes place in insulators	Takes place in conductors.
2	The charge is on the surface.	Charge is inside the conductor.
3	The charge does not flow.	Charge flows through the conductor from one place to another.
4	Protons (+) and electrons (-) are both necessary for this type of electricity.	Only electrons flow.

LESSON THREE: IMPORTANCE OF ELECTRICITY (Week 3)

Electricity is used for:

- Cooking
- Lighting
- Run machines like radios,

Advantages of electricity in solving everyday problems:

- It is quick.
- It is clean.
- Easy to use.
- Conserves the environment.

Disadvantages of electricity

- It is expensive to install.
- Electricity can shock and kill people.
- It can burn buildings.

Safety precautions in handling electricity and electrical appliances

- Never touch a switch with wet hands
- Avoid over loading the socket.
- Avoid repairing any appliance when not trained.
- Avoid pushing metallic objects into sockets.
- Never touch an electric wire that has fallen from an electric pole.
- Never seekshelter under tall trees during thunderstorm.

Companies that dea with electricity in Uganda

ERA(Electricity Regulatory Authority)

1. Gives licenses to individual / companies that would like to generate and sell electricity to customers.
2. Monitors the generation, transmission and distribution of electricity.
3. Supervises and controls the quality of electricity generated.

UEGCL (Uganda Electricity Generation Company Limited

1. Generates electricity.

UETCL (Uganda Electricity Distribution Company Limited) (UMEME)

1. It transmits electricity from generation point to customers.
2. Constructs and maintains substation points
3. Responsible for all exports and imports of electricity in Uganda.

UEDCL (Uganda Electricity Distribution Company Limited (UMEME)

1. Connecting customers to the grid
2. Distributing bills to customers

Problems faced by UMEME

- Some people cut down electric poles for firewood
- Illegal connections

Topical questions

1. Briefly give the meaning of the term electricity.
2. Whyelectricity isis called a form of energy?
3. Give any one way in which electricity can prevent deforestation.
4. Why is it important to properly handle electric appliances?
5. Draw the symbol of an electric bulb.
6. Suggest any one way in which we can prevent our electric appliances from being destroyed by electricity.
7. State any one difference between conductors and insulators.
8. Why are electric wires carrying current from the source raised some meters high from the ground?
9. Cite any one disadvantage of using electricity in the environment
10. Draw a diagram to show the flow of current.
11. Cite any one danger of lightning to the environment.
12. State the static electricity in nature.
13. How can one overcome the dangers caused by short circuits in the environment?
14. Why is the filament of an electric bulb coiled?
15. How is a fuse important in an electric circuit?

16. Name the gas commonly used in electric bulbs?
17. Which energy change takes place in a dry cell?
18. State the use of a wire in an electric circuit.
19. State one advantage of using electricity.
20. Which form of electricity is produced by a generator?

LESSON THREE: MAGNETISM (Week 3)

Vocabulary

- Magnets
- Magnetism
- Attract
- Repel

Meaning of magnetism

Is the property of a magnet which enables it to attract or repelmagnetic materials

Magnet

A magnet is a substance that attracts or repels magnetic substances.

What are magnetic materials?
Are materials that can be attracted by a magnet.

They can easily be magnetized.

Examples of magnetic materials

- Iron (most common magnetic substances)
- Nickel
- Cobalt

- **What are non magnetic substances?**
  Are substances that cannot be attracted by magnets.
  Examples of non magnetic substances.
- Dry wood
- Plastic
- Lead
- Glass
- Cloth
- Copper
- Paper
- Aluminium
- Brass

Types of magnets.

There are two main types of magnets;

i**. Artificial magnets.**

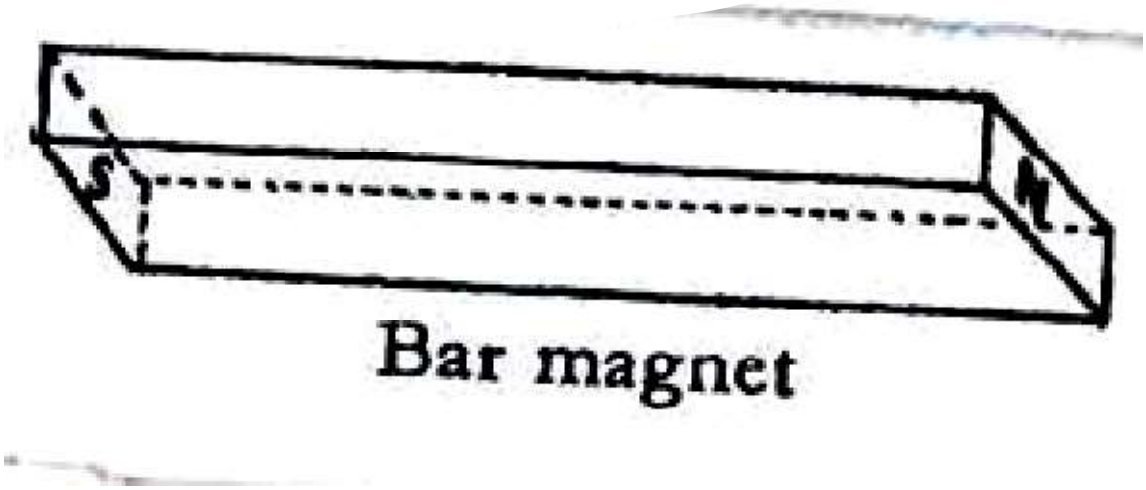
ii. Natural magnets.

a) Artificial magnets (lessontwo) week three

These are magnets made by people.

Examples of artificial magnets and their shapes.

- **Bar magnet**; This is a bar of uniform cross section. It may be rectangular or circular.

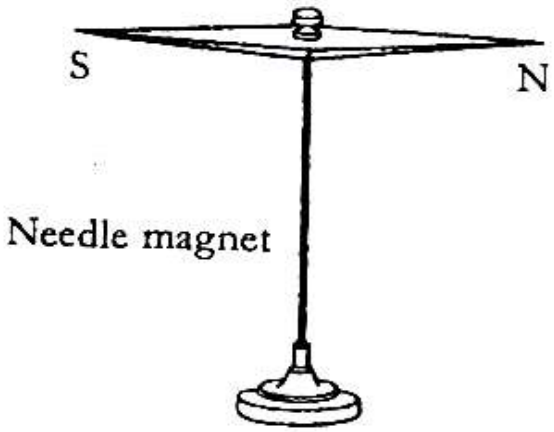


Bar magnet

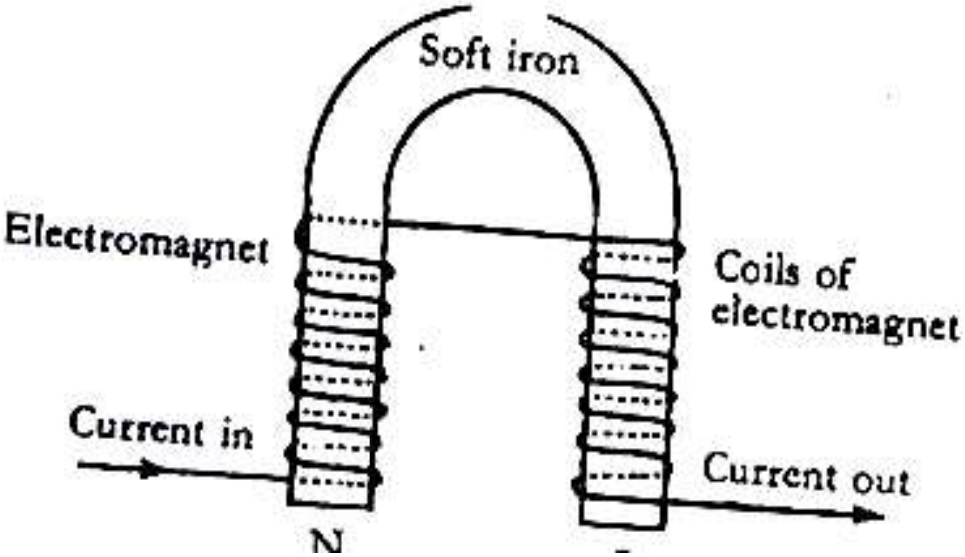
- **Horse shoe magnet**; It has u shape.



- **Needle magnet**; It has a thin pointed at both ends and balanced at the centre.



- **Electromagnet**

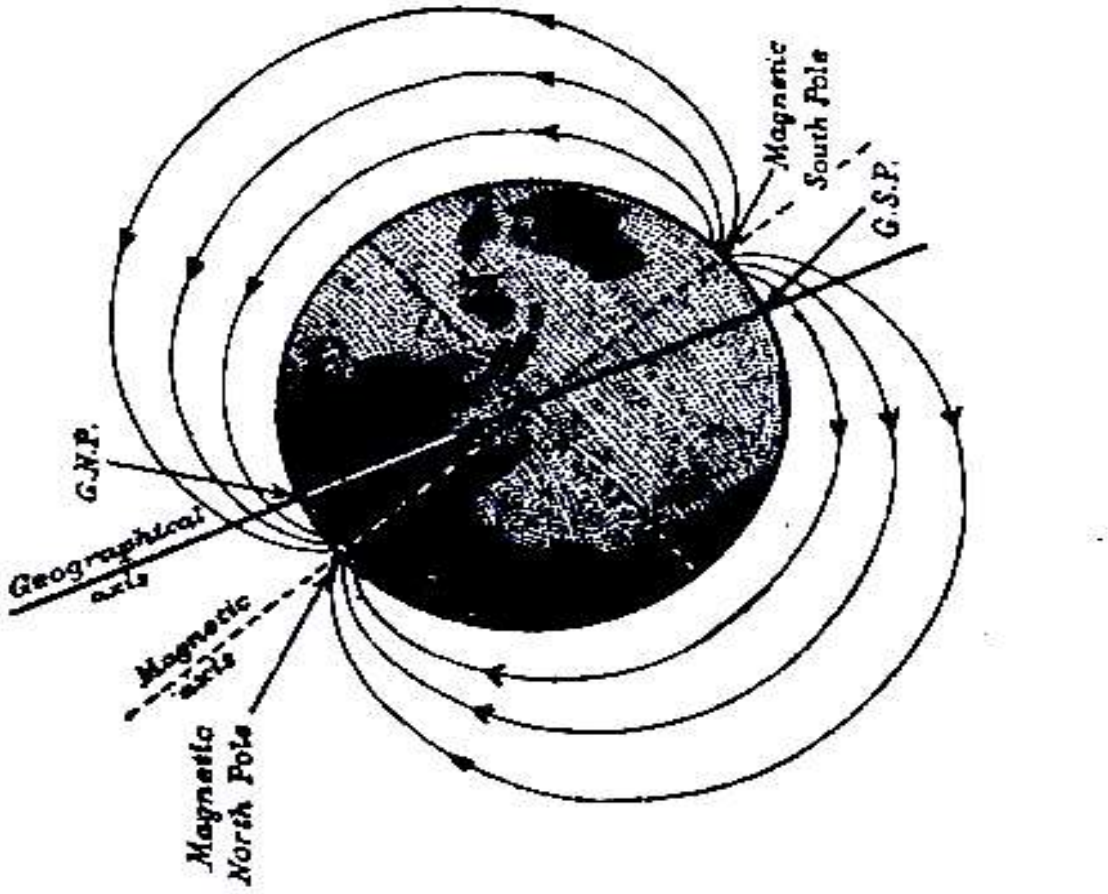


b) Natural magnets

They don't lose magnetism.

Examples of natural magnets.

- **The Earth**; It is a huge natural magnet. Its magnetic field is weak, that is why you can't feel it.



- **Lodestone/magnetite**; Lodestone is a magnetic ore which occurs naturally in the earth. It was discovered near the ancient city of magnesia in Asia Minor. It was the first magnet to be discovered by people.

Exercise

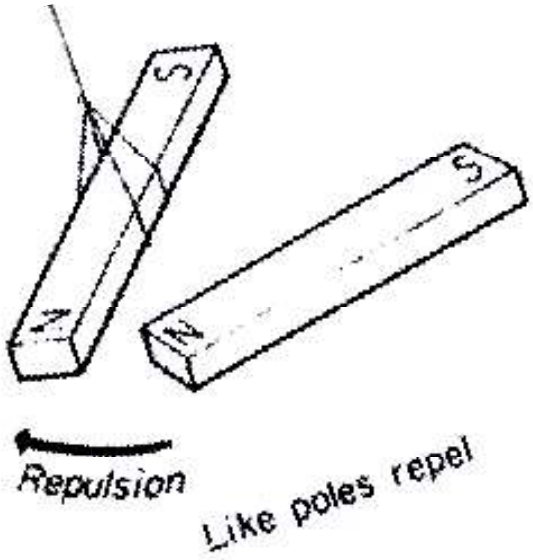
1. Name one example of a natural magnet.
2. Give one example of a temporary magnet
3. Why is the earth regarded as a magnet?
4. Name the most common magnetic substance
5. Why is a cloth not attracted by a magnet?
6. Give the difference between a magnet and magnetism
7. Name any two metals that are non magnetic materials
8. Draw a horse shoe magnet

Vocabulary

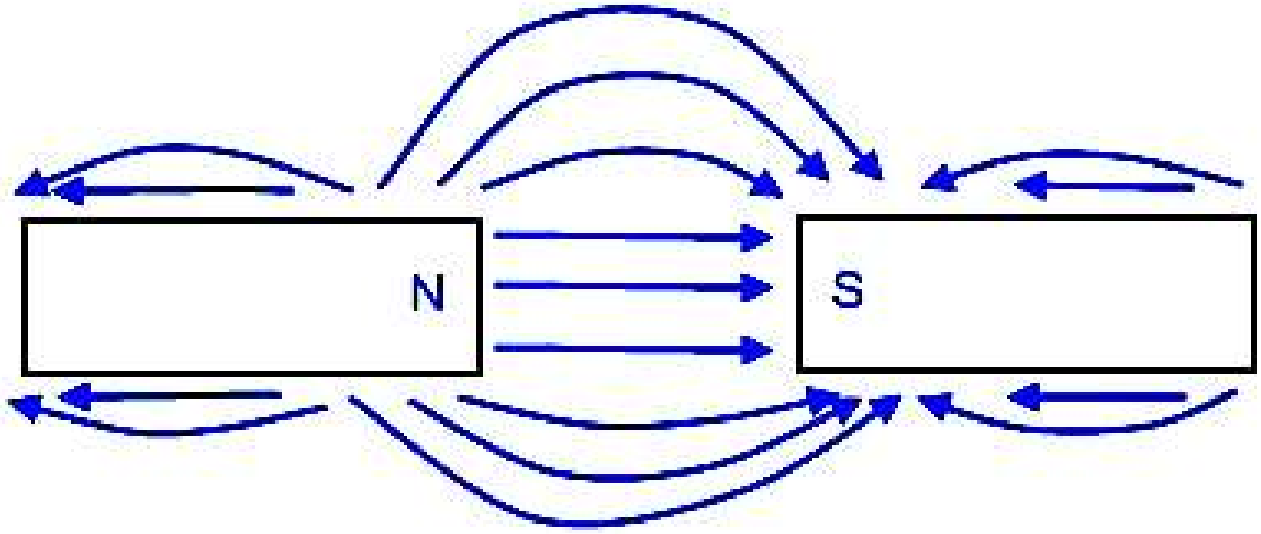
- Repel
- Attraction
- Repulsion
- Suspended

Properties of magnets

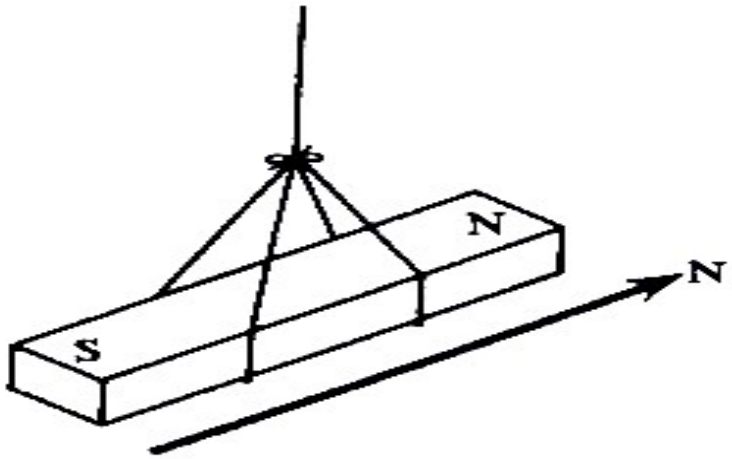
- Like poles of a magnet repel.



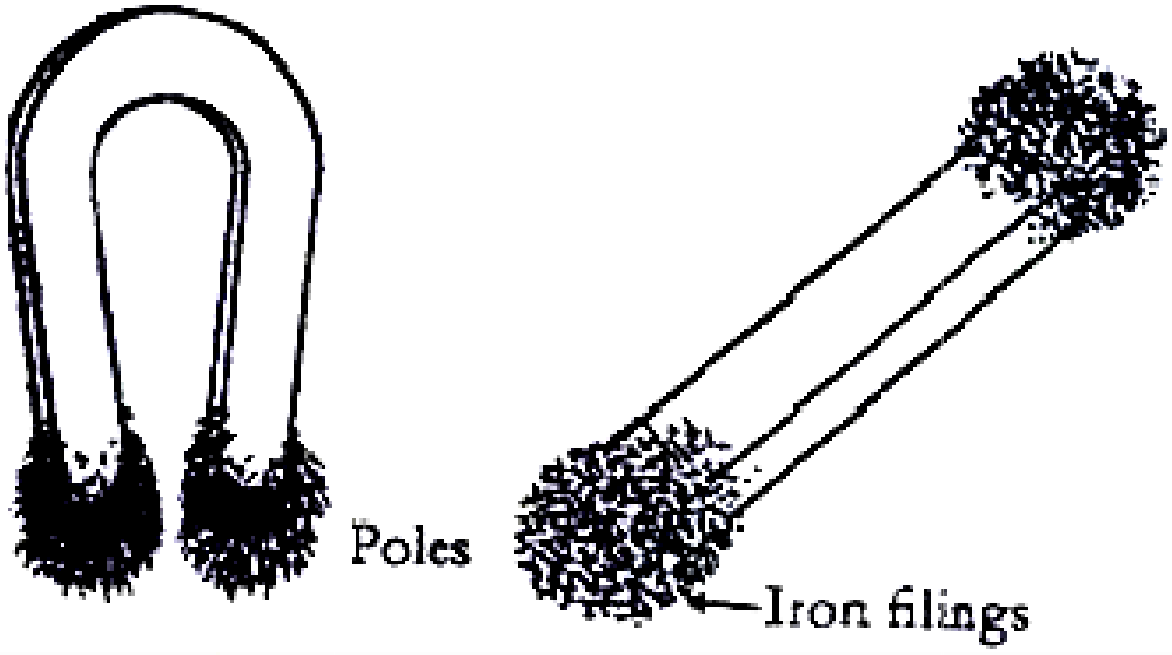
- Unlike poles of a magnet attract each other.



- When a magnet is freely suspended on a piece of thread it will always rest in the north –south direction.

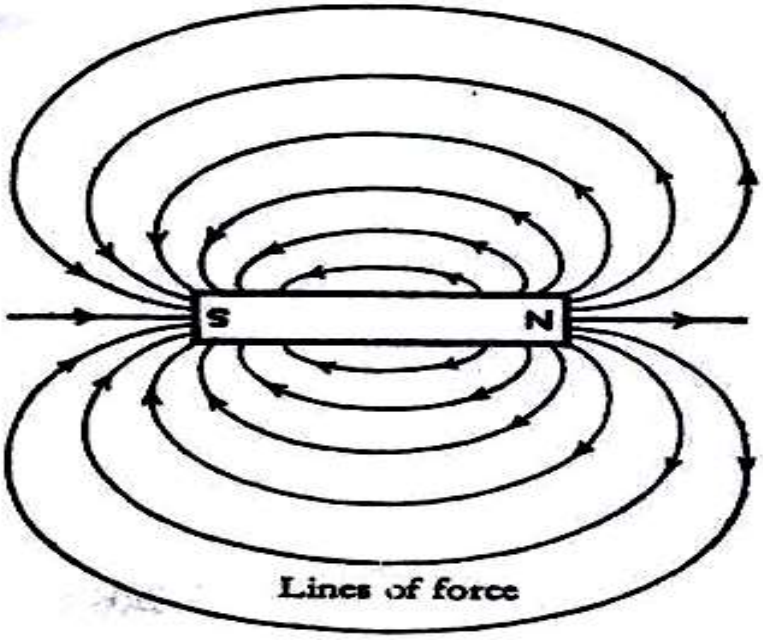


- The poles are the strongest part of the magnet.

