

P.7 SCIENCE TOPICAL BREAKDOWN FOR TERM ONE

THEME	TOPIC	SUB-TOPIC
1. **HUMAN BODY**	a) **MUSCULAR AND SKELETAL SYSTEM**	i) <u>The skeleton</u> a) Meaning of skeleton b) Types of skeleton c) Description of each type i.e definition and examples
		ii) <u>Regions of the human skeleton</u> a) Axial skeleton b) Appendicular skeleton c) Definition of each and the parts that make them up
		iii) The human skeleton (structure) a) A well labeled diagram of the human skeleton b) Skeletal bones and their other names c) Functions of the human skeleton
		iv) <u>Bones</u> a) Definition of bones b) Types of bones c) Description of each type d) Importance of bones e) definition and examples

		v) <u>Joints</u> a) Definition of a joint b) Types of joints c) Examples of each types of joint
		d) Importance of joints
		vi) <u>Muscles</u> a) Definition of muscles b) Types of muscles c) Examples of each type d) Functions of muscles
		vii) <u>Posture</u> a) definition if posture b) Examples of posture c) Importance of good posture d) Disadvantages of bad posture
		<u>Diseases and disorders of the skeletal system</u> a) Diseases b) Signs and symptoms of each c) Prevention and control of each disease d) Disorder i) Fracture ii) Types of fracture iii) Signs and symptoms of each parts i) First Aid ii) Dislocation - Definition - Signs & symptoms - First Aid iii) Sprains and strains - Definition of each - Signs and symptoms of each - First Aid

		viii) Keeping the muscular and skeletal in a proper working condition
2. **MATTER AND ENERGY**	**ELECTRICITY AND MAGNESTISM**	i) Electricity a) Definition of electricity b) Atom i) Definition ii) Elements if an atom and their definitions c) Uses of electricity d) Advantages of using electricity e) Dangers or disadvantages of using electricity ii) Forms of electricity a) Current electricity - Definition

		- Types of current electricity i.e AC and DC iii) AC (Alternating Current) - Definition - Sources of AC iv) DC (Direct current) - Definition - Components if an electric circuit and their symbol - Diagram of a simple electric circuit - Functions of each component - Types of a circuit Electrical resistance - Definition - Measurement of electrical resistance - E.M.F - Measurement of E.M.F vi) Conductors and insulators of a wet cell - Advantages and disadvantages of using wet cell vii) Description of secondary cells - Examples of secondary cells - Difference between primary cells and secondary cells viii) An electric bulb - Parts of an electric bulb - Functions of each part - How an electric bulb works - factors that may fail an electric bulb fail to work ix) <u>Torch</u> - Part of a torch - Functions of each part - factors which may fail a torch to work

		- Other electric appliances x) <u>Short circuit</u> - Definition - causes - signs of short circuit - Advantages if short circuit - Ways of preventing short circuits xi) <u>Electric cells</u> - Definition - Types of electric cells

		- Description of each type of electric cells xii) <u>Parts of a dry cells</u> - Function of each part - Advantages and disadvantages of a dry cell xiii) <u>Parts of a wet cells</u> - Functions of each cell - Factors that affect the proper working xiv) <u>Devices connected to electricity</u> a) Dynamo i) How a dynamo works ii) Parts of a dynamo b) Generator i) How a generator works ii) Importance of a generator iii) How a generator can be made to produce more electricity c) Transformers - Uses of transformers - Types of transformers - How a transformer works d) Electric motors - How an electric motor works - Uses of electric motors - How an electric motor is made stronger xv) <u>An electric plug</u> - Cables used in a plug - Functions of each cable xvi) <u>Static electricity</u> - definition - description of static electricity - Lightning

		i. Formation of lightning ii. Dangers of lightning iii. Control measures of lightning iv. Advantages of lightning xvii) Differences between static electricity and current electricity xviii) Electric companies i) Examples of electric companies

		ii) Duties of each company iii) problems faced by electric transmission companies xix) Safety precaution to guard against dangers associated with electricity. <u>Magnestism</u> i) Definition of a magnet, magnetism ii) Magnetic materials - Definition - Examples iv) Non-magnetic materials - Definition - Examples v) Types of magnets - Examples of each type of magnet vi) Properties of magnets - Illustrations using diagrams vi) Magnestisation - Definition - Ways if making temporary magnets - Description of each method with clear illustration using diagrams Demagnetisation - Definition - Ways of demagnetization - Control of storing magnets - Application of magnets in our day today life a) Electric bell i) Parts of an electric bell ii) Functions of each part iii)

		How can an electric bell work?