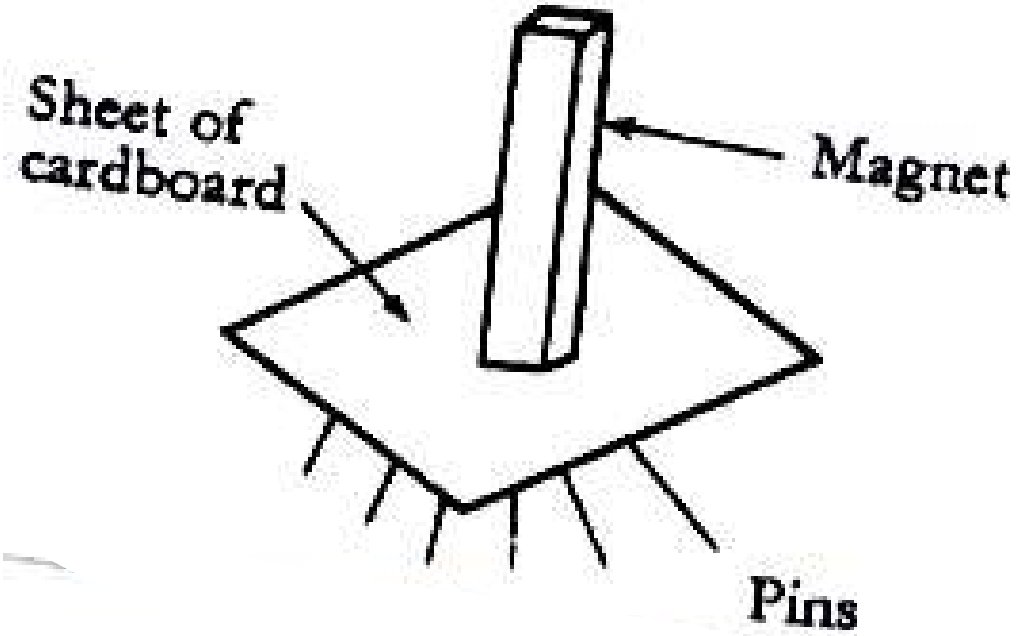


- Lines of force on a magnet run from the North to South pole

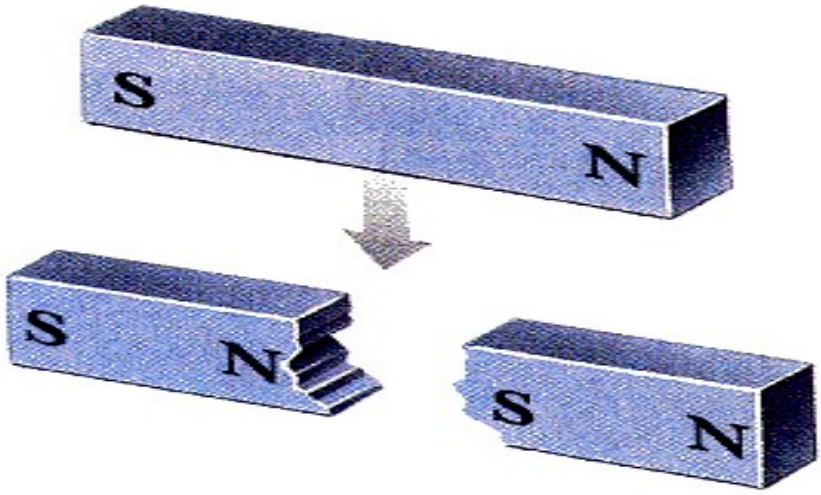
Note: A magnetic field is a region in which lines of force on a magnet act.



- Magnetism passes through **non magnetic materials** like wood and paper.



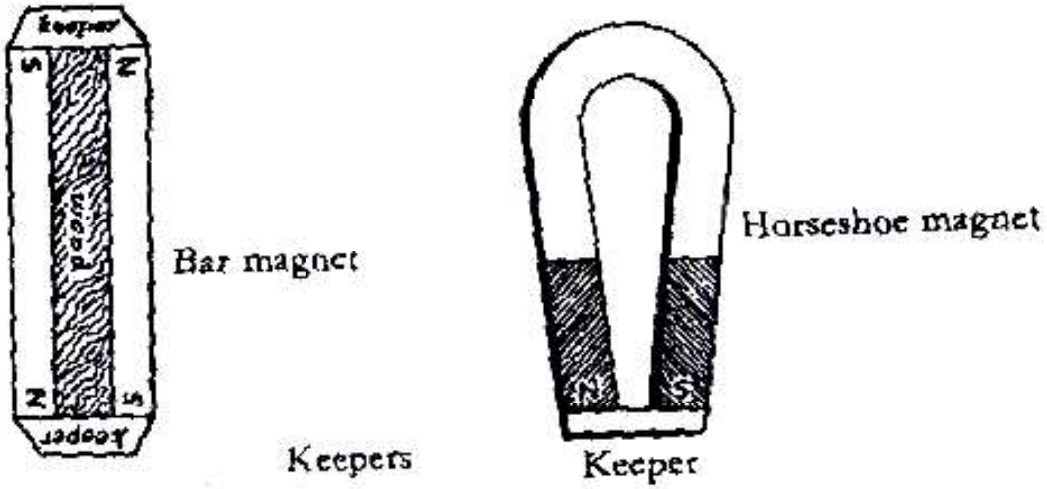
- When magnets break, they form other magnets.



Note: Magnets become weaker with age.

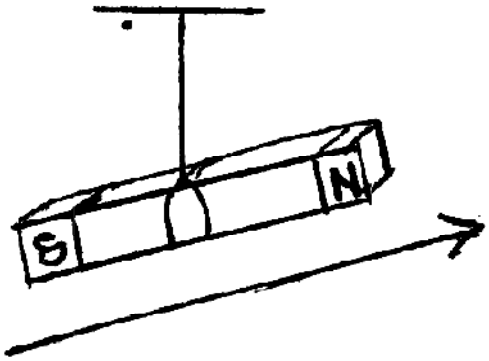
Preventing magnets from losing magnetism.

- Keep them using iron keepers.



Exercise

1. Which property of magnetism enables doctors to remove iron materials from patients bodies?
2. How is the property of magnetism below useful to a sailor?



3. In the space below draw a horse shoe magnet and indicate the lines of force

Vocabulary

- Magnetic field
- Induction
- Stroking

(Lesson four) week three

Law of magnetism

- Like poles of a magnet repel each other while unlike poles attract each other.

What is magnetic field?

It is the area around the magnet in which it can attract other magnetic materials.

Properties of magnetic fields.

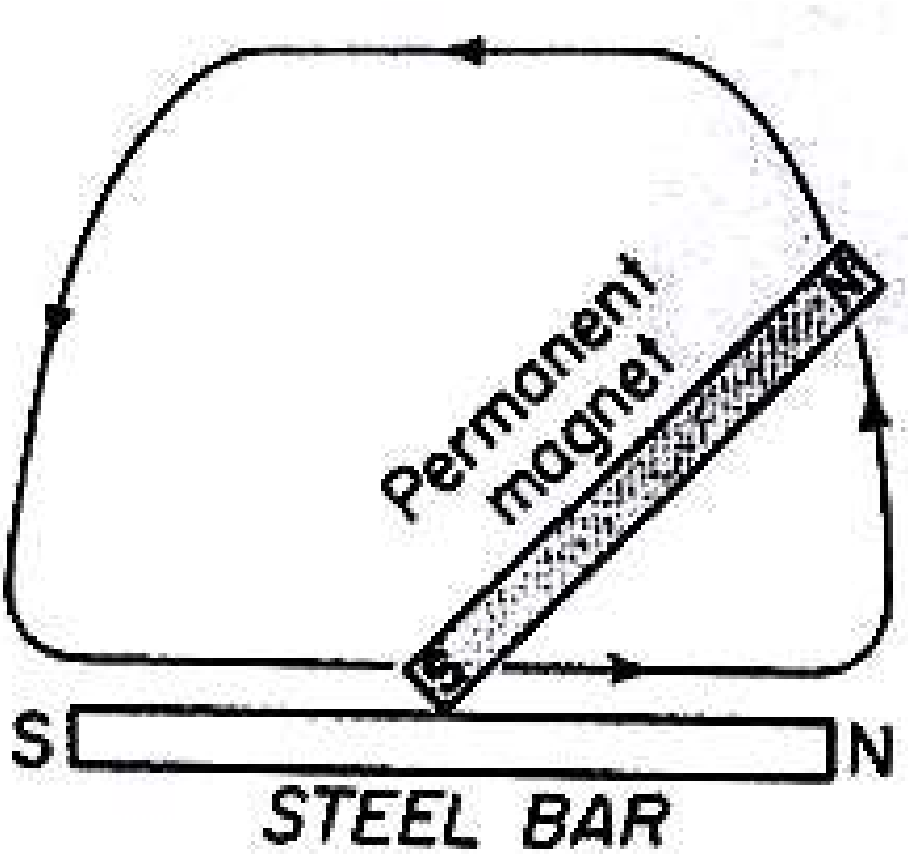
- They originate from **North Pole** and end at the **South Pole.**
- The linesofforce do not intersect with each other.
- A line of force isn't continuous; it starts from the North Pole and ends at the south pole.
- There is no line of force within the magnet itself

Methods of making magnets.

- **Stroking by single touch:**

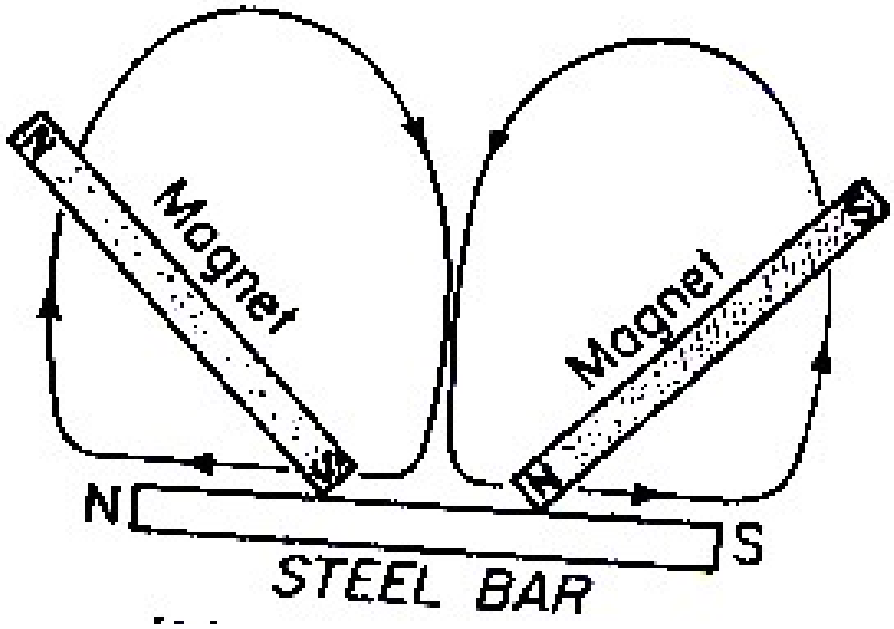
It is stroking by single touch method because one magnet is used.

Note. **The end after the stroke becomes the opposite pole of the magnet being used.**

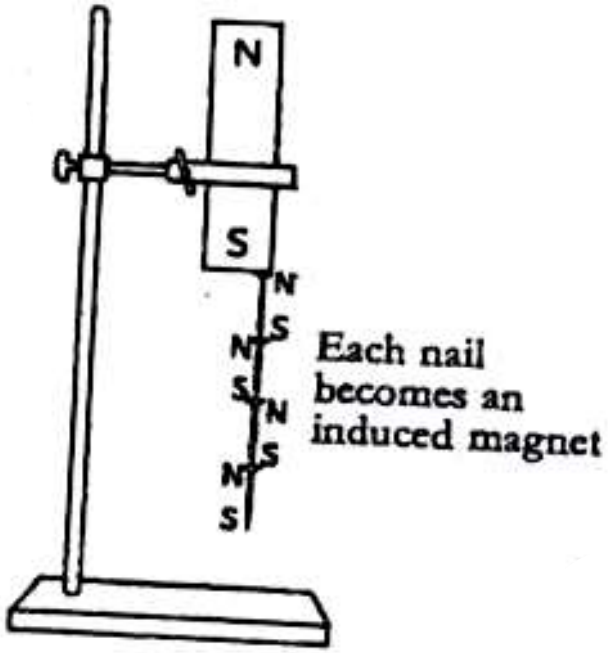


Stroking by double/divided touch

It is so because two magnets are used.



- **By induction**A magnetic object becomes magnetized by induction when it is nearer or contact with a magnet.



Activity

Making magnets by induction and stroking

Vocabulary

1. Electromagnet
2. Electric energy
3. Solenoid
4. Voltage

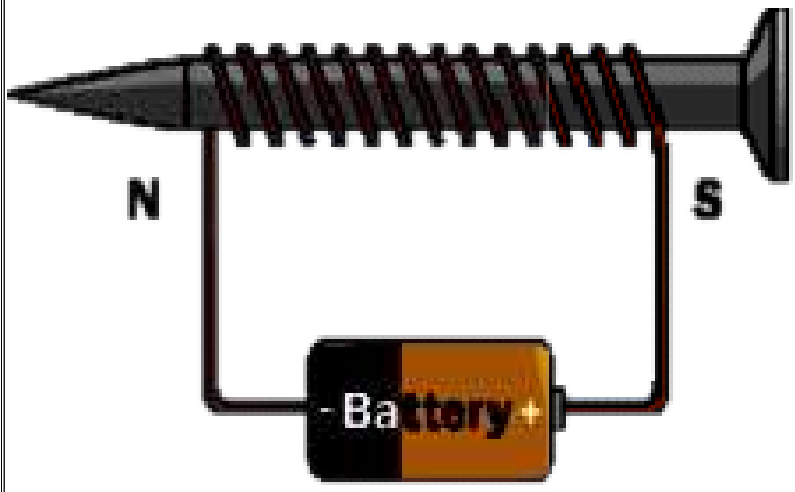
Lesson five and six) week three

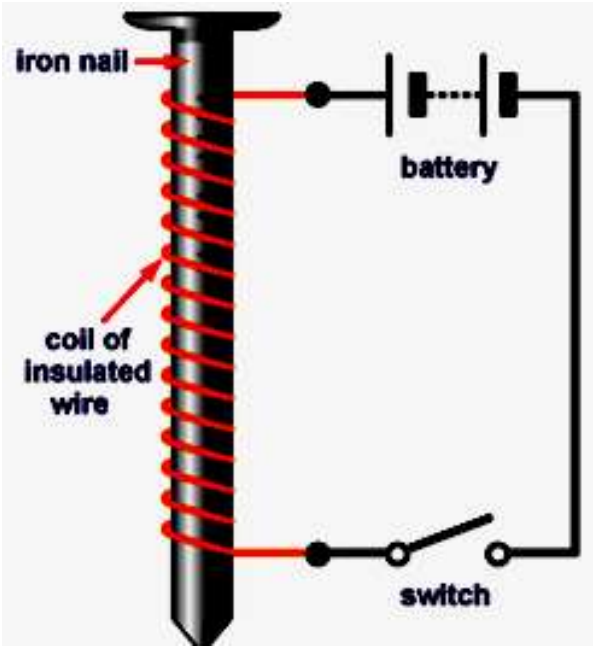
- **By electrical method**

  This is a method of making magnets using electricity

  A magnet made by using electricity is **electro- magnet.**

2





Electro magnets are made stronger by;

- By increasing the number of turns in the coil around the soft iron
- By increasing the voltage (electrical strength

Determining the poles an electromagnet.

i. The direction of flow of current.

- Looking at it from either end;
- If current flows in an **anticlockwise** way through the solenoid, the pole is **North (N)**
- If current flows in **a clockwise** way through the solenoid, the pole is **South(S).**

ii. Using the right hand grip rule.

- Grasp the solenoid in the **right hand** with **thumb pointing in the direction of current.**
- The thumb points to **the North Pole.**

Demagnetizing a magnet(lesson seven) week three

- It is making a magnet lose its magnetism.
- It is weakening or destroying a magnet.

Ways of demagnetizing a magnet

- Hammering/hitting strongly.
- Strong heating.
- Leaving a magnet in an east-west direction for a very long time.
- By keeping the magnets with like poles together.
- By passing an **alternating current** through a magnet.
- Leaving it to rust.

Note: In demagnetization, the domains become disorganized in arrangement.

- **Uses of magnets in modern world of work.**
- Magnets are used in compasses by sailors, pilots and explorers.
- Electromagnets are used in industries to collect heavy scrap iron.
- An electric bell is also built on the principle of magnets.
- Magnets are used in telecommunication devices.
- Electric motors which produce electricity use magnets.
- They are used in loud speakers.
- They are used on doors of fridges.

Appliances that use electricity

- Flat irons
- Heaters
- Driers.
- Washing machines
- Electric fans
- Cookers

Appliances that use magnetism

- Magnetic compasses.
- Magnetic tapes.

Appliances that use both electricity and magnetism..

- Fridges.
- Radios
- Televisions
- Mobile phones
- Electric bells

Exercise

1. Name one example of a temporary magnet.
2. Give two ways of destroying magnets
3. How do explorers used magnets
4. Why are some magnets painted?

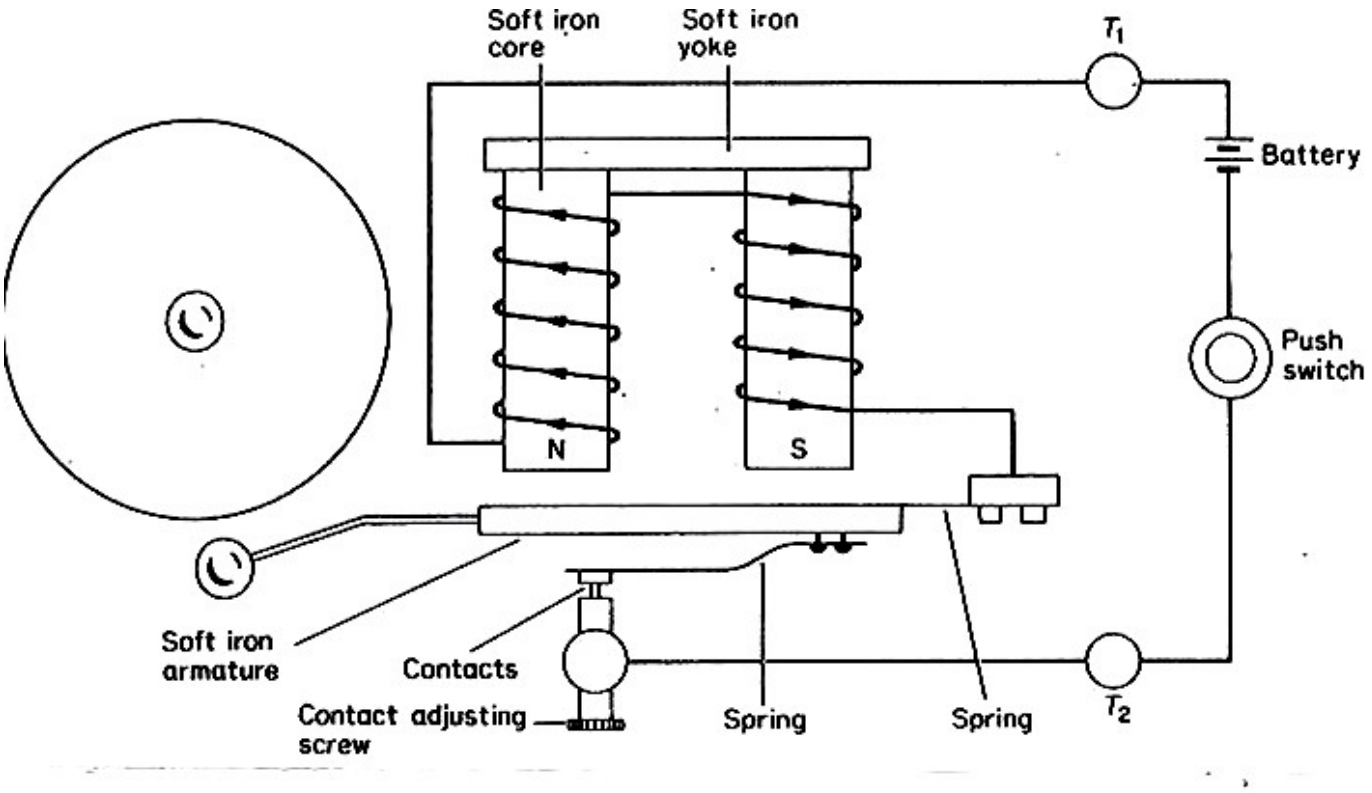
Vocabulary

1. Soft iron
2. Electromagnet
3. Current
4. Temporary

Vocabulary

1. Soft iron
2. Electromagnet
3. Current
4. Temporary

An Electric bell(lesson eight and nine) week three



How it works

- When the contact is made the soft iron becomes magnetized.
- It pulls the soft iron strip with the hammer.
- The hammer hits the gong producing sound.
- When the strip is pulled the soft iron loses its magnetism and the contact is broken because current is not flowing.

Generating electricity using a dynamo.

Dynamo.

A dynamo is a device which converts mechanical energy into electrical energy.
A dynamo uses **a permanent magnet** and a coil of wires on electro magnets
During the turning, the **mechanical energy** is turned into **electric energy.**

Generator

The type of current electricity produced is **A.C**

They change **Mechanical energy** to **electric energy.**

Uses of dynamos and generators

- Provide electricity for light.
- Provide energy to run machines.
- Provide energy for cooking
- Generators are used in hospital theatres incase power goes out.

Topical questions

1. How is magnetism different from magnets?
2. State the any one law of magnetism
3. How are magnets important to the following?
   a) Doctors b) pilots c) teachers
4. Cite one item that uses both magnets and electricity.
5. How are magnets found in radios important?
6. In four sentences, briefly explain how an electric bell works.
7. Write the term AC in full.
8. What is the importance of the hammer found on an electro magnet?
9. State one way of making magnets.
10. In which one way can a p7 child make a magnet lose its magnetism?
11. How does strong heating a magnet can make it lose its magnetism?
12. What type of energy change takes place in a generator?
13. Give two uses of electromagnets
14. Which magnet is got by induction method?
15. Name two methods of forming magnets
16. How are motors useful in day to day life?

TOPIC 3: ENERGY RESOURCES IN THE ENVIRONMENT (lesson 4, week 3).

Vocabulary

- **Resource**
- **Tidal**
- **Coal**
- **Bio gas**
- **Wood fuel**

-Hydro
-Fossil
-Petroleum
-Bio fuel

A resource

This is anything that people uses to satisfy their needs.

Energy resource

It is anything that provides people with useful energy.

Types of resources

1. Renewable resources: Things that can be replaced naturally when used up.

Examples: Plants, animals, (soil), water, air.

2. Non-renewable resources: Things that cannot be replaced when used up.

Examples: Minerals, rocks, fossil fuels.

Energy resources.

These include: the Sun, Water, Minerals, Air or wind, Plants and Animals.

Note: The sun is as major source of energy in the environment (solar energy)

THE SUN

The sun is the main source of heat and light as forms of energy on earth.

Importance of the sun to people and environment

- The sun is used in rain formation.
- Preserves our food by sun drying.
- Usedto make vitamin D in the human skin
- Sunlight energy disinfects beddings
- Light from the sun aids us to see.
- Light from the sun is used to make solar electricity.
- Light from the sun enables plants to make food.
- Dries our clothes.

Water as an Energy resource

It is used by people to get the following form of energy.

1. **Hydro electricity**

It is the form of electricityproduced by the power of running water at a fall.

When waterfalls at a greater height, **potential energy** is changed to **kinetic energy**.

Kinetic energy turns the turbinesconnected to a generator with powerful magnetic field and a coil of wire turning it. In this way HEP is produced.

2. **Steam**

Steam with Kinetic energy is used to power **steam engines.**

3. **Tidal energy**

This is the form of energy got from **water tides** on the sea shores.

Tides are periodic rises and falls of large waterbodies.

The tides are caused by gravitational interaction between the earth and the moon.

Importance of water to people and environment

i. Fast running water at a fall turns turbines to produce HEP.
ii. Used to cool machines in industries.
iii. Used for bathing and drinking.

iv. Tidal energy is used to produce electricity.

How sun is used as energy resource

I. It is used for generating solar electricity
II. Heat from the sun dries clothes
III. Light from the sun enable people to see
IV. Light energy helps plants to make food.

Exercise

1. Give the general name for energy got from the sun.
2. Apart from formation of solar energy, how is the sun used as an energy resource?
3. State one way water is used as an energy resource apart from formation of HEP
4. Which type of energy is possessed by water in a reservoir
5. Give two examples of non- renewable resources
6. Give any one way of conserving water
7. Why are animals grouped under renewable resources?

Lesson Five: Fossil fuels (coal, petroleum, Uranium) as energy resources (week 3)

Vocabulary

-Coal -Petroleum -crude -uranium -

Examples of fossils

1. Coal
2. Petroleum
3. Natural gas

Petroleum/crude oil

It is an energy resource from undergroundformed from animals that died many years ago.

The changes in the earth created a lot of heat and pressure on them hence turning into petroleum.

Examples of petroleum

-Petrol -diesel -oil -jet fuel -paraffin

These fuels are generated from crude oil by the process called *fractional distillation*.

Importance of petroleum products

a) Used to generate power that can run machines and vehicles.

b) They are burnt to produce light and heat.

Importance of coal

a) Used as fuel in steam engines.
b) Coal is burnt to produce thermal electricity
c) It is used to make tar for surfacing roads.

Other products from petroleum

-Plastics -polythene paper -tar, dye -detergents -Vaseline -mattresses -grease -- paint -fertilizers etc.

Other products from coal

-Paints -fertilizers -perfumes.

Uses of uranium

a) It is used to make atomic bombs.
b) It is used as fuel in nuclear-powered sub marines.
c) Uranium is burnt to produce atomic electricity.

Geothermal energy

It is got from hot springs/thermal springs where steam is trapped to turn turbines and produce electricity.

LESSON THREE AND FOUR WEEK FOUR

LESSON FIVE: ANIMALS AS ENERGY RESOURCES (week 3)

a) Oxen plough land.
b) Donkeys transport people and goods.
c) Some animals are eaten as source of food.
d) Oxen and horses are used to pull carts.

PLANTS AS ENERGY RESOURCES

a) They are sources of food.
b) They are source of wood fuel.
c) They provide materials for making biogas.

How to conserve plant resources

a) Through a forestation.
b) Use fuel saving stoves.
c) Use of alternative sources of fuel like biogas.
d) Educate people about the advantages of plants in the environment.

WIND AS ENERGY RESOURCES

Importance of Wind/air

- Used for winnowing
- It turns wind mills to produce electricity.
- Used to sail boats
- Used to disperse seeds
- Used in pollination.
- Aids to fly kites.
- Speeds up evaporation and hence increases the speed to dry things.

Exercise

1. State two uses of plants to people.
2. Why do people plant trees around their homes?
3. How is wind useful to a school child?
4. Name the energy resource used for winnowing.
5. State two ways of preventing dangerous effects of wind.
6. Name two dangers of plants to people

LESSON SIX: ANIMALS AS ENERGY RESOURCES (week 3)

Vocabulary

- Biogas
- Methane
- Biogas digester
- Anaerobic bacteria
- Decomposition
- biomass

Production of Biogas from plants

Meaning of Biogas

It is a methanethat is produced from rotting organic matter.

Materials used to make biogas

1. Cow dung
2.Plant materials
3.Animal urine

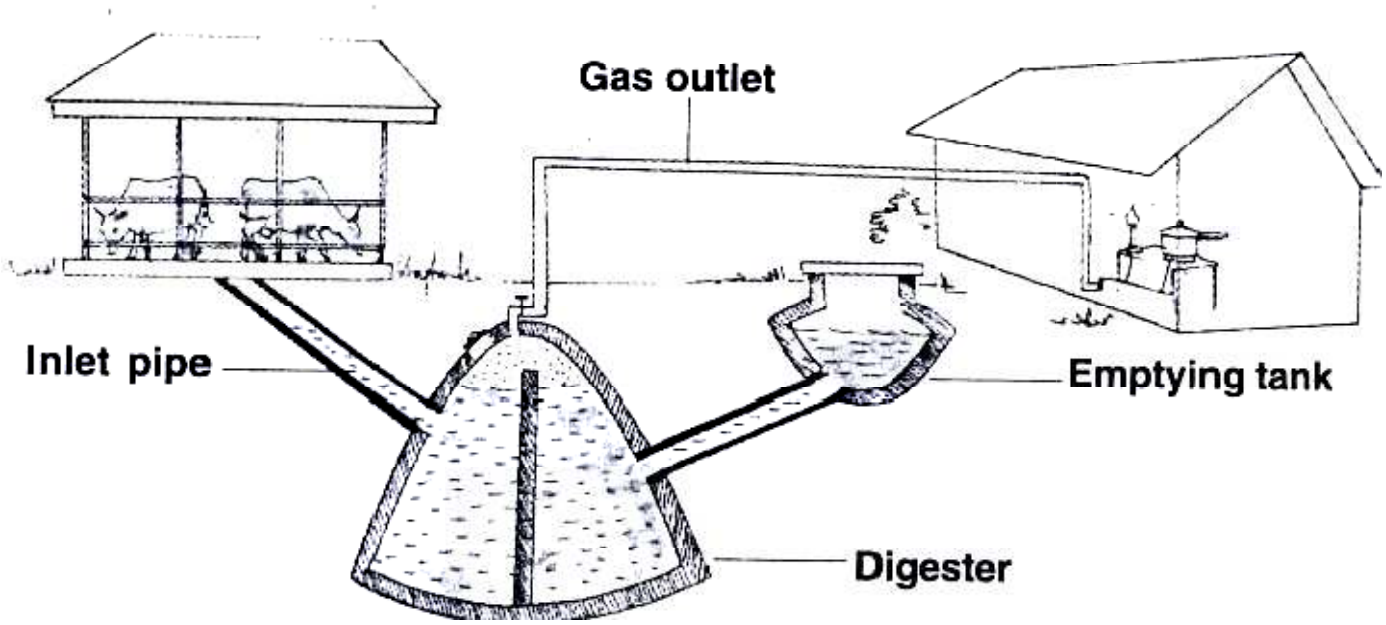
Steps of making biogas digester.

The above materials are put into an air-tight container called a biogas digester.

The materials are worked on by anaerobic bacteria to ferment and biogas is formed.
When the gas formation stops, the remains can be used as manure.

Note: Biogas is formed through *anaerobic decomposition*

Structure of Biogas digester



Uses of the parts

- Inlet pipe: Where plant and animal matter are inserted into the digester.
- Outlet: Removes old used up matter to the garden.
- Emptying tank: Stores used up matter before it is taken to the garden.
- Biogas tube: Traps biogas and takes it to the heating or lighting equipment.

a) **Uses of biogas**
   a) For cooking
   b) For lighting
   c) For heating.

Advantages of using biogas

1. It is cheaper than using natural gas
2. It does not pollute the environment.
3. It controls deforestation
4. It improves on sanitation

TOPICAL QUESTIONS

1. In which one way do plants depend on?
   a) Cattle b) human beings c) goats
2. Mention any one advantage of using biogas over using firewood.

3. How is a biogas digester important in the production of biogas?
4. Cite any one thing used in the making of biogas.
5. Write down any three ways how animals depend on non living things in the environment.
6. In what way can a farmer use the residues of making bio gas?
7. State any two uses of biogas to human beings.
8. Why wind referred to as an energy resource?
9. How does the use of biogas control environmental degradation?
10. What danger is caused when biogas containers are kept near the reach of young children?
11. Give any one way children use wind when playing.
12. State any three ways of conserving mineral resources
13. Give the meaning of each of the following:-
    i) Biomass
    ii) Biodiversity
    iii) Biogas
14. Give two examples of biodegradable materials.
15. Cite two examples of non-biodegradable materials.

TOPIC 4: SIMPLE MACHINES AND FRICTION (lesson one, week 4)

Vocabulary

- **FrictionForce**
- **Nuisance**
- **force**

FRICTION

It is the force that opposes movement of objects.

Types of friction

1. Static friction: It is found in objects which are fixed in one position.
2. Sliding or rolling friction: It is found in moving objects.
3. Viscosity friction: This occurs in liquids and gases.

Properties of friction

I. There is more friction with rough surfaces than with smooth or slippery ones.
II.The greater the load, the greater the friction force (weight increases friction)
III.Whenever friction occurs heat is produced.

Friction as a useful force in our daily life

1.It aids in moving and stopping vehicles.
2. It aids in writing.
3. It is used in sharpening objects.
4. It aids in walking.

5.Ithelps in lighting match sticks.

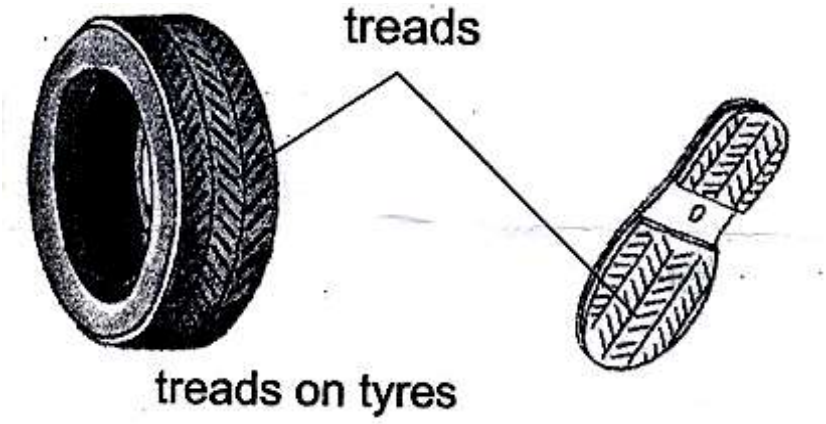
Friction as a nuisance force/ disadvantages

1. It wears down things e.g. shoe soles, parts of engines.
2. It hinders work due to the much force required.
3. It produces unnecessary heat and noise in machines

How to increase friction

i.By making surfaces rough.

ii. Putting treads on vehicle tyres and shoe soles.

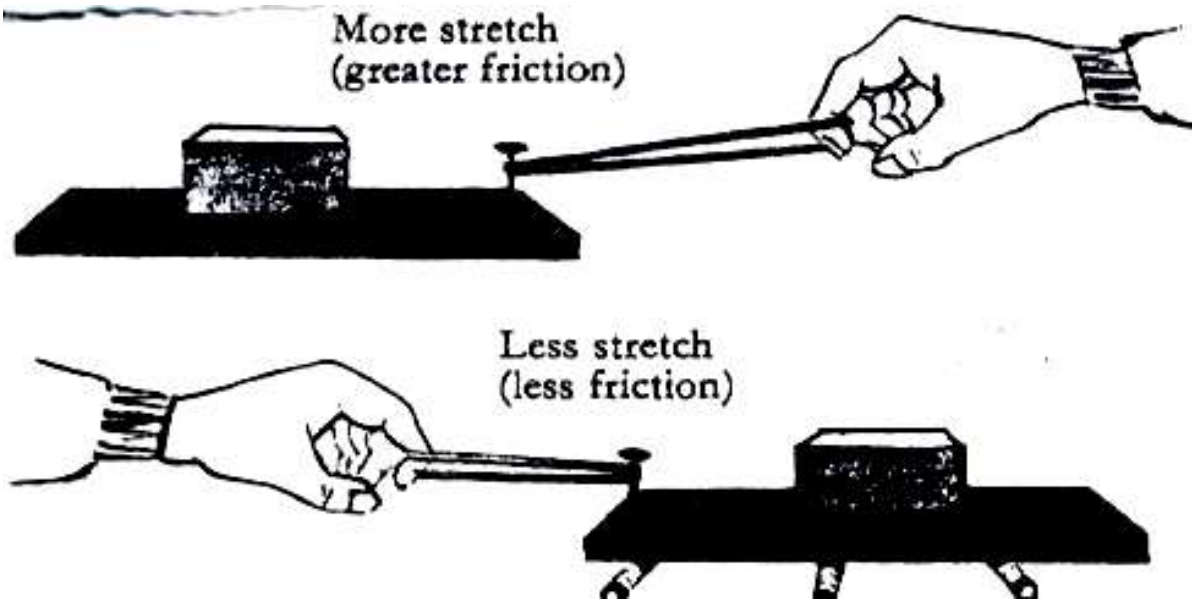


iii. Putting spikes on sports boots.

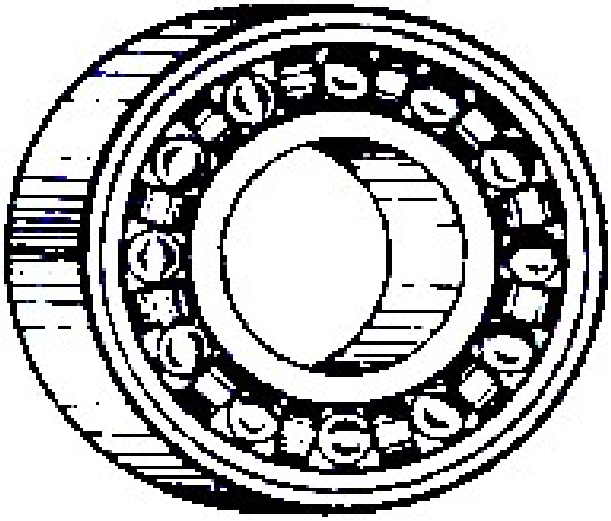
iv. Putting grips on handles of bicycle and car steering wheels.

How friction can be reduced

i. **Using rollers** which decrease areas of contact between moving parts.

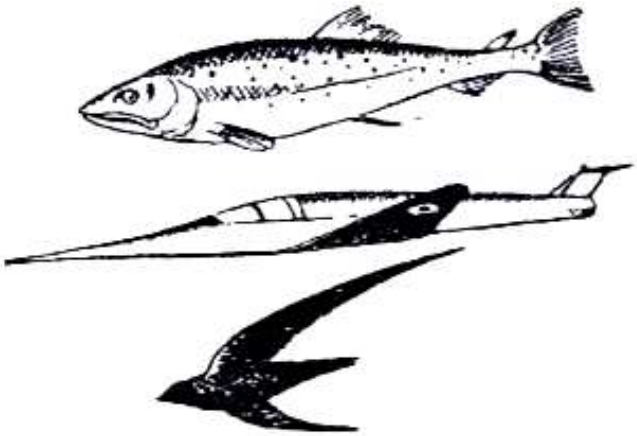


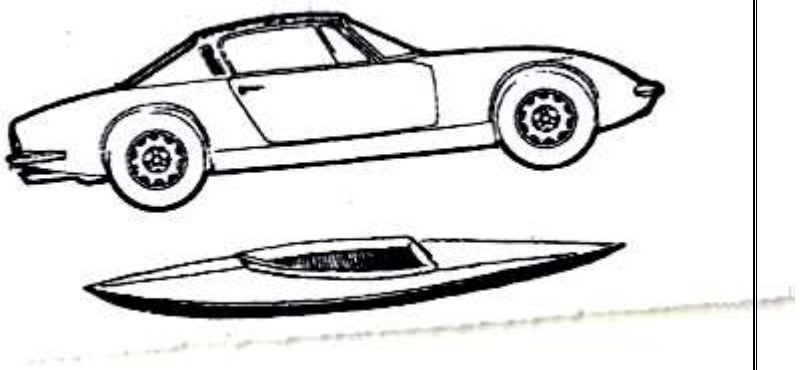
ii. **Using ball bearings**: These are round metallic balls which reduce friction by keeping moving parts separated.





iii. **Lubricating** using oil or grease. Oil and grease are referred to as **lubricants**.
iv. Streamlining objects like planes, cars





v. Making rough surfaces smooth.

Exercise

1. State the meaning to the term friction.
2. Cite one way of increasing friction on a slippery surface.
3. Write down any two advantages of friction in our lives.
4. Why is friction said to be a nuisance force?

5. Why are some objects stream lined?
6. State any two items that are stream lined?
7. How does tarmac increase friction on roads?

LESSON TWO: MACHINES (week 4)

Vocabulary

- Machine
- Wedge
- Water pump
- Stairs

Meaning of a machine
It is a device that simplifies work.

How machines simplify work
1.By changing the direction of force.
2. By reducing the effort required to do work
3. By increasing the speed of work.

Types of machines
1.Simple machines
2. Complex machines

Complex machines
It is a machine that is made up of many parts and simplifies work.
When two or more simple machines (tools) are put together, a complex machine is made.

Examples of complex machines
-Tractor -Bicycle -Sewing machine -Car -Aeroplane etc.

Simple Machines
It is a device that is made up of few parts and simplifies work.

Examples of simple machines

A hoe	See saw	Claw hammer	Nut cracker.	Human arm.	Nut cracker.
A wheel barrow	Pincers	Water pump	Sugar tongs	Spade.	Sugar tongs.
A pair of scissors	Crow bar	Bottle opener	Fishing rod	Ladder	Stairs

Classes of simple machines
1.Levers
2.Inclined planes/slope
3.Pulleys
4.Screws

5.Wheel and axle
6. Wedges

LESSON THREE: LEVERS (week 4)

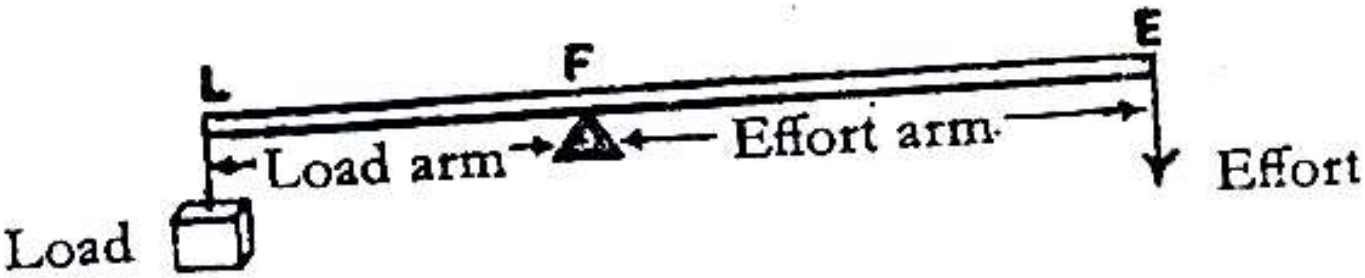
Vocabulary

- Load
- Effort
- Pivot
- Force
- Lever

Meaning of a Lever

Is a stiff rod that turns on a fixed point called a pivot or fulcrum.