ENVIRONMMENT	**ENERGY RESOURCE IN THE ENVIRONMENT**	1. <u>Resources and energy resources.</u> - Definition of each - Definition of environment - Types of environment - Components of each type of environment 2. <u>Types of resources</u> - Definition of each type of resources - Examples of each type of resources • Water as a resource • Sun as a resource • Air as a resource

		• Animals as a resource • Soil as a resource 3. <u>Energy resource</u> - Examples of energy resources - Energy resources from water - Energy resources from plants - Energy resources from animals - Energy resources from the sun - Energy resources from air (wind) - Energy resources from minerals 4. <u>Bio gas production</u> - Definition of biogas - Materials used to make biogas - Structure of a biogas digester - Uses of biogas 5. <u>Environmental conservation</u> - Definition - Ways of conserving:- a) Soil b) Wildlife c) Animals d) Plants e) Air f) Water 6. <u>Reasons for conserving the environment</u> -

THE HUMAN BODY	Excretory system	<u>Excretion and excretory organs</u> - Definition of excretory system and excretion - Examples of excretory organs - Importance of excretion to man <u>Kidneys</u> - Description of the kidney - Structure of the urinary system - Structure of the kidney - Functions of each part of the kidney - Functions of the kidneys to man - How the kidneys help to regulate body fluids, temperature - Diseases of the kidney Bilharzia

		- Causes, signs and symptoms - Control of bilharzia - Kidney stones - Kidney failure - Gonorrhoea - Nephritis - Ways of maintaining the proper working of the kidney <u>The Skin</u> Main parts of the skin Description of :- a) Epidermis layer b) Dermis layer - The structure of the skin - Functions of each part of the skin - How the skin performs its function - Functions of the skin to man - Diseases of the skin - Disorders of the skin - How to care for the skin <u>The liver</u> - Description of the liver - Functions of the liver to man - Diseases of the liver - Ways of caring for the liver <u>The Lungs</u> - What is respiration? - Body organs connected to the respiratory system - Structure of the respiratory system - Functions of each part <u>Alveolus</u> - Adaption of the alveolus to its function - Breathing mechanism in man i.e exhaustion and inhalation

		- Lungs as an excretory organ - Uses of the lungs to man - Diseases of the lungs - Maintenance of proper functioning of the lungs

ENVIRONMENT	**INTER DEPENDENCE OF THINGS IN THE ENVIRONMENT**	• <u>Environment</u> - Definition - Types of environment - Components of each type of environment • <u>Inter dependence</u> - Definition of; a) Interdependence b) Food chain c) Eco system d) Food web e) Habitat f) Bio mass - Formation of pyramid of bio mass • <u>Components of the food chain</u> - Description of each component of the food chain - Examples of food chains - Formation of the food web
		• <u>Interdependence of things in the environment</u> - How animal depends on plants - How plants depend on animals - How plants depend on other plants - How animals depend on other animals - How living things depend on non living things - How non living things benefit from living things

		• Agroforestry - Definition - Importance of agroforestry • Types of tree species - Examples of indigenous tree species - examples of exotic tree species - Advantages of indigenous trees over exotic ones - Differences between exotic trees and indigenous trees • Growing trees and crops - Selection of seeds for growing - Qualities of a good planting material • A Nursery bed - Definition
		- Preparation of a nursery bed - caring for seedlings in a nursery bed - Advantages of using a nursery bed - Transplanting procedures - Caring for crops in the garden - Description of the crop growing practices - caring for trees - Tree diseases and pests - Timely planting of trees - Selective felling of trees - Methods of harvesting trees - Description of each method - The advantages of each method of harvesting - Preparation of wood for different uses - Wood storage and seasoning - Wood lot project - Advantages of having a wood lot project in a school/home - Products from wood

PRIMARY SEVEN SCIENCE LESSON NOTES
TERM I

SKELETAL AND MUSCULAR SYSTEM THE SKELETAL SYSTEM

A skeleton is the supportive structure of the body of an organism.
The cells contain non – living materials called calcium salts.
Bones can grow and change as a result of activities of the cells.