Parts of a lever



1. Effort: is the force exerted on a machine to overcome the load.
2. Load / resistance: it is the weight of the body to be lifted.
3. Fulcrumor Pivot: is the turning point of a machine.
4. Load arm is the distance between the fulcrum and the load.
5. Effort arm is the distance between the fulcrum and the effort.

Classes of levers

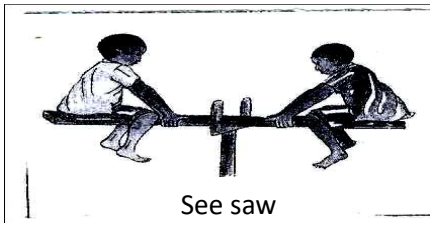
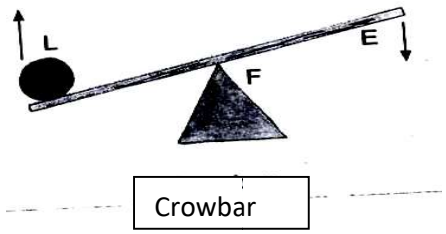
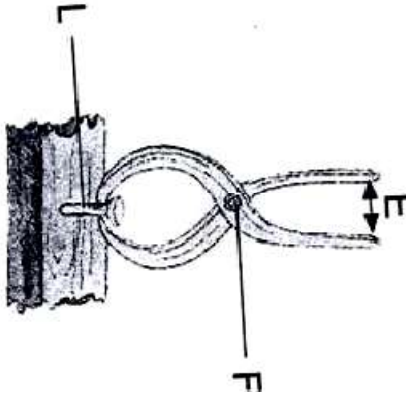
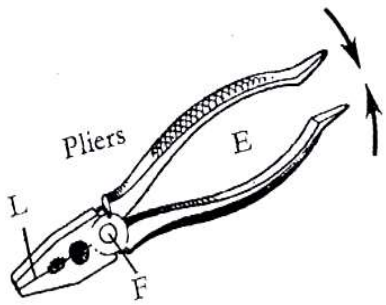
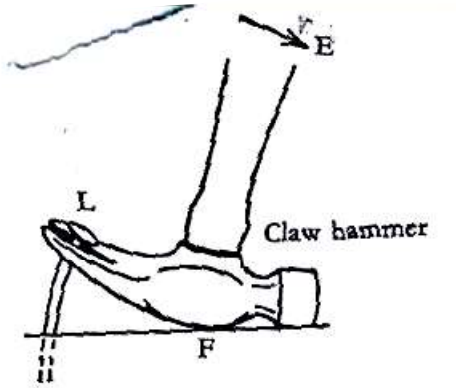
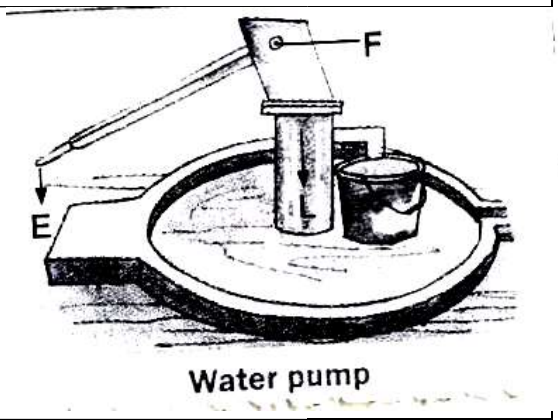
There are three classes of levers depending on the position of the fulcrum(f), Load(l) and effort(E)

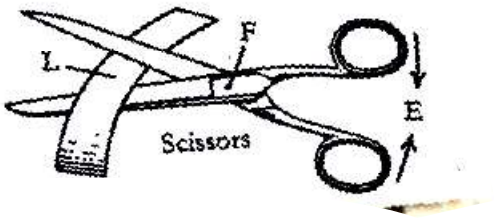
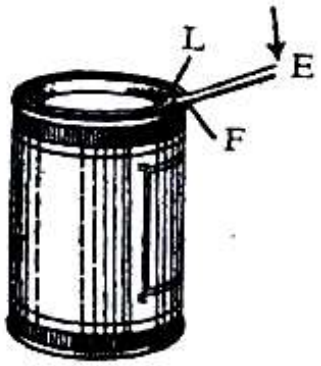
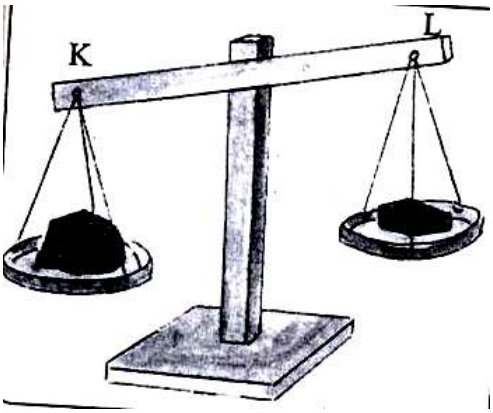
First class levers

Fulcrum/pivot is between the load and effort.

-In this class, the effort arm is longer than the load arm.
-The longer the effort arm, the smaller the effort applied.
-The advantage of the first class lever is that less effort is used.
-First class levers change direction of force

Examples of first class levers

1	See saw	5	Crow bar
	 See saw		 Crowbar
2	Pincers	6	pliers
			
3	Claw hammer	7	Water pump
			
4	Scissors	8	Lid opener

			
9	Scales		
			

Second class levers

Load is between the **fulcrum** and **effort.**

-The fulcrum and the effort are on either side. (FLE OR ELF)

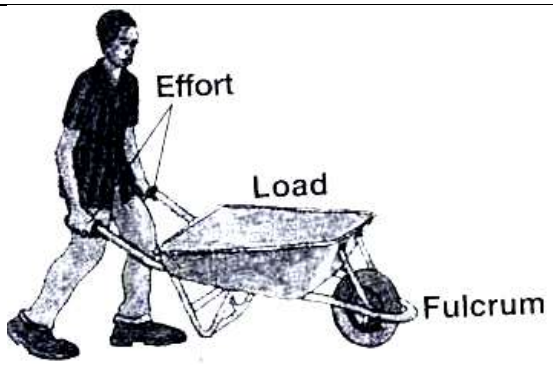
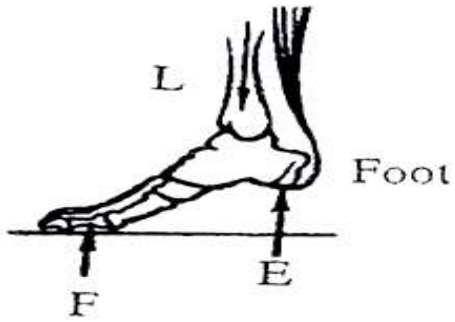
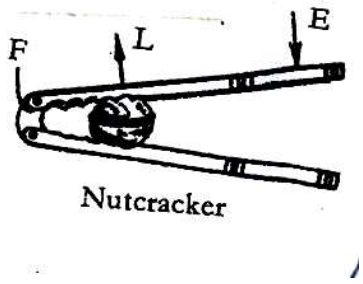
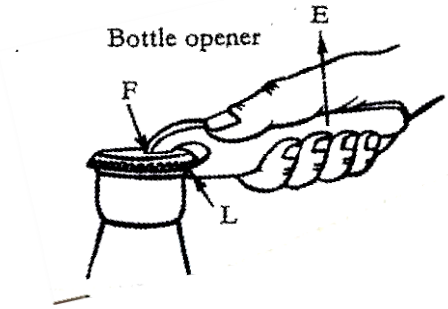
-The load is closer to the fulcrum than the effort

-The effort applied is smaller compared to the load.

-First and second class levers are referred to as force multipliers because they reduce Effort needed to do work.

-Second class levers do not change direction of force.

Examples of second class levers.

1	Wheel barrow	3	H\uman Foot
			
2	Nut cracker	4	Bottle opener
			

Exercise

1. Write down any two examples of each of the following.
   a) 1st class lever b) second class lever
2. State any one advantage of using first class levers
3. Draw any two machines classified as 1st class levers
4. How are machines important in life?
5. State any two ways by which machines improve their efficiency?

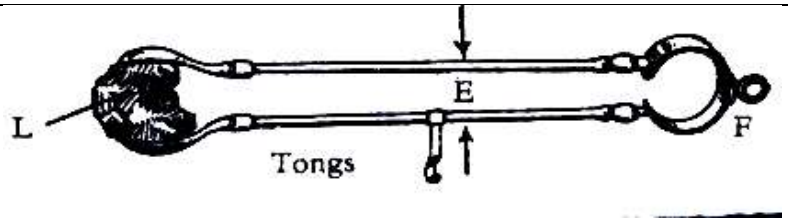
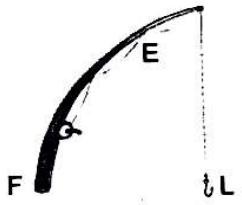
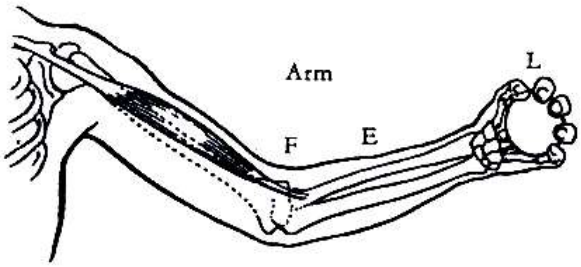
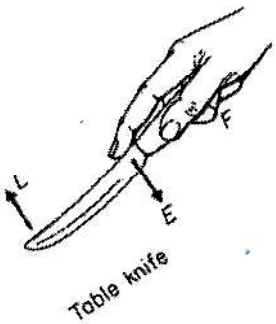
LESSON FOUR: THIRD CLASS LEVERS (week 4)

Their Effort is between fulcrum and load
-The fulcrum and the load are on the either side. (FEL)
-The effort is closer to the pivot than the load
-The effort used is greater than the load.

-Third class levers are referred to distance multipliers because the load moves through a longer distance than effort.

The advantage of using this class is that the effort moves through a shorter distance than the load.

Examples of third class levers

1	Sugar tongs	3	Fishing rod.
			 Fishing rod
2	Human arm. 	4	Spade. 
5	Tweezers 	6	Table knife 

Note:

The formula PLE or FLE can help to determine the class of lever

The principle of moments (The law of levers)

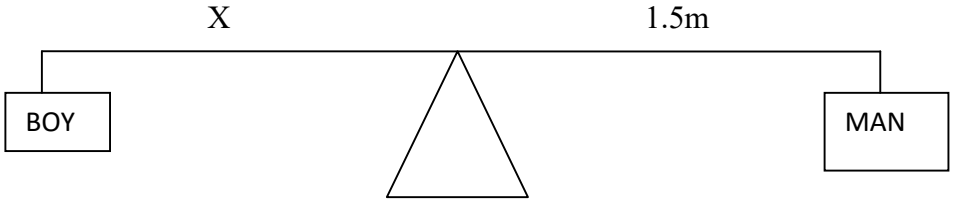
It states that clock wise moments are always equal to anti-clock wise moments. Therefore, the load force multiplied by the load arm is equal to the effort force multiplied by the effort arm.

Examples

A man weighs 60kgf. He sits 1.5 metres from the fulcrum of the see saw. How far from the fulcrum will the boy whose weight is 30 kgf sit in order to balance the man?

Let the man be the effort and the boy be the load.

Let the load be x metres.



Load x Load arm = Effort x effort arm.

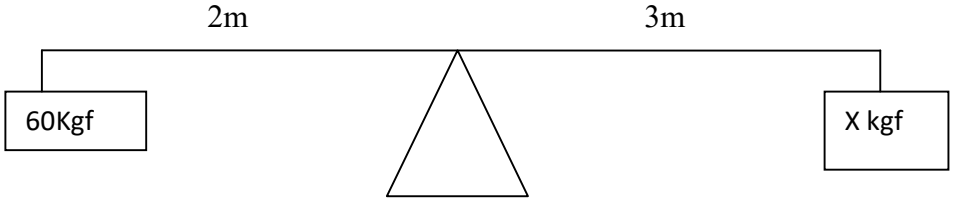
30Kgf x X=60kgf x 1.5m

$\frac{30x}{30} = \frac{90}{30}$

x =3 metres

2. A boy weighing 60kgf sits 2 metres away from the fulcrum of the see saw.

A girl sits on the other side at a distance of 3 metres from the fulcrum in order to balance the see saw. Find the weight of the girl.



Let the boy be the effort and the girl the load.

Let the girl's weight be y

Then, Load x Load arm=Effort x Effort arm

y x 3m =60Kgf x 2 metres.

$\frac{3y}{3} = \frac{120}{3}$

y = 40kgf

3. A weight of 120Kgf at a distance 3cm from the fulcrum is balanced by a weight of 30Kgf on the other side. Find the distance from the 30kg weight to the fulcrum.

Take 120kgf as the effort and 30kg as the load.

Let y be the distance of the load from the fulcrum.

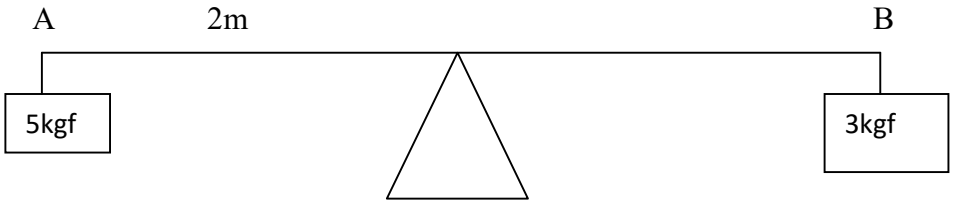
Then Load x load arm=Effort x Effort arm.

30 x y =120gf x 3cm

$\frac{30y}{30} = \frac{360}{30}$

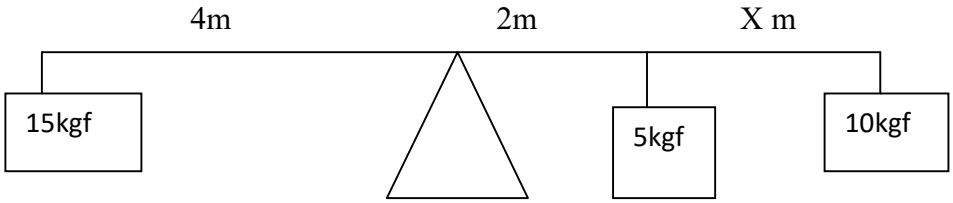
y =12cm

4.Using a see-saw shown below, find the length of the wooden plank AB.

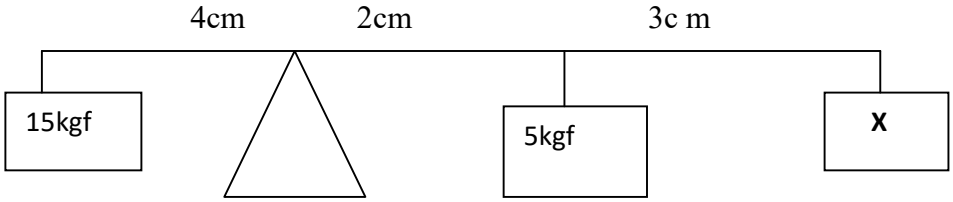


LESSON FIVE: LAW OF MOMENTS (week 4)

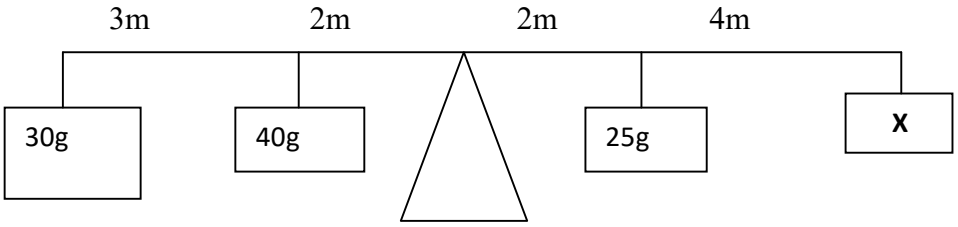
1. **Find the value of X**



2. **Find the weight at X**



3. Find the weight at X



LESSON SIX & SEVEN: INCLINED PLANES (week 4)

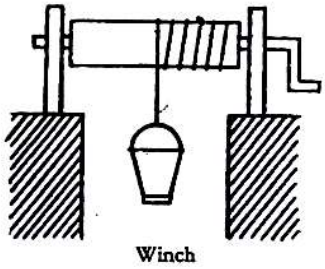
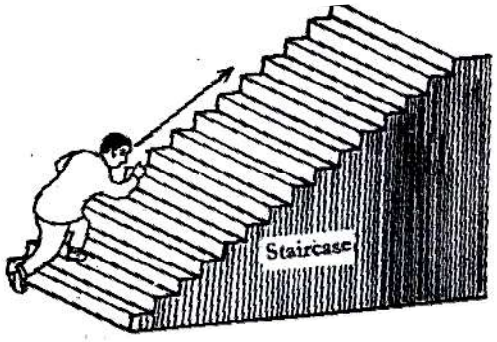
Meaning of an inclined plane

An inclined plane is a slanting surface.

Importance of an inclined plane

It enables heavy loads to be raised using a lesser effort.

Examples of inclined plane

1	Winding road	3	Winch
			
2	Stairs/ steps.	4	Ladders
			

Mechanical Advantage of machines

Mechanical Advantage (M.A) is the ratio of the load to effort. i.e. M.A = Load/effort.

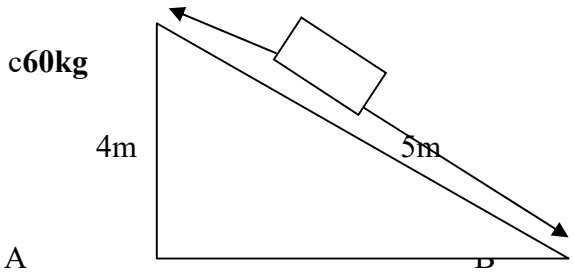
-M.A is the number of times a machine simplifies work.

-M.A has no units since it is a ratio.

-Friction lowers M.A.

Example;

John used a slope to raise a load of 60kgf from the ground to the higher level as shown below.



Work out the following

The effort distance

=5m

The load distance

=4m

Work done

W=FXD

M.A= Load

Effort

= Distance effort moves

Distance load moves

=5

4

Work

Work is a product of force and the distance moved.

Work=Force x Distance moved.

Work done by the effort=effort x effort arm.

Work done by the load= load x load arm.

The unit of work is a joule.

The unit of force is the Newton.

The standard unit of distance is the metre.

1 kgf = 10N

1 joule(of work) is done when one newton (of force) moves through one metre (of distance)

1 joule=1 N x 1 m

1 joule=1 Nm

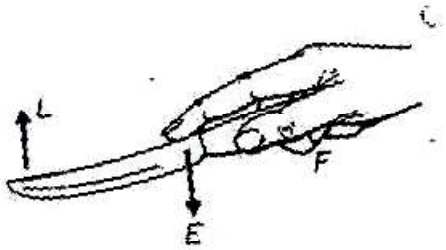
Exercise

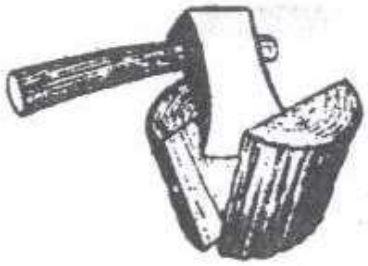
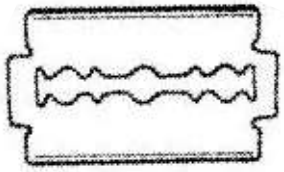
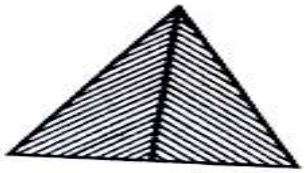
From comprehensive science book seven.

LESSON ONE: WEDGES (week 5)

A wedge is a cutting tool. It isadouble inclined plane/slope.

Examples of wedges

<table>
<tr>
<td>Knife edge.


Toble knife</td>
<td>Axe bladder

Axe</td>
</tr>
<tr>
<td>Hoe
</td>
<td>Razor blade
</td>
</tr>
<tr>
<td>Nail
</td>
<td>Needle
</td>
</tr>
<tr>
<td colspan="2">A wedge

Wedge</td>
</tr>
</table>

Uses of wedges

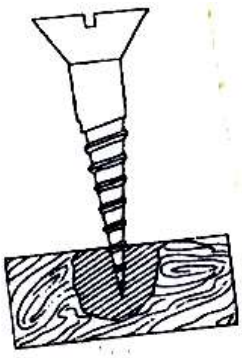
- For cutting objects
- For piercing
- For splitting materials
- For digging

LESSON TWO: SCREWS (week 5)

Vocabulary

- Pitch
- Thread
- Rod
- Groove

DIAGRAM SHOWING A SCREW.



A screw is an inclined plane wound round. It is used to ease our work.

USES OF SCREWS

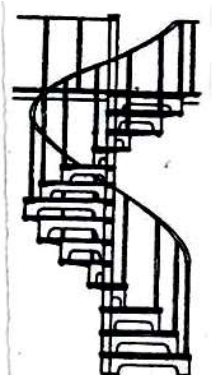
1.Lifting very heavy things e.g. screw jack.

2.It makes movement upstairs easier e.g. using a spiral staircase

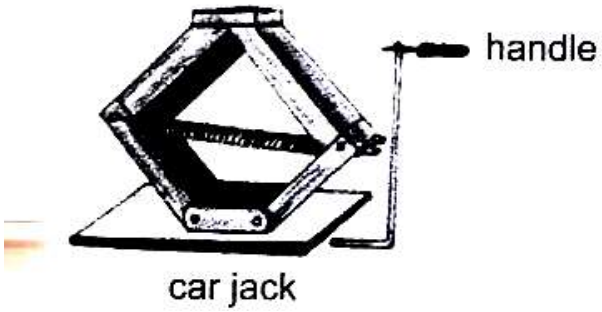
3. Used to fasten things together.

Examples of screws

Spiral staircase



Screw jack



Screw nails



LESSON THREE: WHEEL AND AXLE (week 5)

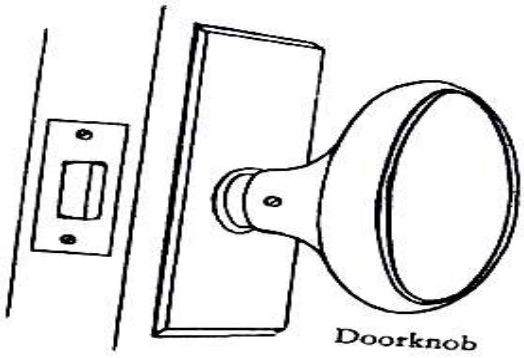
Meaning

An axle is a rod passed through a wheel.

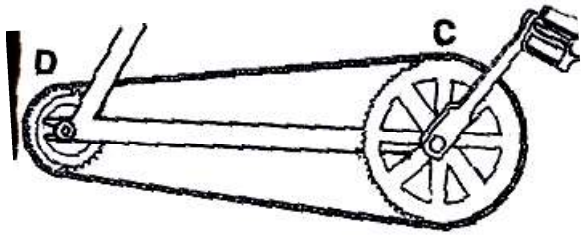
The wheel rotates on an axle.

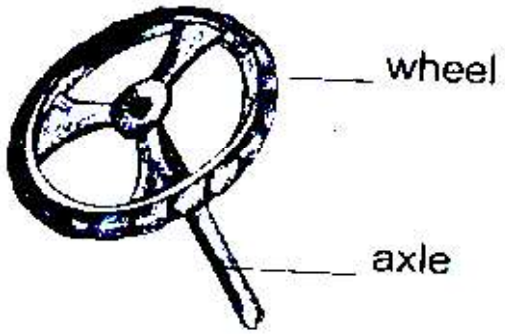
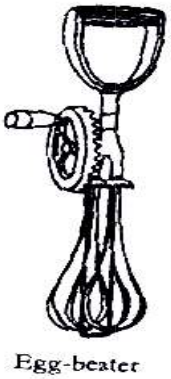
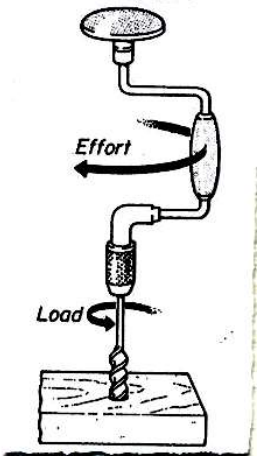
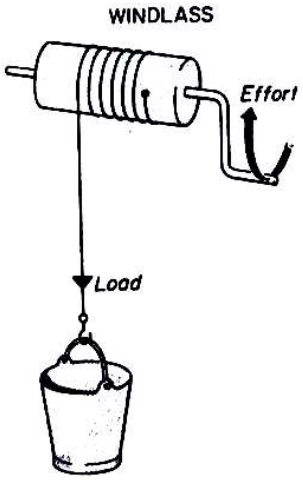
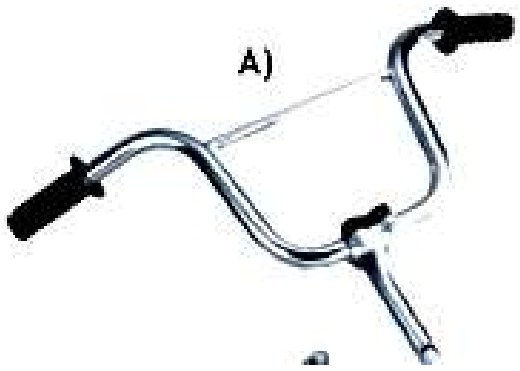
Examples of devices that use wheels and axles

Door Knobs



Pedal wheels



Steering wheel  	Egg beaters 
Screw drivers 	Brace 
Windlass  	Handles of a bicycle. 

Uses of wheel and axle

1.Drawing water from underground tanks using windlass/winch.
2. Drilling holes in wooden materials using the brace
3. Tightening screws to fix things together using a screw jack.
4. It used to loosen screws.
5. Whisking eggs for frying.

Exercise

1. **Give any two examples of each of the following:**
   a) **Wheels and axles**
   b) **screws**
2. **How are screws important to people?**
3. **Give any two groups of people who use screws in their work**
4. **Cite any two examples of wedges at home**
5. **How are inclined planes important to human beings?**

LESSON FOUR& FIVE: PULLEYS (week 5)

Vocabulary

- Pulley
- Movable
- Immovable
- Mechanical advantage

PULLEYS

A pulley is a wheel with a grooved rim that rotates freely about an axle through a centre.
A rope or chain passes over the pulley which prevents the pulley from slipping by the groove.

The frame which holds the pulley is called block.

Importance of Pulleys

1. They help in lifting objects from the lower level to higher level.

2. They help in lifting heavy loads during building.

3. They help in off loading heavy vehicles.

4. They help in towing vehicles.

5. They are used to raise flags on the poles.

6. Help to move window curtains.

Types of pulleys

1. Single fixed pulley

2. Single movable pulley.

3. Block and Tackle system.

Single fixed pulley

The effort applied is equal to the load.

It changes the direction of force

When applying the down ward force, work becomes easier.

The M.A of a single fixed pulley is one (1).

M.A = 1

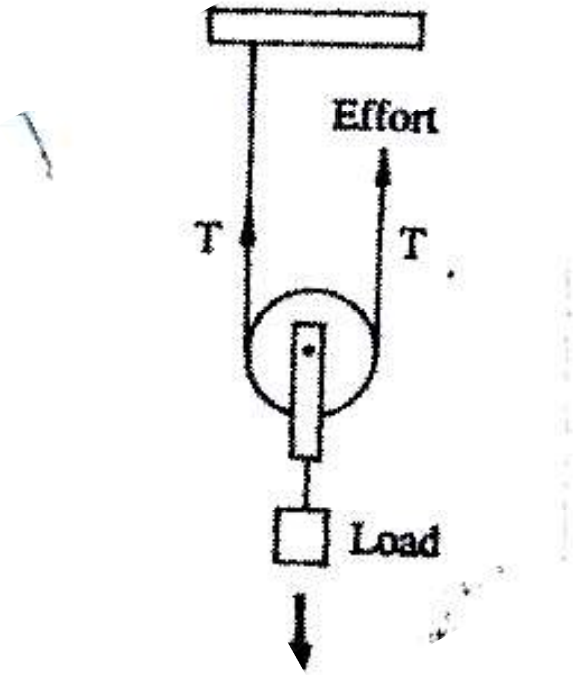
Example:
If a load of 30kgf is to be raised using a single fixed pulley, find the effort needed
M.A =1
L=30kgf
E=??
M.A = load/Effort
1 = 30/E
E x 1 = 30
E = 30kgf.

Exercise:

Single Movable Pulley

-It is supported on two ropes.
-The rope is pulled up wards.
-The pulley moves with the load.
-Each of the ropes share a half of the effort needed.
-The rope moves twice as far as the load.
-The M.A advantage of single movable pulley is 2 (two)

Effort applied is half the load force. (It reduces the effort needed)



M.A = 2

Example. If a load of 30kgf is to be raised using a single movable pulley, Find the effort needed.

M.A = 2
L = 30kgf
E =??
M.A = L/E
2 = 30/E
2 x E = 30
$\frac{2E}{2} = \frac{30}{2}$
E =15kgf

LESSON SIX AND SEVEN (WEEK 5)

DIFFERENCES BETWEEN FIXED AND MOVABLE PULLEY

Fixed pulley	Movable pulley
Work is done faster	Work is slower
Change direction of force	No change of in direction of force
Force used is equal to the load.	Effort applied is half the load force.

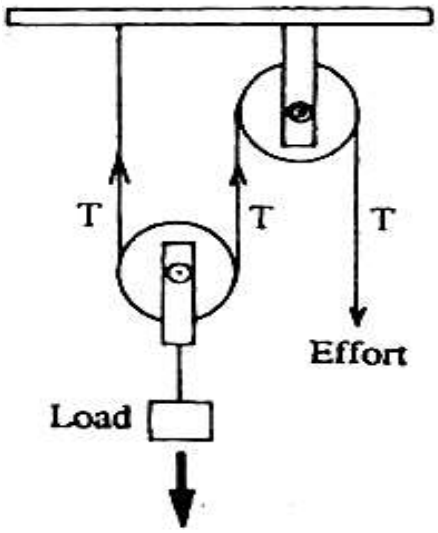
BLOCK AND TACKLE PULLEY SYSTEM

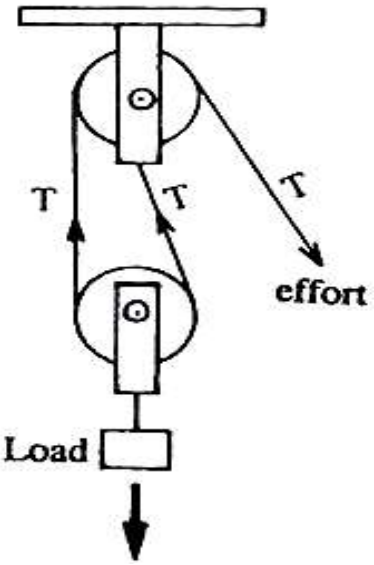
-It does work more easily because it is a combination of both fixed and movable pulleys.

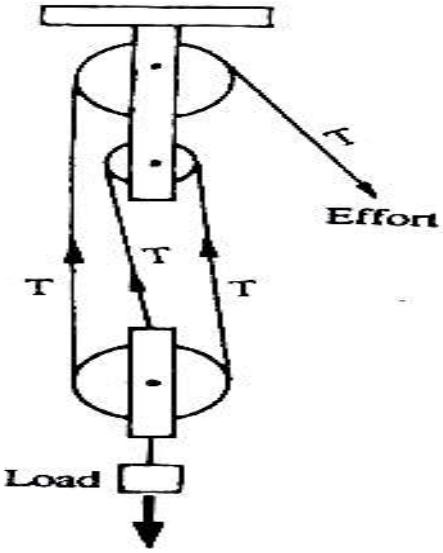
-It changes direction of force.

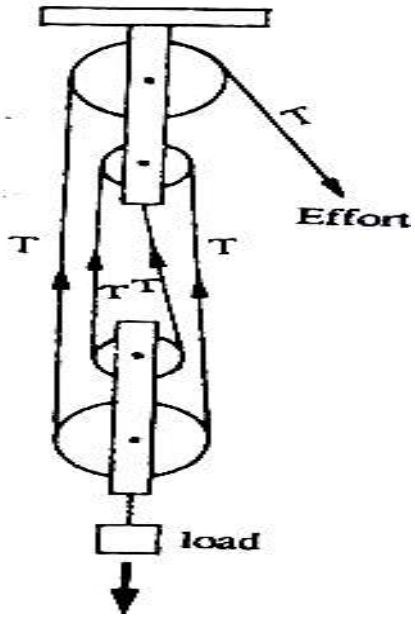
-It reduces effort needed.

-Th



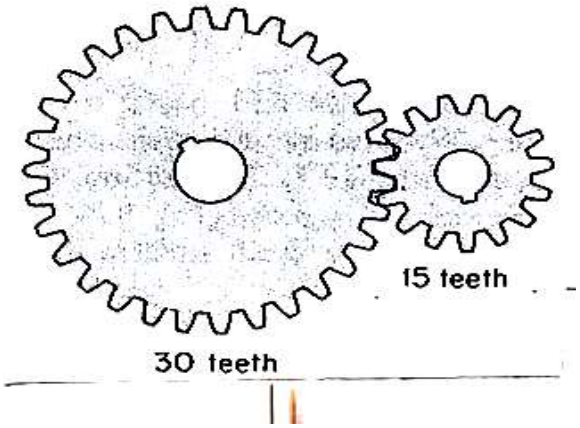


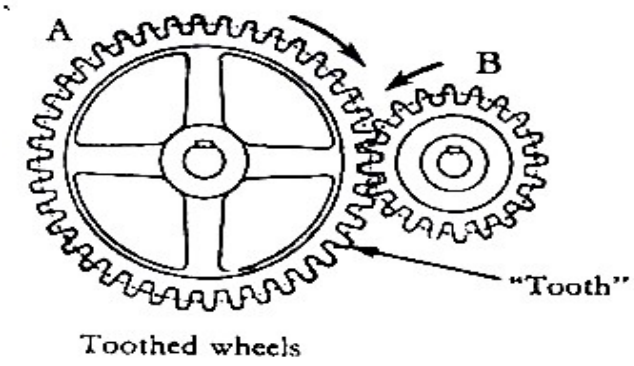




GEARWHEELS/COG WHEELS OR TOOTHED WHEELS

-A gearwheel is a special form of the wheel
-It has teeth around its edge.
-These teeth-like interlocks with the groove of another gear wheel.
-When one turns, it causes the second one to turn too.



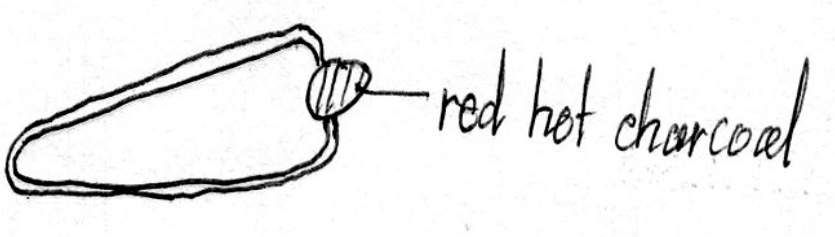


Toothed wheels

If A has 30teeth and B has 15 teeth, how many rotations does B make in one revolution?
30divided by 15
=2 turns.

Exercise

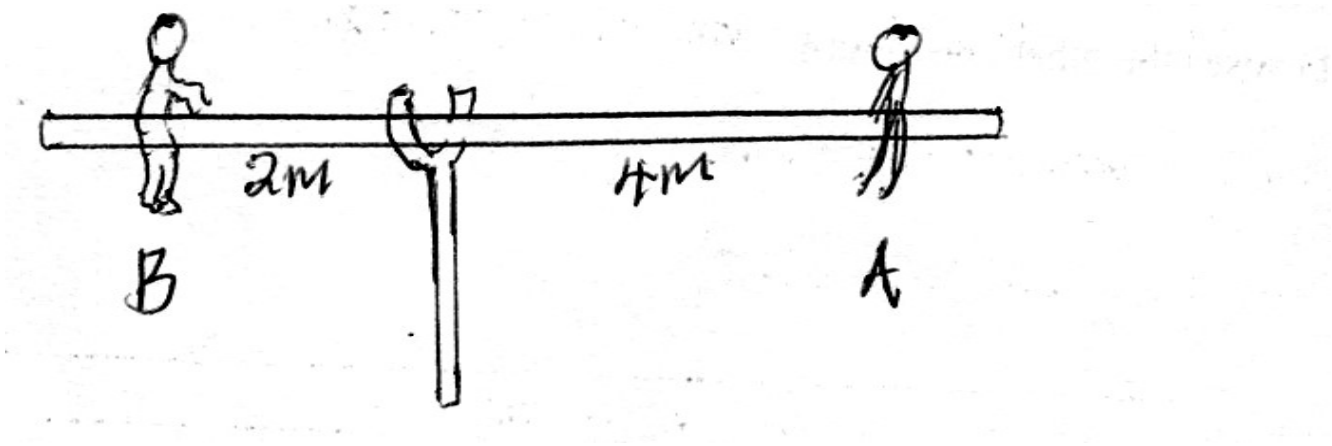
1. Give any two types of pulleys.
2. How are pulleys important at school?
3. Calculate the Mechanical Advantage of a machine that needs an effort of 20kgf to overcome a load of 60 kg.
4. State one difference between a single fixed pulley and a single movable pulley.
5. Cite any two importance of the rope on a pulley.
6. Which class of levers is called a force multiplier?
7. State two differences between a single fixed and single movable pulleys.
8. Use the diagram below to answer the questions that follow



a) Name the above simple machine
b) To which class of levers does it belong?

c) Use arrows to indicate the effort on the machine.

9. Two boys were balancing on a seesaw below



a) Who of the two boys is heavier?
b) Give a reason for your answer in (a) above.

TOPICAL TEST ON SIMPLE MACHINES AND FRICTION

1. Name the force that opposes movement of objects.
2. What is lubrication?
3. Give any one use of a screw to people.
4. Why is a hoe grouped under simple machines?
5. How do machines simplify work?
6. Under which group of levers does a bottle opener fall?
7. A packet of sugar has a mass of 1kg. What is its weight?
8. Why is friction useful when you are walking?
9. Why are most fast moving cars streamlined?

The diagram below shows arrangement of wheels in a gear box. Use it to answer questions 10 and 11

Name the type of machine shown above.

10. Use arrows to show the direction of movement of both gear wheels.
11. Kato used a single movable pulley to raise a load of 20kg. Calculate the effort needed to raise the load.
12. Why do cars slide when brakes are applied on muddy roads?
13. Identify any one part of the human body that works like levers.

SECTION B

14. A man applies a force of 500N to push a truck 1000 cm down the road. How much work does he do?
15. The diagram below shows a type of pulley. Use it to answer questions that follow.
    a) Identify the type of pulley drawn above.
    b) How does the above pulley simplify work?
    c) What is the mechanical advantage (M.A) of the above pulley?
    d) In which one way can the above pulley be used at school?
16. a) Give any one danger of friction to people.
    b) State any one advantage of friction in our daily life.
    c) How can friction be reduced in moving parts of a bicycle?
    d) What is the purpose of treads on car tyres?
17. **The diagram below shows a lever. Use it to answer question 19**

    a) Which part of the lever is representing the turning point?
    b) Calculate the weight of child P.

Topic 5: EXCRETORY SYSTEM (Lesson 1, week 6)

VOCABULARY

- **Excretion**
- **Skin**
- **Excreta**
- **wastes**

The excretory system collects waste products from the body cells and removes them from the body.

Importance of the excretion

1. Maintains homeostasis by keeping the body's internal environment stable and free from dangerous substances.

Excretion

It is the process by which harmful materials are removed from the body.

Also refers to the removal of harmful substances from the body.

Excretory Products from the Body

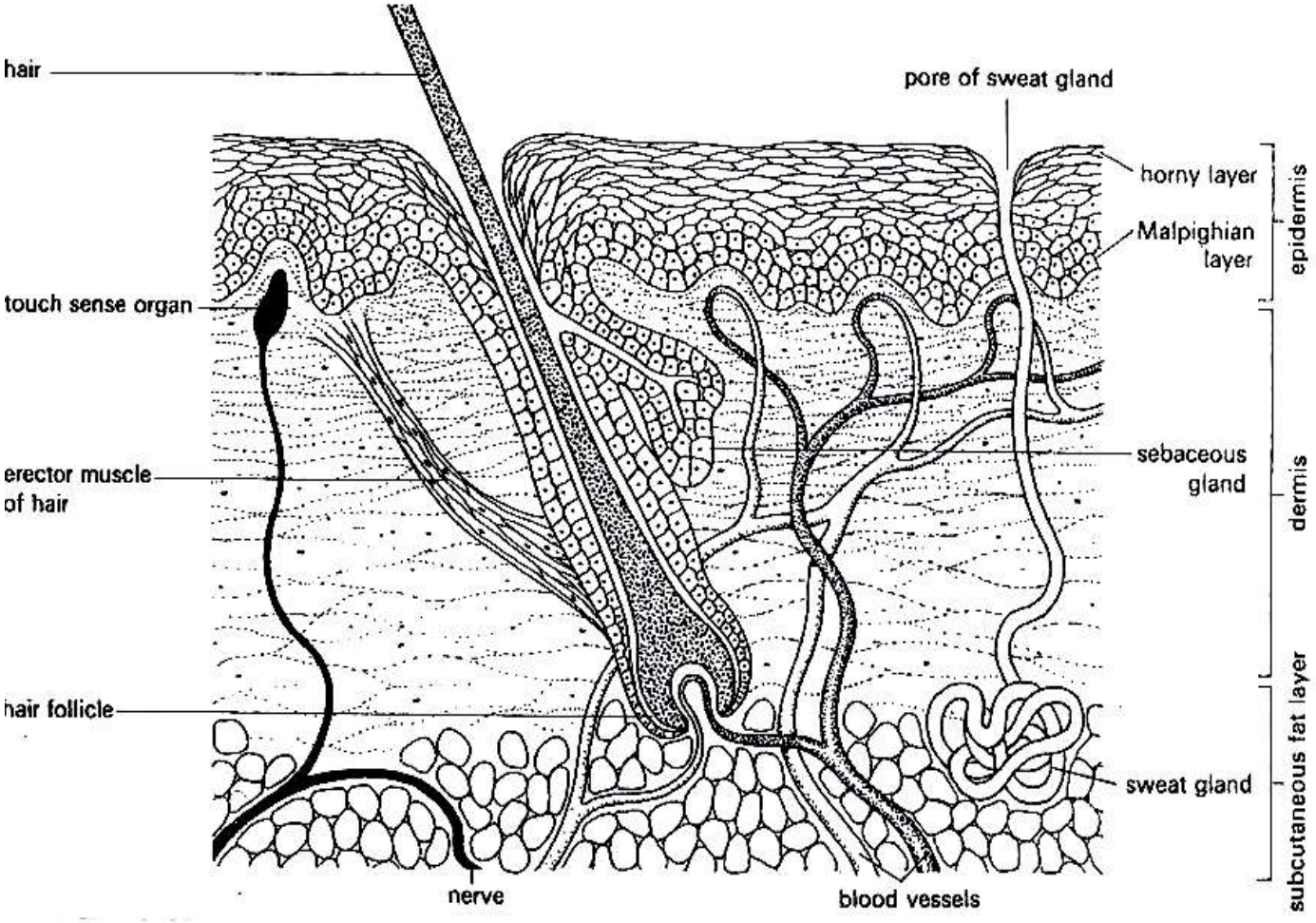
Excretory organ	**Excretory products**
Lungs	Carbon dioxide ,watervapor
Kidneys	Uric acid, excess water ,salts, urea
Skin	Water, salt, urea, lactic acid
Liver	Bile pigments

Note: **Urea, inactive hormones, excess salts and water** are waste products in**Urine.**
Water and **salts** are waste products in **sweat**

WEEK SIX, LESSON TWO& THREE: THE HUMAN SKIN

-It is the largest organ of the body
-It covers most part of the body.
-It is a sense for feeling
-The skin removes sweat from the body.
-Through sweating, the body cools down.