Types of skeleton

Exo skeleton
Endo skeleton
Hydro – static skeleton

Exo skeleton

Where the hard tissue is formed mainly on the outside of the body it is often called an exo skeleton.

Examples of animals with exo-skeleton

Animals such as arthropods have exo skeleton like insects, crustaceans, myriapods, arachnids, terrapins, tortoise.

Animals with exo skeleton periodically shed their outer most layer and form the new cuticle on the exposed surface. This is called ecdysis (moulting)

Endo skeleton

This is the type of skeleton where the hard tissues are found inside the body of an organism.
All vertebrates have endo skeleton.
Examples of animals with endo-skeleton
Man, Goats, Cat, Sheep, Lion, Hen
They have bony skeleton in their bodies.
These animals can grow by a continuous increase in the size and not by a series of eldyses.

Hydro static skeleton

This is the type of skeleton with no hard tissues but instead the body is filled with a liquid under pressure.

Examples of animals with hydo-static skeketon

Earth worms, snails, slugs, caterpillars, star fish, jelly fish

This type of skeleton is found in earth worms.

The human skeleton

The human skeleton is made up of 206 bones in total.

The human skeleton is subdivided into two main regions namely:-

Axial skeleton

Appendicular skeleton.

Axial skeleton

This region consists of the vertebral column/spine and skull. It forms the foundation of the skeleton and on this the ribs are attached. i) The back – bone

This forms the central axis of the body and has 33 bones called vertebrae. The back bone is divided into 5 regions.

1. Cervical region – this is found in the neck and has seven bones.
2. Thoracic region – this is found behind the chest and the ribs are attached on it.

The ribs together form the rib cage.

The thorax region has 12 vertebrae

3. Lumber region

This is found in the abdomen and has 5 vertebrae.

4. Sacral region - the sacrum is found in the pelvic and has 5 vertebrae fused together.
5. Coccyx region – this is found in the tail and has 4 vertebrae fused together.
6. The rib cage – this is made up of 24 ribs (12 pairs) all of which are attached to the back – bone (spine)
7. The upper 14 ribs (7 pairs) are attached directly to the sternum (breast bone) by means of cartilages.

ii) **The skull**

This is made up of 22 bones.

It consists of the cranium and face – bones.

The cranium is formed by many bones fused together by interlocking serrated edges.

These edges become fused in adulthood.

Appendicular skeleton

This consists of the girdles and the four limbs.

Pectoral (shoulder) girdles.

These are made up of 4 bones, two on either side.

These bones are the scapula (shoulder bones) and clavicle (idler bones)

Pelvic (hip girdle) This is made up of 3 bones.

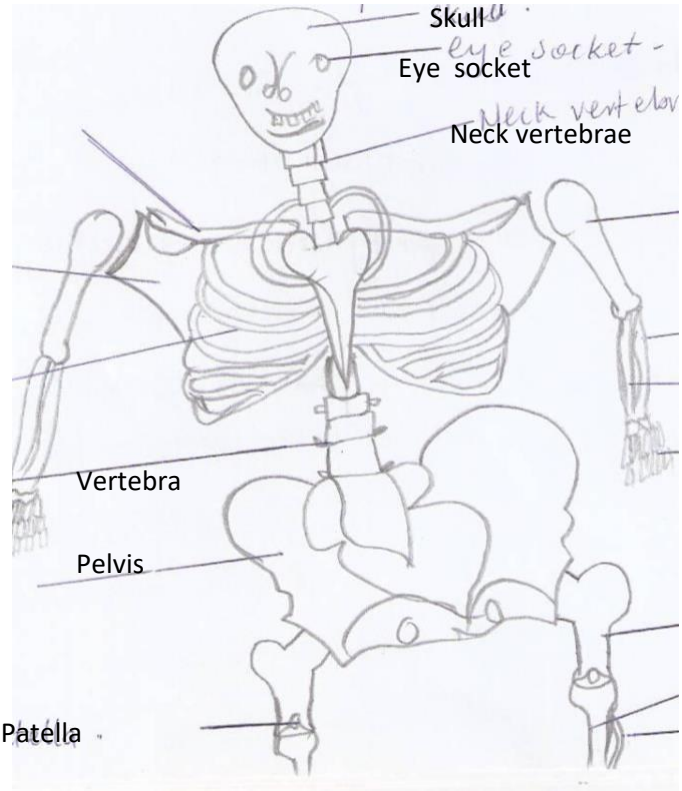
The limbs. These include two upper limbs and two lower limbs