STRUCTURE OF THE SKIN



The skin consists of two main layers

These are:

- Epidermis.
- Dermis layer.

Epidermis

- It is the outer layer.

The layers that make up the epidermis include:

a) Cornified layer

b) Granular layer

c) Malpighian layer

Cornified layer

It is the tough outer most layer with dead cells.

- ❖ It prevents bacteria/germ invasion to the skin.
- ❖ It provides resistance to damage.
- ❖ It reduces excessive loss of water by evaporation

Granular layer

It contains living cells and produces new cells which die continuously to form the cornified layer.

Malpighian layer

It is made up of young cells.

It contains melanin that determines skin colour and hair colour.

Melanin also protects the skin against strong radiation from the sun.

- ❖ NB: When you lack melanin, you become an albino
- ❖ On the finger nails are cells called keratin that helps to produce toes and finger nails.

Dermis

It is the inner layer of the skin.

Parts of the dermis

-Capillaries -Sweat glands -Hair follicle -Sebaceous glands -Sweat duct -Pores -Erector muscle -Nerves -Subcutaneous fat

Uses of some parts of the skin

- ❖ **Hair**: For keeping the body warm.
- ❖ **Sweat glands**: -They produce and store sweat
  -Absorbs sweat from blood.
- ❖ **Pore**: It lets out sweat from the body.
- ❖ **Capillaries**: Transport food and oxygen to all parts of the skin.
- ❖ **Sebaceous glands**: Produce an oily substance called sebum.
  -Sebum protects, lubricates and water proofs the skin
  -Sebum repels water, damaging chemicals and microorganisms that may damage the skin.
- ❖ **Erector muscle**: It keeps the hair standing.
- ❖ **Nerves:** Conduct sensations of pain, coldness, heat and touch to the brain.
- ❖ **Subcutaneous fat:** It contains fat cells where fat is stored.

Function of human skin

- ➢ Excretes salts, water and urea(sweat).
- ➢ Stores fats that insulate the body and keep it warm.
- ➢ Prevents the entry of germs in the body.
- ➢ It regulates the temperature of the body.
- ➢ It is a sense organ for feeling.
- ➢ It is water proof hence prevents entry of water in the body.
- ➢ It contain substances used to make vitamin D
- ➢ Protects the body from mechanical injury.

How the skin regulates body temperature

When it is hot, the skin regulates the body temperature through:

- Sweating which cools the body.
- Vasodilation- widening of arterioles to allow blood flow to the skin surface.

When it is too cold, it regulates the temperature by:

- Shivering to increase body temperature and keep the body warm
- Vasoconstriction- arterioles become narrow to reduce the flow of blood to the skin surface.
- Furry mammals and birds fluff out fur or feathers to improve insulation and reduce heat loss from the body.
- Production of goose pimples in man which reduce heat loss.

Exercise

1. Name any one excretory organ.
2. State any one importance of the skin to people
3. Identify one activity done to care for the skin
4. Name the bacterial disease of the skin
5. Of what use is sebum in the human skin
6. In which layer of the skin is melanin found?
7. How can you protect your skin from skin diseases?

Diseases of the human skin

- Scabies- caused by itch mites.
- Athlete's foot- caused by fungus.
- Dhobi itch- caused by fungus
- Leprosy- Caused by bacteria.
- Impetigo- Caused by bacteria
- Boils- Caused by bacteria.
- Skin cancer- using strong chemicals on the skin.
- Chicken pox- caused by a virus.
- German measles- Caused by a virus.
- Scurvy- Lack of vitamin C/Vitamin C deficiency

Disorders of the human skin.

a) Albinism: Lack of melanin in the skin.
b) Burns.
c) Scalds
d) Cuts

Care of the human skin

- ❖ Wash the body with clean warm water and soap.
- ❖ Smear the body with Vaseline to make it soft.
- ❖ Avoid sharing clothes, bath towels, basins and sponges.
- ❖ Wash and iron clothes before wearing them.
- ❖ Eating foods rich in a balanced diet.
- ❖ Avoid playing with sharp cutting materials.
- ❖ Do regular physical exercises.

WEEK SIX, LESSON FOUR: THE KIDNEYS

Vocabulary

- Filtration
- Cortex
- Urine
- Ureter

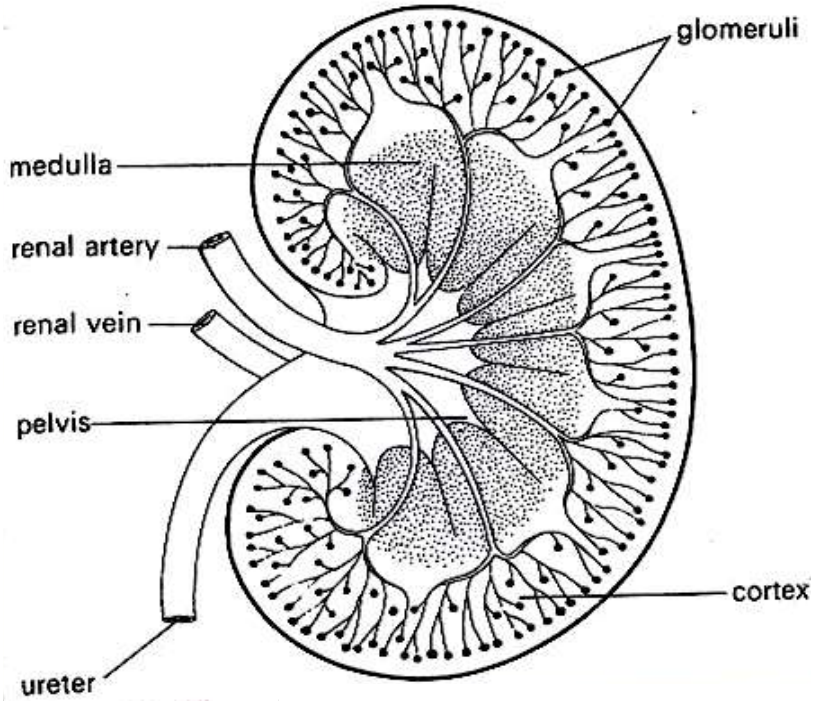
a) The kidneys remove nitrogenous compounds from the body.
b) They regulate the amount of water and salt in the body.
c) They belong to the excretory and urinary systems.

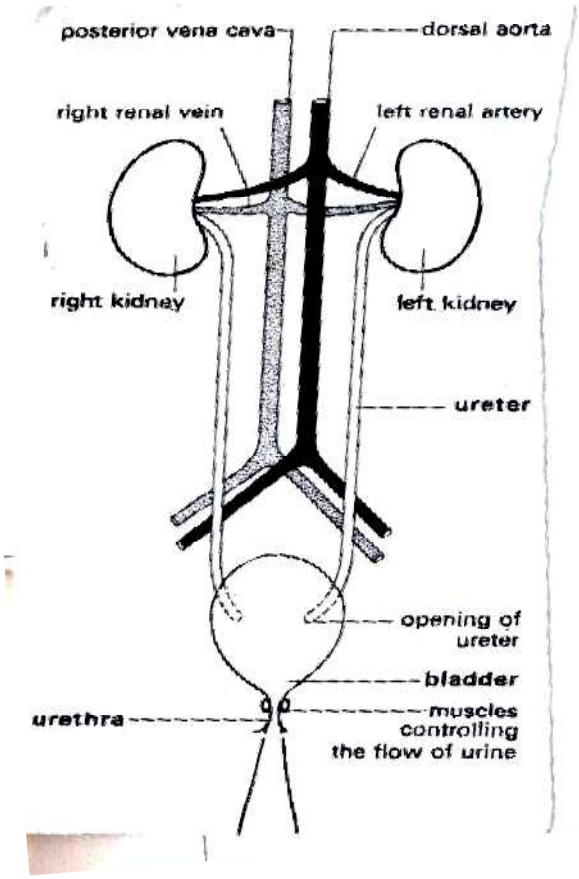
Activity

Drawing and naming parts of the kidney

WEEK SIX, LESSON FIVE& SIX: THE KIDNEYS

Structure of the kidney





FUNCTIONS OF THE PARTS OF THE KIDNEY

- **Kidney wall**: It protects the internal parts of the kidney.
- **Cortex**: For filtration of blood.
- **Medulla**: Re-absorption of water, salt and other substances.
  The process of re absorption of water from urine is known **as osmoregulation.**
- **Pyramid:** A hole through which urine from thecortex pours into pelvis.
- **Pelvis**: receives urine from the cortex before it goes down to the urinary bladder.
- **Ureter**: It is a passage of urine from pelvis to the urinary bladder.
- **Renal artery**: It carries oxygenated blood from the aorta to the kidney.
- **Renal Vein:** It carries deoxygenated blood from the kidney to the venacava.
- **Kidney**- It filters blood to remove urine// regulate amount of salt and water.
- **Urethra**-It is a tube through which urine is passed out of the body.
- **Sphincter muscle**-They control the flow of urine out of the urinary bladder.
- **Urinary bladder**-It stores urine before it is passed out of the body.

Functions of the kidneys

- Filters blood(main function)
- Regulates the level of water, sugars and salts in the body.

Good habits for the kidney

- ❖ Doing daily physical exercises.
- ❖ Avoid holding back urine for a long time.
- ❖ Go for medical examination in case of long time back pains
- ❖ Drink a lot of boiled water.

Why people urinate more frequently on cold days than a hot days

On a hot day, you sweat a lot, therefore there is less work of excretion by the kidneys

On a cold day, there is less or no sweating as the pores are half or fully closed.

The kidneys therefore take over the work of removing excess water from the body.

Why do you pass out urine more regularly when you drink a lot fluids?

Kidneys keep a constant amount of water in the blood. Excess water will be excreted in form of urine

Why is the left kidney located slightly higher than the right kidney?

The right kidney is found under the liver which is the largest internal organ than the left kidney which is under the spleen.

DISEASES OF THE KIDNEY AND THE URINARY SYSTEM

- ❖ Kidney stones.
- ❖ Kidney failure
- ❖ Bilharzia.
- ❖ Nephritis: this is an inflammation of the kidney

THE LUNGS AS EXCRETORY ORGANS

- ✓ The Lungs remove carbon dioxide and water from the body.
- ✓ Lungs are both **excretory and respiratory organs.**
- ✓ As air goes through the nose, it is warmed, moistened and cleaned. (filtered)
- ✓ When we breathe through the mouth, we take in cold air which may affect our lungs.
- ✓ Gaseous exchange takes place in the alveoli.

Diseases of the Lungs

-Diphtheria -Lung cancer -Asthma -Pneumonia -Bronchitis -Tuberculosis -Whooping cough -Haemophilus influenza -Laryngitis -Emphysema -Pleurisy

Disorders of the Lungs

- ➢ Choking
- ➢ Hiccups
- ➢ Yawning

WEEK SIX, LESSON SEVEN: THE LIVER

It is the largest internal body organ.

Function of the liver

- Regulation of blood sugars.
- Produces bile salts which aid absorption of fats.
- Stores iron.
- It reduces on excess amino acids in the body (deamination)
- Manufactures of plasma proteins.
- It burns fats to forms glucose and release energy.
- It converts poisonous compound into harmlesssubstances (Detoxification)
- It stores vitamin A, D and B_{12}
- It produces heat.

Circulation to and from the liver

a) **Hepatic artery**: It supplies oxygenated blood to the liver.
b) **Hepatic portal vein**: It supplies blood with digested food from the stomach and intestines to the liver.
c) **Hepatic vein**: Carries deoxygenated blood from the liver to the venacava.

Diseases of the liver

1. **Hepatitis:** Caused by a virus spread by contaminated water.
2. **Cirrhosis:** Hardening of liver tissue as a result of alcoholism.
3. **Abscesses** There are pus filled sacs on the liver.

Exercise

1. How are the following important in our bodies:
   a) Kidneys c) liver
   b) Lungs
2. State any two excretory organs.
3. Write down any one waste material from the body.
4. Why is it important to keep our bodies clean?
5. State any one disorder of the following:
   a) Skin b) kidneys.
6. State any two ways of keeping the following in good working conditions
   a) Skin b) lungs c) liver
7. Why is the skin referred to as an excretory organ?
8. Write down any two diseases of the following:
   a) Skin b) lungs
9. How is the urinary bladder different from gall bladder?
10. Give one adaption of the cortex to its function
11. State one difference between the air we breathe in and the air we breathe out.

TOPICAL TEST: EXCRETORY SYSTEM

1. Name the excretory organ that removes lactic acid from the body

- The skin

2. State one way of caring for the liver.

- Avoid taking a lot of alcohol
- Doing regular physical exercises
- Avoid eating poisonous foods/ substances

3. Give any one function of the skin

- Protects inner parts of the body
- Regulates body temperature
- It is a sense organ for feeling

4. Why are the lungs grouped under excretory system?

- They remove carbondioxide and water from the body.

5. Name any one disease that affects the kidney.

- Kidney cancer / nephritis/ cystis / bilharziasis / honorrhoea

6. Give the difference between a burn and a scald.

- A burn is caused by dry heat while a scald is caused by wet heat.

7. How is melanin useful in the body?

- It determines skin colour
- It protects the body from strong rays of the sun.

8. How is the gall bladder different from the urinary bladder?

- The gall bladder stores bile while the urinary bladder stores urine.

9. Name the outermost later of the skin.

- Epidermis

SECTION B

10. The diagram below shows the human kidney. Use it to answer questions that follow;

i. Name parts P and Q

- P – cortex
- Q – Pelvis

ii. To which organ does R lead to?

- To the urinary bladder

iii. How is blood transported by S different from that of T?

- Blood in T is unfiltered while blood in S is filtered.

- Blood in T is oxygenated while blood in S is de-oxygenated.

11. a) State two functions of the skin in the body.

- It removes bile pigments from the body
- It regulates blood sugar
- It produces heat in the body.
- It makes poisonous substances in food harmless.

b) Name two diseases that attack the liver

- Cirrhosis / hepatitis / liver abscess

12. Fill in the table below correctly

Disease	**Cause**	**Organ**
Tuberculosis	**Bacteria**	Lungs
Scabies	Itch mite	Skin
Bilharziasis	**Bilharzias flukes** **Schistomosomes**	Kidney
Lung cancer	**Smoking**	Lungs

13. a) What happens to the following when we breathe I;

i) diaphragm
   - It moves down wards / contracts

ii) Lungs
   - Increases in size.

b) How is Cilias useful in the nose?

- it traps dust and germs from air we breathe.

c) Name one disorder of the respiratory system

- hiccups/ choking/ chills of the lungs

WEEK SEVEN: LESSON ONE AND TWO

TOPIC 6: LIGHT ENERGY

VOCABULARY

- **Energy**
- **Source**
- **Natural**
- **Artificial**

LIGHT

Light is a form of energy that enables people to see.
NB: We see things around us because light **from them**is reflected into**our eyes.**

Light as a form of energy
Light is a form of energy because it is capable of doing work.

Importance of light in the environment.

- ✓ Sunlight is absorbed by plants to make their own food.
- ✓ It enables us and other animals to see
- ✓ Our skins are able to make vitamin D.
- ✓ It is used for photography.
- ✓ We use artificial light on the streets to control traffic

What are sources of light?
Materials that give out light.

Sources of light

1. Natural sources of light
2. Artificial sources of light

Natural sources of light
These are sources of light provided by nature.

Examples of natural sources of light include
Sun, Star, Erupting volcanoes, Lightning, Glow worms, Fireflies
NB: - Of the above, some are very hot e.g. sun and stars, erupting volcanoes.
- Others are not hote.g. Fireflies, glow worms

Artificial sources of light
These are sources which are made by people.

Examples of artificial sources of light.
These include:-Solar lamps -Electric lamps -Fluorescent tubes - Hurricane lamps

Objects that produce light are divided into two:

i**) Luminous objects**

ii) **Non luminous objects**

Luminous objects/ Direct sources

These are objects that produce their own light

Examples are sun, stars, erupting volcanoes, lamps, torches, burning charcoal etc

Non luminous objects/ indirect sources

These are objects that reflect light from other sources of light.

Examples of non- luminous are: the moon, the planets, and mirrors.

The speed of light

The speed of light in normal air is 300000km/sec/ 3 x 10^8m/sec.

Light travels faster in materials less dense than air e.g. warm and slowly in materials that are denser than air e.g. glass, water.

1. State any two sources of light.
2. How is the sun useful to human beings?
3. Why is the moon not a humorous object?
4. How can you protect your eyes from too much sunlight?

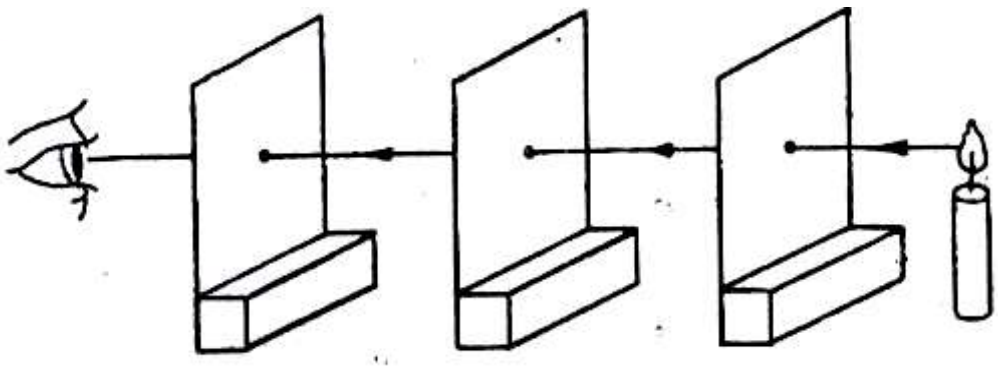
LESSON THREE, WEEK 7: PROPERTIES OF LIGHT

Vocabulary

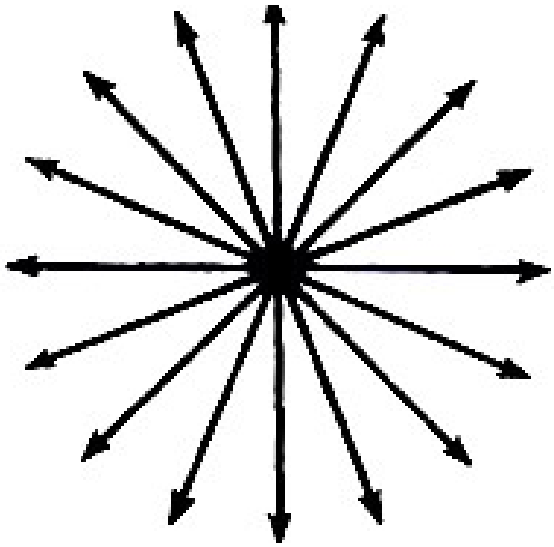
- Property
- Beam
- Ray

Light energy has several properties namely:

1.Light travels in a straight line



2. Light travels from a source in all directions.



Light travels out in all directions from the source

RAYS

A ray is a path taken by light.



BEAMS OF LIGHT

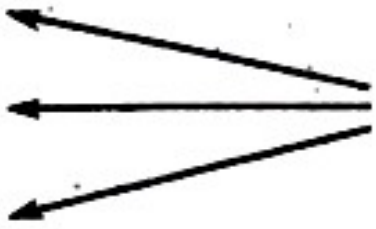
A beam is a group of light rays traveling in the same direction.