The upper limbs (arms)

These have tree (3) long bones each.

The three bones are humerus, radius and ulna.
In each arm there are short bones such as carpals (8), metacarpals / bones of the palm (5) and phalanges / finger bones (14)

The lower limbs (legs) These
also have 3 long bones each.
The three bones are femur, tibia and fibula
In each limb there are patella / knee bone(1), tarsal / ankle bones (8), metatarsals / foot bones
(5) and phalanges / toe bones (14)



Functions of the skeleton

If gives support to the soft parts of the body.
It helps in movement which is caused by the muscles attached to it.

It provides surface for attachment of muscles. It protects the delicate organs.

- The skull protects the brain
- The eye sockets protects the eyes
- The rib cage protects the heart and lungs.
- The pelvis (pelvic girdle) protects the reproductive organs.
- The back bone protects the spinal cord.

It contributes to the formation of blood cells eg in porous ends of the long bones the red blood cells and some white blood cells are made.

BONES

These are hard connective tissues found in the body of an organism.

Types of bones

Long bones

These bones are found in the arms and legs eg femur, radius, fibula, ulna and tibia. The femur is the longest and strongest bone in the body.

Short bones

These are found in the last edges of the limbs.

These include the carpals, metacarpals, phalanges, tarsals, metatarsals

Flat bones

These include the bones of the skull, scapula, patella (knee cap).

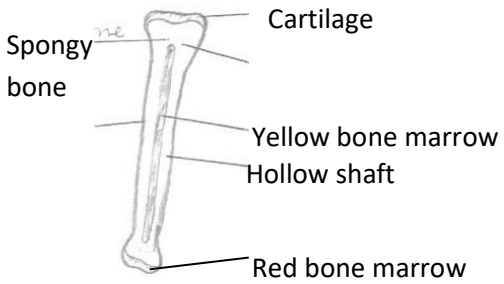
Irregular bones

These include the vertebrae of the spinal column.

Functions of the bones.

1. They manufacture blood cells i.e
   White blood cells are manufactured in the yellow bone marrows of long bones.
   red blood cells are manufactured in the red bone marrows of short bones
2. It provides the surface area for attachment of muscles

The structure of a bone



Cartilage

These cover the ends of the bone that moves.

They act as cushions to absorb friction when bones rub each other.

Yellow bone marrow

This is where white blood cells are manufactures from. It also contains fat cells.

Spongy bone.
This is the porous part of the bone which is filled red bone marrow.
Hard bone
This part protects the bone marrow from escaping. It contains calcium. **Bones and their other bones.**

Skull – cranium
Scapula – shoulder bone
Sternum – breast bone
Clavide – collar bone Jaw bone – mandible
Back bone – spine / vertebral column
Pelvis – hip bone
Tail bone – coccyx
Patella – knee cap
Femur – thigh bone
Tibia – shin bone
Palm bones – metatarsals
Ankle bone – tarsals **Joints**

A joint is where two or more bones meet.
At the joint the bones are joined to each other by ligaments.
The ligaments also help to prevent dislocation of the bones.
At the end of some bones, there are cartilages which act as slippery and smooth surface.
Within the joint there is synovial fluid which helps to reduce friction.
Types of joints:

Movable joints
Immovable joints

Movable joints
These joints allow body movement.
There are different types of movable joints i.e.

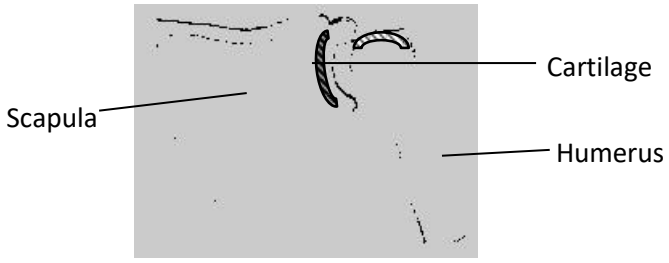
i) Hinge joint ii) Ball and socket joint
iii) Gliding joint/plane joints/sliding joint iv) Pivot joint

a) Hinge joints
These joints allow movement in one plane or one direction.
They include the elbow, knee joint, joint of the jaw and finger joints.



b) Ball and socket joints.

These allow movement in all directions or all planes.
They include the shoulder and hip joints.



c) Gliding joints (plane joint)

These are formed by bones which move over surfaces of each other.
They make little movement in all direction.
They include the carpals of the wrist, tarsals of the ankle and the joints between the bones of the spine (vertebral bones)

d) Pivot joints

This is the type of joint that allows rotation of certain body parts on other parts.
These allow little movement in all directions.
These are found between the head and the neck.
They allow our heads to nod or shake. **Immovable joints (fixed joints)**
These do not allow any movement at all.
They include the suture joint of the skull. **Functions of the joints.**

1. They allow body movement.
2. They enable us to stretch and bend the body.

The bones surfaces are prevented from wearing away by cartilages and synovial fluid.

MUSCLES.

These are elastic substances found in the body of animals or muscles are the soft flesh attached to the bones.
Muscles are attached to the bones by strong tissues called tendons.

Types of muscles

There are two types of muscles namely:-

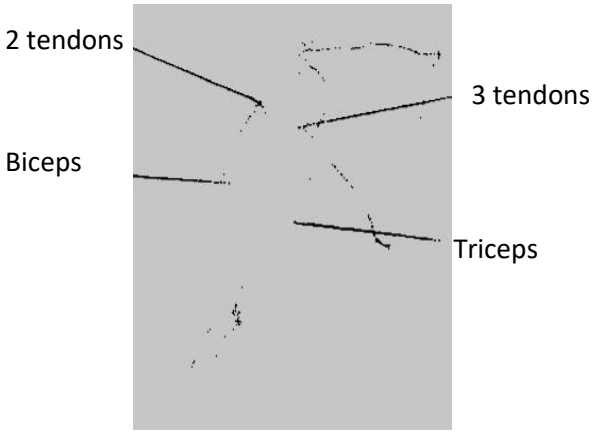
i) Voluntary muscles ii) Involuntary muscles

Voluntary muscles (Stripped muscles)

These are muscles that contract and relax at one's will.
These are muscles attached or joined to the bones i.e skeletal muscles.
These muscles form the bulk of the body.
They contract and relax at will.

Examples of voluntary muscles are biceps and triceps.

i) Biceps muscles ii) Triceps muscles iii) calf muscles iv) Fermalis muscles
v) Masseler muscles



Characteristics of voluntary muscles.

1. They are attached to bones.
2. They relax and contract at one's will

When bending the arm, the biceps contract while the triceps relax.
When the arm straighten the biceps relax and the triceps contract.

Involuntary muscles

These are muscles which do not contract and relax at one's will.
They contract and relax automatically.
These muscles are not connected to the bones.
They do not contract and relax at will.

Characteristics of involuntary muscles 1.
They are not attached to the bones.
2. They have automatic movement
3. They are located on body organs 4. These muscles move automatically.

Examples of involuntary muscles

i) Muscles of the alimentary canal. ii) Muscles of the reproductive system iii) Muscles of blood vessels.
iv) Muscles of the heart v) Intercostal muscles

Cardiac muscles

These muscles combine both structures of the voluntary and involuntary muscles. They contract and relax alternatively without any nervous stimulation They move automatically and rhythmically. **General functions of muscles**

1. Muscles generate energy
2. They help in movement
3. They give rigidity to the skeleton by preventing movement of bones.
4. During tissue respiration, the muscles release heat to warm the body.
5. Muscles maintain body posture
6. They aid movement of food through the alimentary canal
7. It helps to join bones in the body.