Types of beams

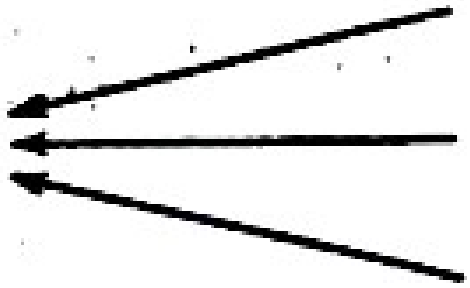
i. Parallel beams



ii. Divergent beam



iii. Convergent beam



Activity

A demonstration on light travelling in a straight line

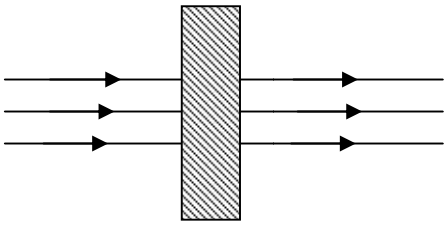
LESSON FOUR, WEEK 7: EFFECTS OF DIFFERENT MATERIALS ON LIGHT

Vocabulary

- Transparent
- Opaque
- Translucent
- Frosted

1. **Transparent objects**
   These are materials that allow all light to pass through them
   Examples of transparent materials
   1.Clear glass
   ii.Clear water.
   iii. Air.

Diagram showing effect of light in transparent materials



2. **Translucent materials**
   These are objects which allow little light to pass through them.
   We can't see through translucent objects because they scatter light passing through them.

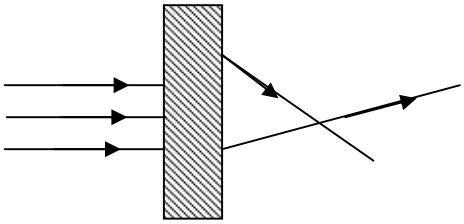
Examples of translucent materials.

I. Frosted glass
ii. Coloured glass.
iv. Oiled paper.
v. Smoky air.
vi. Thin cloth.
vii. Tracing paper.Etc.

Effects of translucent objects on light.

They allow little light to pass through them.
They diffuse the light

Translucent object



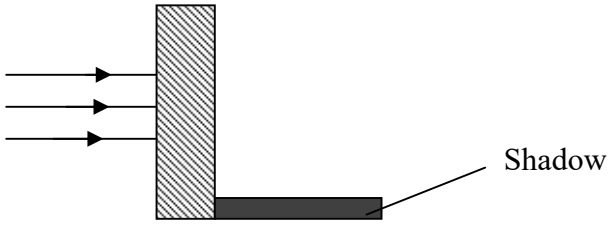
3. **Opaque objects**

An opaque object is that which does not allow any light ray to go through it.

Examples of opaque objects

1. A wall.
2. A hard paper.
3. Wood.
4. Stones.
5. Metals
6. Human Body e.t.c.

Opaque object



Effects of opaque objects on light

They obstruct light and form shadows.

Exercise

1. Give any two uses of translucent objects in our daily life
2. Why are we unable to see through a concrete wall?

LESSON FIVE& SIX, WEEK 7: SHADOWS

Vocabulary

- Shadow
- Umbra
- Penumbra

A shadow is a region of darkness caused by obstruction of light.

Formation of a shadow

a) **Shadows formed from a point of source of light**

A total shadow is formed.

b) **A shadow formed from a source of light bigger than a point**

-Each point on the source produces its own shadow
-All these shadows overlap to give a single shadow.
-This single shadow has a darker inner portion and less dark outer portion

Diagram showing formation of a shadow

Parts of a shadow

i. **Umbra**- It is the darker part of a shadow.
It is formed by total obstruction of light

ii. **Penumbra**- It is the lighter part of a shadow.
Penumbra is formed by partial obstruction of light.

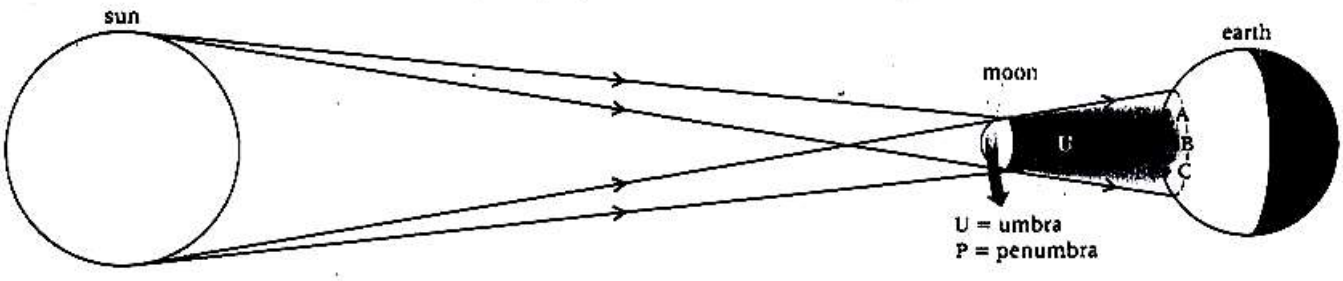
ECLIPSE

It isa total or partial blocking of sunlight when the earth or moon is between the other bodies.The sun, the moon and the earth are the bodies commonly involved in the eclipse.

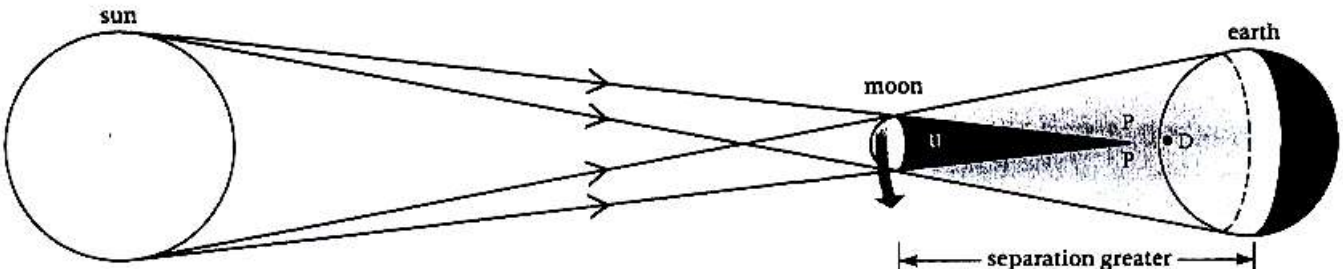
Types of eclipse

1. Solar eclipse

This is the eclipse of the sun.
It occurs when the moon comes between the sun and the earth (SME)



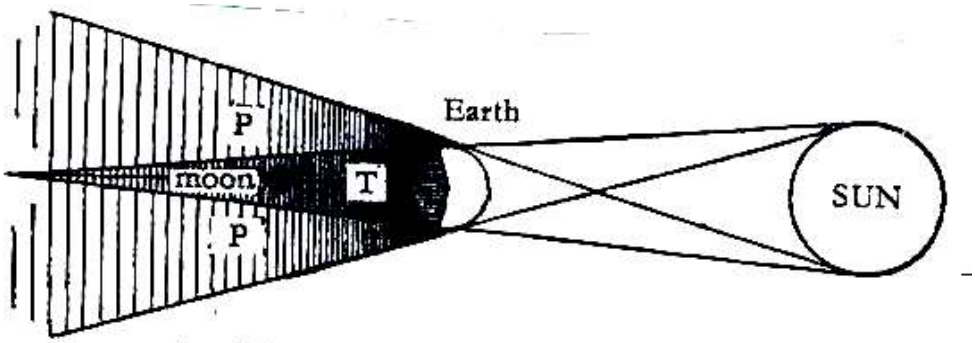
b) Annular eclipse of the sun



3. **Lunar eclipse**

This is the eclipse of the moon

It occurs when the earth comes between the moon and the sun (MES/SEM).



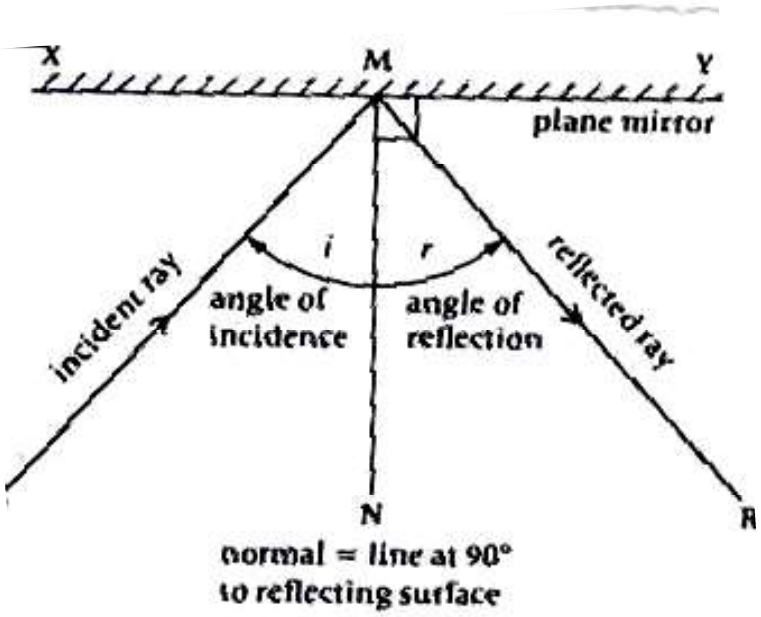
Conditions for lunar eclipse
P=partial eclipse, T=total eclipse

Exercise

1. Name the eclipse formed when:
   a. The earth is between the moon and the sun.
   b. The moon is between the earth
2. Why is a person unable to clearly see objects during eclipse of the sun?

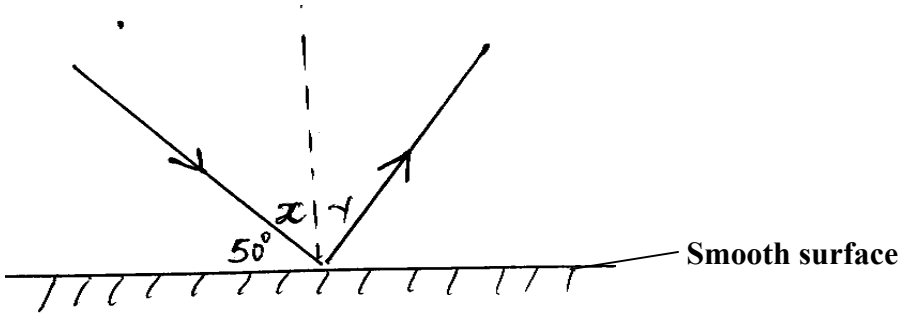
LESSON SEVEN& EIGHT, WEEK 7: REFLECTION

Reflection is the bouncing of light.



- The ray that hits the surface isthe**incident ray.**
- The ray that bounces off the surface is the**reflected ray.**
- **The normal** is perpendicular between the incident ray and reflected ray.
- The angle between the normal and the incident ray is **angle of incidence.**
- The angle between the normal and the reflected ray is **angle of reflection.**

Calculations about reflection of light
Example



From the diagram

i. Calculate the angle marked x and y

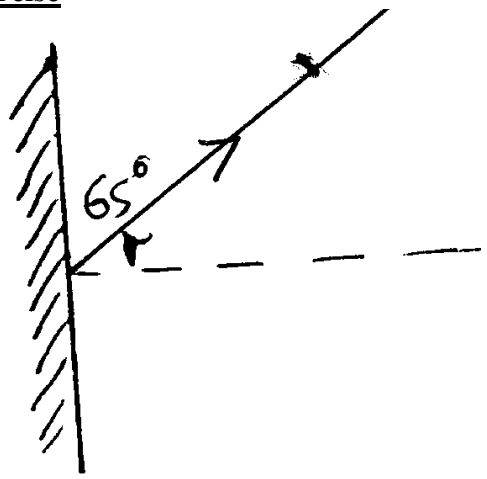
$X+50^0 = 90^0$

$X+50^0 - 50^0 = 90^0 - 50^0$

$X = 40^0$

Angle Y = 40^0(anglei = angle r)

Exercise



a) Find the value of angle r
b) Complete the diagram by indicating the missing ray

3. State any one law of reflection of light
4. Curve any one way reflection is useful in our daily life.

Types of reflection

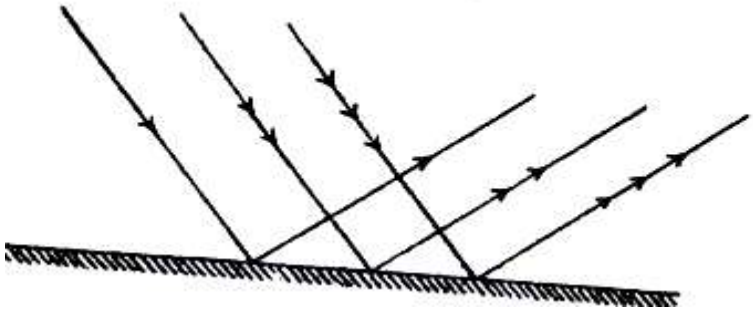
There are two types of reflection namely:

1. Regular reflection.
2. Irregular reflection/Diffuse reflection.

Regular reflection

It occurs on shiny smooth surfaces.

The reflections are regular.

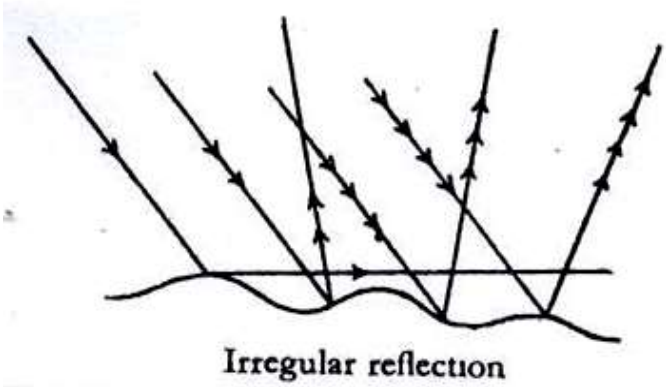


Smooth shinny surface

Irregular/diffuse reflection

It occurs in shiny rough surfaces

The reflections are irregular

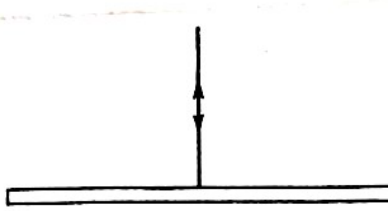


ıgh surface

Normal reflection

When a ray strikes a mirror at right angle, it is reflected

Through the same path.



<u>The laws of reflection</u>

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

The ray travelling along the normal is reflected back along itself.

Exercise

1. How can we keep our eyes clean?
2. Why is it important to use clean water when cleaning our eyes?
3. **Draw a diagram showing the effect on translucent objects on light.**

LESSON NINE, WEEK 7: REFLECTION AND LIGHT

- Light coloured objects reflect more light than the dull ones.
- White light contains all the three primary colours of light.
- A white object absorbs no colour but reflects all.
- A black object absorbs all the primary colors and reflects none.
- An object which absorbs all the primary colors appears black.
- Black light means absence of any color.

When light falls on an object, the following can happen:

a) It is reflected either regularly or irregularly.
b) It can pass through a body totally or partially.
c) It is either refracted or diffused.
d) It can be absorbed either partially or completely

The table shows why certain colours appear the way they do:

colour	Absorbs	Reflects	Appears as
Red object	Green, Blue	Red	Red
Blue object	Red, green	Blue	Blue
Green object	Red, blue	Green	Green
Black object	Red, Blue, Green(all)	None	Black.
White object	None	Red, Blue, Green(all)	White

Uses of reflection in our daily life

1. People can watch a football match over the heads of the crowd using a periscope.
2. Soldiers can see enemies without exposing themselves using periscopes.
3. Submariners can see ships on the surface of the sea using periscopes.
4. Mirrors are used on vehicles to see traffic behind and avoid causing accidents.
5. Torches, car headlamps have concave reflectors.
6. Solar cookers use a concave mirror to focus sunlight on spot and use it for cooking.
7. Some shaving mirrors are concave and they magnify the image.

Exercise

1. **How does light move from one place to another?**
2. **Why do people wear light clothes during hot weather?**
3. **Cite the purpose of painting houses with bright colours**
4. **Why do black clothes appear black?**
5. **Draw the following:**
   a) **Diverging beam of light** b) **converging beam of light**
6. **State the types of reflection**

LESSON ONE, WEEK 8: SIMPLE OPTICAL INSTRUMENTS

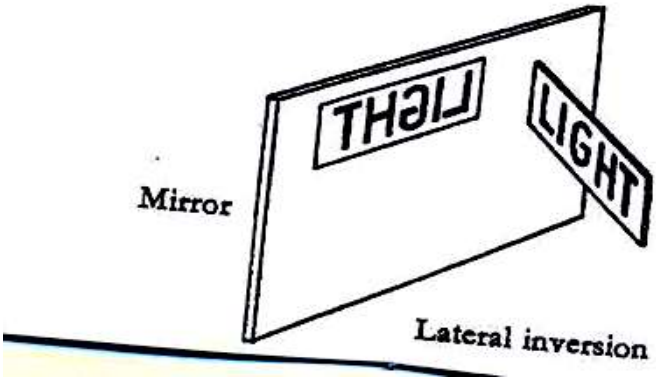
Optical instruments are instruments which use light for their functioning.
Examples of simple optical instruments include:

- **Microscopes**
- **The eye**
- **Telescopes**
- **Projectors**
- **Lens camera**
- **Periscopes e.t.c**

Plane mirrors

Characteristics of images formed in a plane mirror

- They are erect/upright.
- They have the same size as the object.
- The image is laterally inverted. (the right appears to be left in the mirror).
- Image distance is equal to the object distance from the mirror
- The image is virtual. (not formed on the screen)



Uses of plane mirrors

- They are used in periscopes
- Used as dressing mirrors to view our images
- They are used by dentists.
- They are also used in saloons

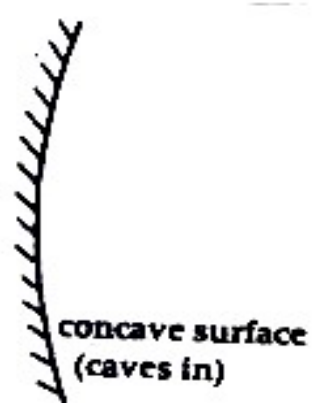
LESSON TWO, WEEK 8: CURVED MIRRORS

These have their reflecting surfaces form a hollow sphere.

Types of curved mirrors

Concave mirrors: It is coated on the outside of the spherical surface.

-They are used as reflectors in head light of cars and torches.
-Used by dentists.
-They are used in solar cookers to focus light on one spot.
-Used as shaving mirrors



Characteristics of Images Formed on Concave Mirrors

- They are virtual
- Images are bigger than the object
- They are upright.

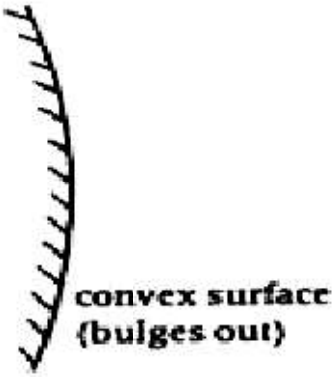
CONVEX MIRRORS

These are coated on the inside of the spherical surface.

-Give a clear view of the object behind the car
-They are used as driving mirrors because they a clear view of the traffic behind.

Characteristics of images formed in convex mirrors

- ✓ The images are upright
- ✓ The images are virtual.
- ✓ The images are smaller than the objects.



Real and virtual images

Virtual images are not formed on screen.

Virtual images are cast by plane mirrors, concave lens, and convex lens.

LESSON THREE, WEEK 8: PERISCOPE

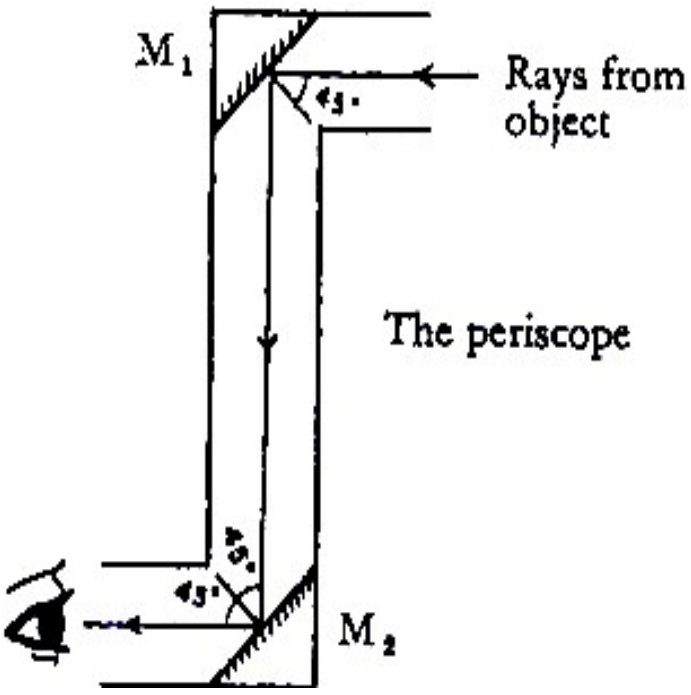
They are instruments used to see objects overhead.