Posture

Posture is the way a person positions his or her body when performing an activity.

Types of posture

1. Good posture
2. Bad posture

Good posture: This is the proper way of positioning the body when performing an activity. **How to promote good posture.**

1. Always sit properly without bending.
2. By tightening the ankles and knees during movement.
3. By placing all the feet on the ground during movement 4. By putting all body weight on both battocks when sitting.

Importance of having good body posture

1. It makes the muscles and bones strong.
2. It allows proper growth and development of body organs.
3. It prevents skeletal and muscular disorders and deformities
4. Allows proper digestion of food
5. It makes one look smart
6. It prevents chest and back pain

Bad posture

This is the improper positioning of our bodies when performing an activity.

Activities that can lead to bad posture

1. Standing while bending forward.
2. Sleeping while bending some body parts
3. Sitting while bending forward

4. Waling and running while bending forward

Dangers/Effects of bad posture

1. It leads to deformation of bones and muscles
2. It causes chest and back pain
3. It causes indigestion
4. It leads to poor blood circulation in the body
5. It causes skeletal disorders

Importance of body exercise

- It promotes physical fitness
- It allows proper circulation of blood in the body
- It makes the joints more flexible
- It reduces the level of fats in the body
- They strengthen bones and muscles
- They break fatigue
- They increase energy production in muscles
- They promote the proper functioning of the body organs and system
- It reduces the risks of getting heart diseases
- It eases food digestion

SKELETAL DISEASES

These include the following;

1. Polio
2. Rickets
3. Osteomalacia
4. Tuberculosis of the spine
5. Leprosy
6. Osteoporosis
7. Tetanus
8. Cancer of the bones
9. Athritis

1) Rickets

It is caused by lack of enough vitamin D and calcium. **Signs and symptoms.**

1. Weak bones especially leg bones.
2. Poor teeth formation

3. Fractures are very common to one person.
4. Formation of ox-bow legs
5. The child is prone to fracture

Rickets can be prevented by feeding on food rich in vitamin D, calcium and phosphorous.

2) Polio (poliomyelitis) It
is caused by virus.
The virus can cause paralysis or weakness of one or more limbs.
The virus is transmitted through drinking contaminated water The
virus can cause paralysis or weakness of one or more limbs.

Signs and symptoms of polio

1. Deformed bones of the limbs
2. High fever
3. Paralysis of the limbs
4. General body weakness
5. Lameness

Prevention of polio.

All children below 5 years should be immunized with polio vaccine
Proper disposal of human wastes. Drink properly boiled water.

3) Cancer of the bones. 4)
Tuberculosis of the bones It is
caused by bacteria.
It spreads through air and through milk from infected cows.

Signs and symptoms.

Prolonged dry cough
Thick mucus
General body weakness.

Prevention and control of tuberculosis.

Immunization with BCG vaccine
Isolation of infected persons Treatment of infected persons.
Drink boiled milk.

5) Yaws
6) Osteomalacia (softness of bones)

TETANUS

It is caused by a bacterium found in the soil.
The bacteria enter the body through fresh cuts or wounds.
It attacks muscles making then stiff and also breathing becomes difficult.

In new born babies, it can enter through the umbilical cord if its cut with a dirty unsterilized instrument like a razor blade or knife.

Signs and symptoms of tetanus

Stiff muscles all over the body
Spasms when touched
They baby stops sucking mother's breasts

Prevention and control of tetanus

Early immunisation with DPT vaccine on the left upper thigh
Treatment of the infected people

Leprosy

It is caused by bacteria
It is spread through direct body contact with an infected person
It attacks both muscles and bones
prevention
Isolating infected persons
Avoid sharing towels, basins, beddings with an infected person
treat early cases with antibiotics

Disorders of the muscles and skeleton.

1) Fracture
2) Strains
3) Sprains
4) Dislocation

Fracture

A fracture is a cracked or broken bone

Types of fracture.

8. Simple fracture
9. Compound fracture
10. Green stick fracture
11. Comminuted fracture

Simple (closed) fracture

This is when a bone breaks and remains inside the body (flesh).