It is used by soldiers, sub mariners etc.

A ray of light from the object strikes mirror once at 45 degrees and then turned through 90 degrees to strike mirror two until the object is seen by the observer.

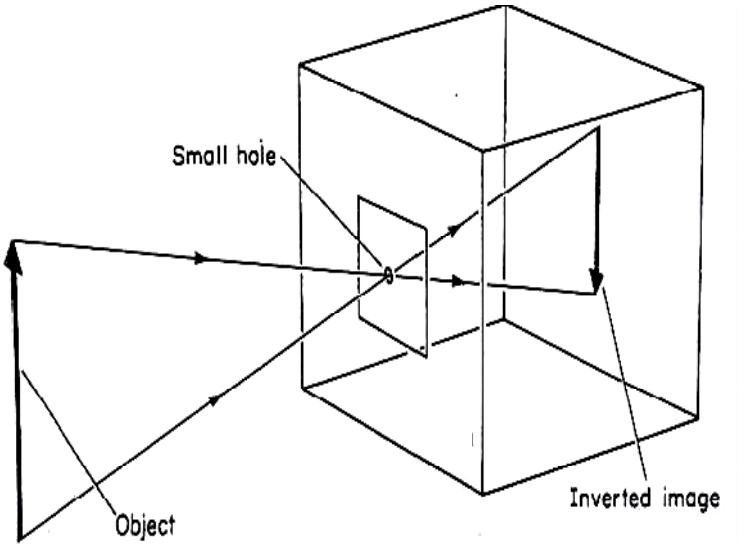
Illustration of a periscope

-Works on the principle that light travels in a straight line



Pinhole camera

It works on the principle that light travels in a straight line.



The image is

Upside down because the

Rays cross each

other at the pinhole

Characteristics of images formed with a pin-hole camera

- The image is smaller than the object/diminished.
- The image is upside down/inverted
- The image formed is real.

NB:-If the distance between the object and camera is increased, the image becomes smaller and blurred.

- If the distance between the object and the camera is decreased, the image becomes larger and brighter.
- When the hole is too big, the image is blurred.

LESSON FOUR &FIVE, WEEK 8: REFRACTION

Activity

-Making pinhole cameras and periscopes

Vocabulary

- Refraction
- Media
- Depth

Refraction of light

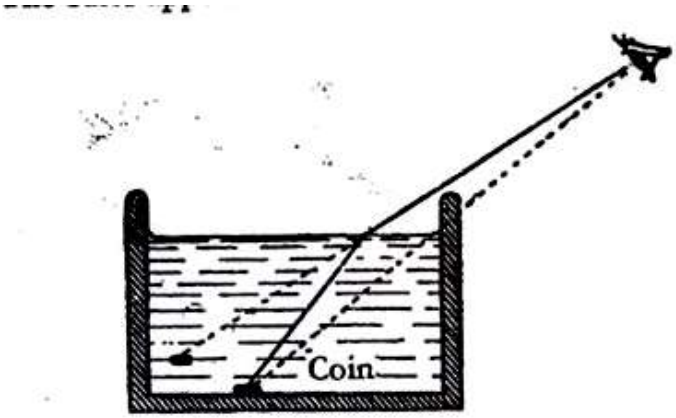
Refraction means the bending of a light ray as it moves from one transparent medium to another.

Principle or law of refraction

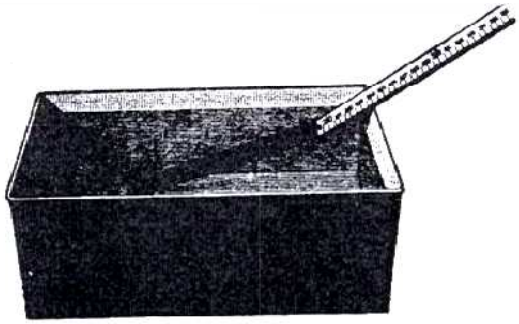
- The incident ray and refracted rays are on the opposite sides of the normal at the point of incident and all three are in the same plane.

Effects of refraction

1. Makes water bodies to appear shallow.



2.An object put in water appears bent.



Causes mirage

Dangers of refraction

- Makes fishing using a spear difficult.
- May lead to drowning as it makes water bodies to appear shallow
- May lead to road accidents due to formation of mirage

Activity

Carry out a domestration about refraction

PRISMS AND LIGHT SPECTRUM

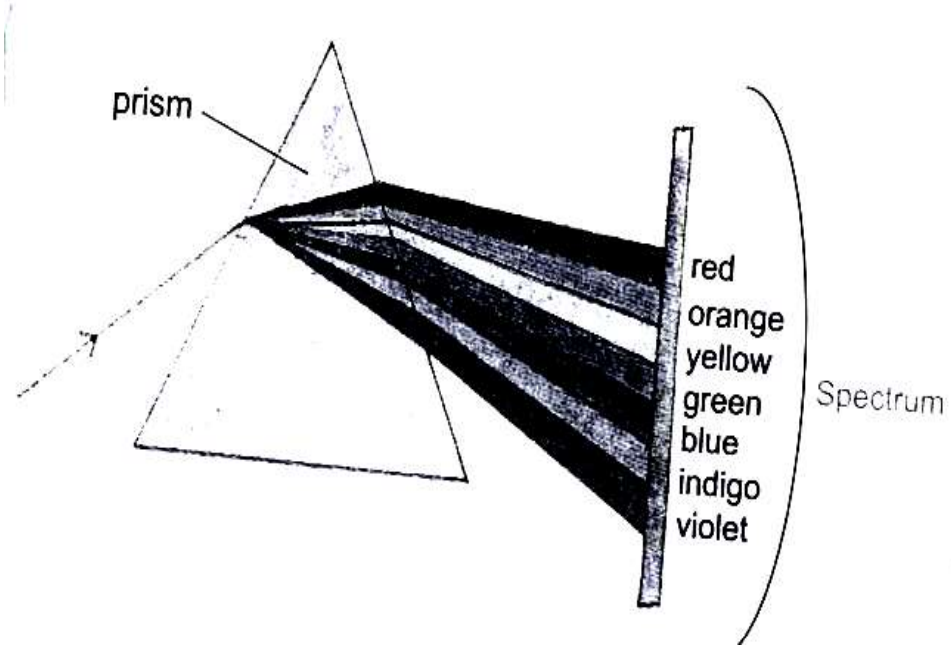
Spectrum: is a band of seven colours.

Dispersion of light: Is the splitting of light into different colours.

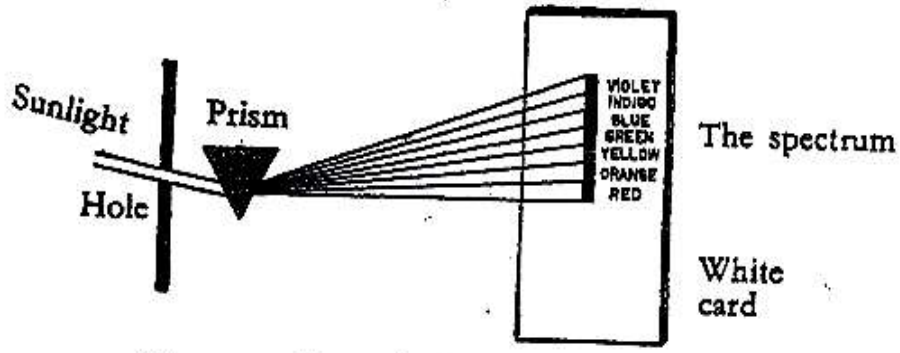
-Dispersion is caused by refraction of light rays at different angles on a glass prism.
Dispersion/ Refraction of white light by a glass prism. (ROYGIBIV)

-Light rays in a glass prism bend at different angles because they move at a different speed.

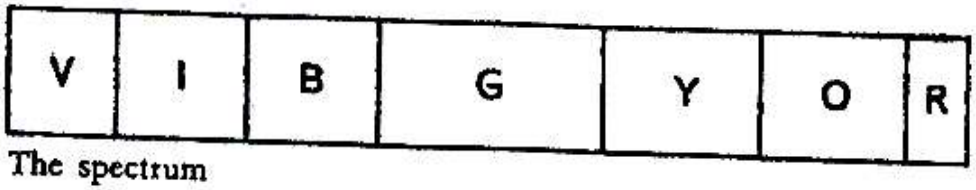
- The fastest ray bends most (violet) and it has a short wave length.



White light is composed of seven colours



Decomposition of white light by a prism

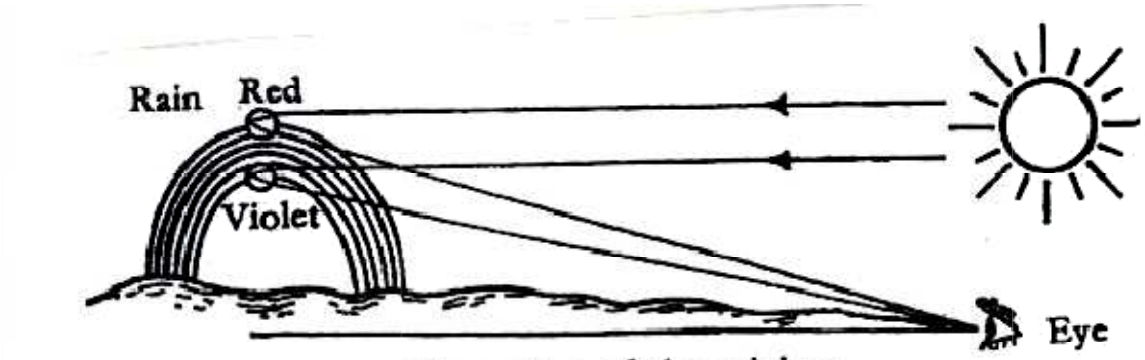


The spectrum

- The slowest ray bends least.(red) and it has a long wave length.
- The order of the colours of the spectrum from top to bottom is Red, Orange, yellow, Green, Blue, Indigo, Violet.
- It can be memorized in the sentence Richard Okello Your Girl Benita Is Vomiting.

THE RAINBOW

- It is a natural spectrum in the sky.
- It is formed when light rays from the sun pass through rain drops.
- The inner colour of the rainbow is violet.
- The outer colour of the rainbow is red.



Formation of the rainbow

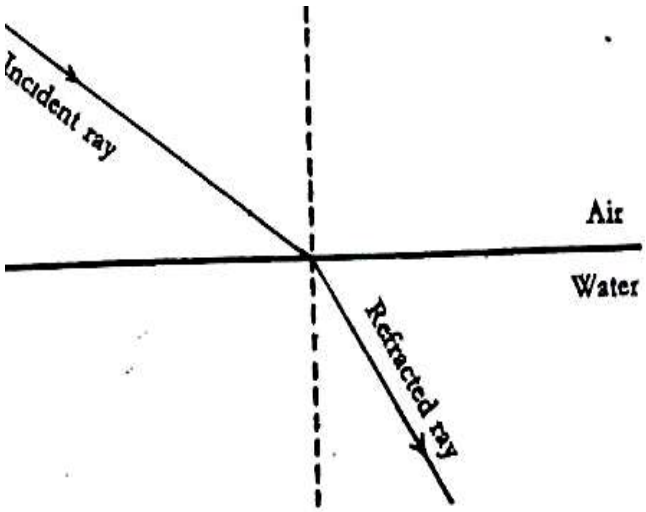
Activity

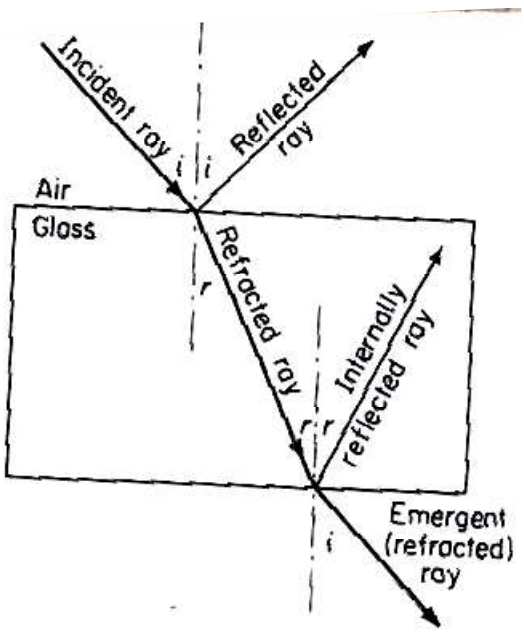
Draw the spectrum and a rain bow

Vocabulary

- Prism
- Glass prism
- Medium

REFRACTION THROUGH A RECTANGULAR GLASS PRISM





- **I** - Angle of incidence
- **R** - Angle of refraction
- Angle**I** is greater than angle **r**.

Qn. What happens to the ray of light when it moves from one medium with fewer molecules to another one with more molecules?

-Its speed slows down.

-It bends towards the normal

Qn. What happens to the ray of light when it moves from one medium with molecules to another with fewer molecules?

-Its speed increases.

-The light ray bends away from the normal.

COLOURS OF LIGHT

Types of Colours

- Primary colours
- Secondary colours.
- Complementary colours.

Primary colors of light are the colours got without mixing any other colour.

Examples of primary colours: Red, Blue and Green

Secondary coloursare the colours formed by mixing two primary colours.

Examples of secondary coloursare:**Yellow, Magenta and cyan.**

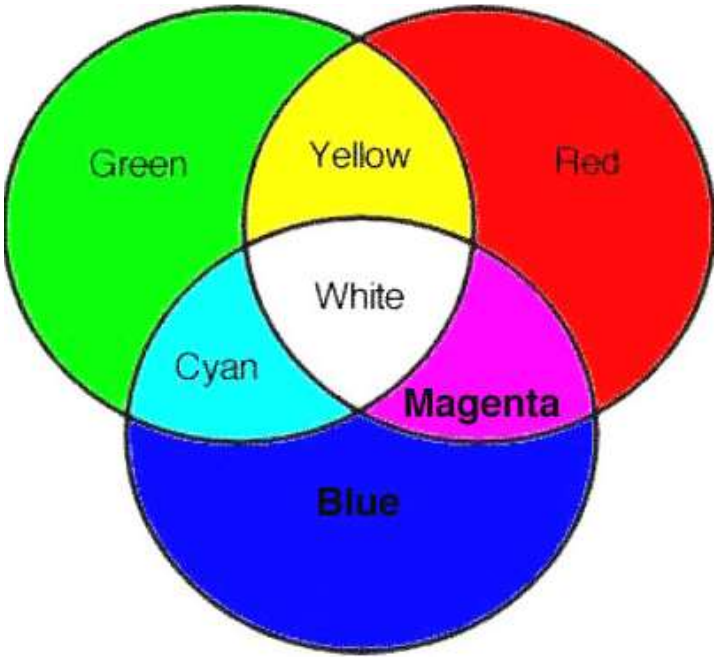
i.e. -Red + Green = Yellow

- Red + Blue = Magenta
- Blue + Green =Cyan

Complementary colours. Are the two colours of light which when mixed give white light

Examples of complementary colours are:

1. Blue + Yellow = White
2. Red + Cyan = White
3. Green + Magenta = White
4. Red + Green + Black = White light.



Exercise

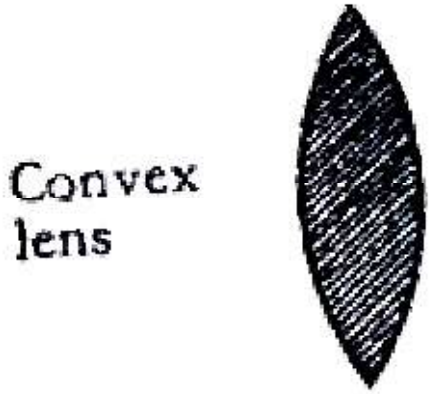
1. Name any one primary and secondary colour
2. Why is Yellow grouped under secondary colours?

LESSON SIX & SEVEN, WEEK 8: LENSES

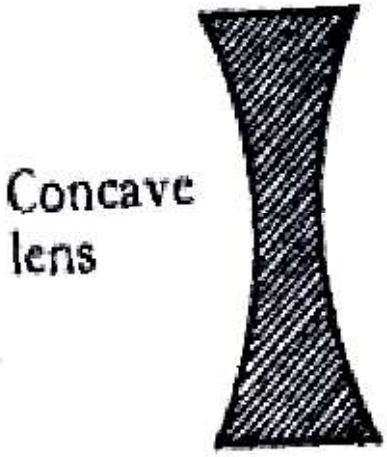
- Lenses are optical instruments used to focus or defocus light.
- The surface of the lens may be convex, concave, plane or a combination of these.
- Lenses are used in devices like; cameras, microscopes, binoculars.

TYPES OF LENSES

1.Convex (converging) lens



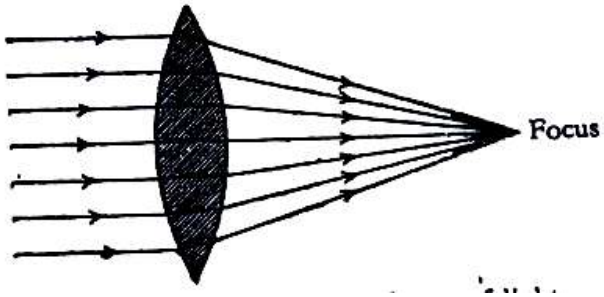
Concave (diverging) lens



The effect of lenses on beams of light

1. Convex (converging) lens

It refracts light to meet at one point (focal point)

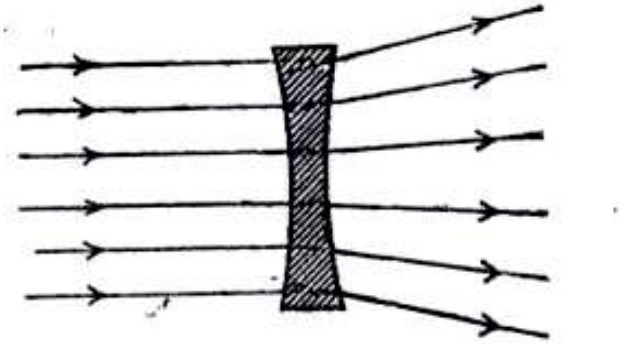


Characteristics of images by convex lenses

- It is inverted.
- It is magnified.
- It is real
- It is formed in infinity.

2. Concave (diverging) Lens

It refracts light and spread it out in different directions.



Characteristics of images formed by concave lens

a. Are erect/upright
b. Are virtual.
c. Image is diminished/reduced in size.

Uses of lenses

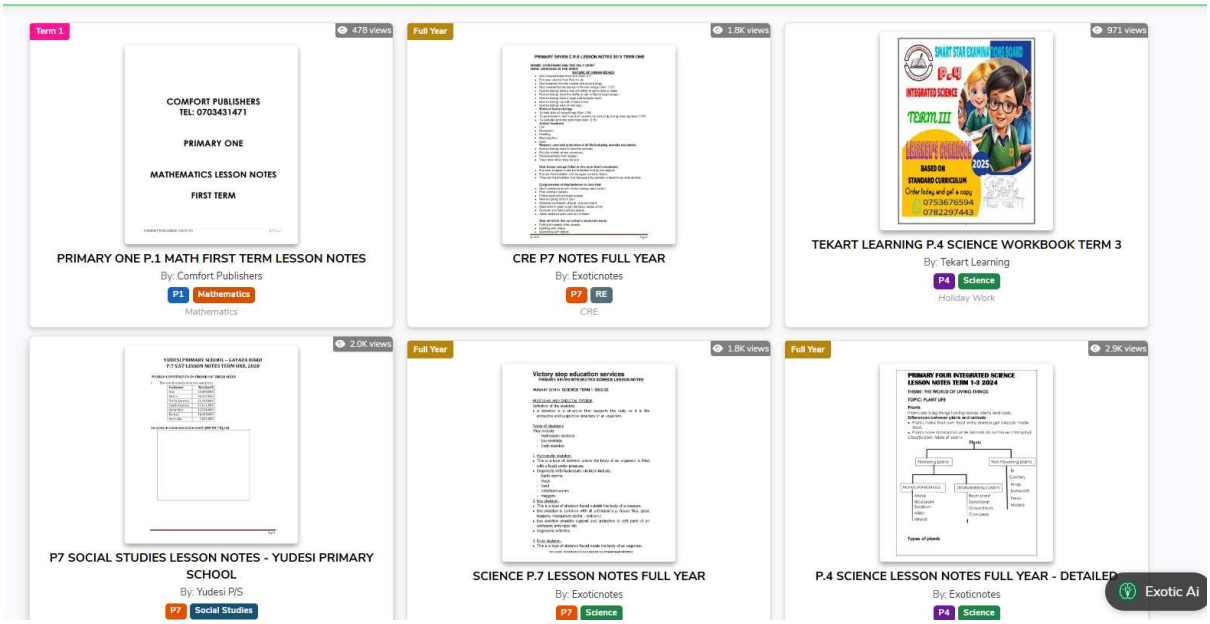
- Lenses are used in optical instruments like telescopes, camera, and microscopes etc.
- Lenses are used in spectacles.
- Lenses are used as magnifying glasses.

The magnifying glass

Exercise

1. Name any two instruments that use lenses
2. Draw a piano convex and piano concave lenses

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