The muscles and blood vessels may be damaged.



Compound (open) fracture.

This is when the bone breaks and comes out of the skin (flesh).



Green stick fracture.

This is a type of fracture where the bone does not break completely.
Part of the bone remains attached.

This type of fracture is common in young children because their bones are soft.



Comminuted fracture.

This is a type of fracture where the bone is broken into several parts.



Signs of fracture

Severe pain and tenderness of the site of injury.
Failure to move the fractured part with ease.
Bleeding of the wound in case of a compound fracture.
In case of a compound fracture, the bone is seen pushing out of the skin.
Swelling and bruising of the fractured part
The injured limb may be shortened or may lie in an unusual position.
The broken limb appears crooked.

First aid for fractures.

Removes any object which may have caused the fracture.
Stop any bleeding around the injured part.
Give comfort and assurance that he / she is to recover soon.
Prevent infection of the injured part by using antiseptics.
Prevent any further movement of the injured part.
Apply a splint to keep the bones in position.

If the bones keeps moving further or injuries may occur.

NB: An arm sling is tied around the neck to support a broken arm. **Sprains and strains**

A sprain is an injury on the ligament.
OR
A sprain is a torn or over stretched ligament.
A strain is a torn or over stretched muscle.

Signs and symptoms of sprains and strains.

Severe pain at the injured part.
Sudden swelling and bruising of the injured part.
Failure to move the affected part with ease. **First aid for sprains and strains.**

Use a firm bandage to support the affected part.
Movement of the affected part should be stopped.
In case of a sprained wrist, an arm sling should be applied for support.
Take the patient to a doctor.

Dislocation

A dislocation is when the bones that form a joint have been displaced.

Signs and symptoms a dislocation.

Severe pain at the affected part.
Sudden swelling and bruising of the affected part.
Failure to move the affected part with ease. **First aid for dislocation**
Prevent any further movement of the affected part.
Comfort the patient and assure him / her of quick recovery. Take the patient to the doctor.

Avoid tampering with the affected part by trying to put the bones back into their normal position.

How to keep the muscular and skeletal systems healthy.

Eat a balanced diet.
Always maintain a good posture.
Take all children for immunization.
Avoid bad games.
Carry out regular physical exercises.

TOPIC TWO

ELECTRICITY AND MAGNETISM

What is electricity?

Electricity is a form of energy produced by the flow of electrons. Electrons are negatively charges and orbiting round an atom. Protons are positive charges while neutrons are uncharged.

What is an electric current?

An electric current is a flow of electrons through the conductor. We measure electric current by use of an ammeter which gives units in amperes (amps)

Forms of electricity

- Current electricity
- Static electricity

Current electricity

It is the form of electricity which is formed when electrons from the source to another through a media called a conductor. **Static electricity**

It is a form of electricity produced by rubbing two plastic materials together. One of the objects becomes negatively charged and another positively charged. **Types of current electricity**

- Direct current electricity (DC)
- Alternating current electricity (AC)

Direct current is the type of electricity which flows only in one direction, ie from the source to the appliance. It can be stored, but it cannot be stepped up or down.

Sources of Direct current electricity

- Dry cells
- Simple or wet cells
- Batteries or accumulators.

Alternating current is the type of current electricity which flows in both directions, ie forward and backward.
It can be stored in form of direct current electricity and it can be stepped up and down.

Sources of alternating current or type of electricity

There are four types;

- Hydro electricity
- Thermal electricity
- Atomic electricity
- Solar electricity

a) Hydro electric power

This is a type of electricity got by the power of fast flowing water which turns the turbines. The turbines are connected to a generator which produces electric power. The kinetic energy of flowing water is changes to electrical energy.

b) Thermal electricity

This is a type of electricity got by burning a fuel either coal or oil. Coal or oil contains stored chemical energy.

c) Atomic electricity

This is the type of electricity got from burning uranium mineral dug from underground which stores chemical energy. Uranium is burnt to heat nuclear reactors so as to produce electricity.
d) Solar electricity:
It is the type of electricity got from the sun. it is got by using solar cells in solar panels which trap heat and light energy from the sun. the heat energy and light energy is then sent to solar batteries, which store and produce electricity.

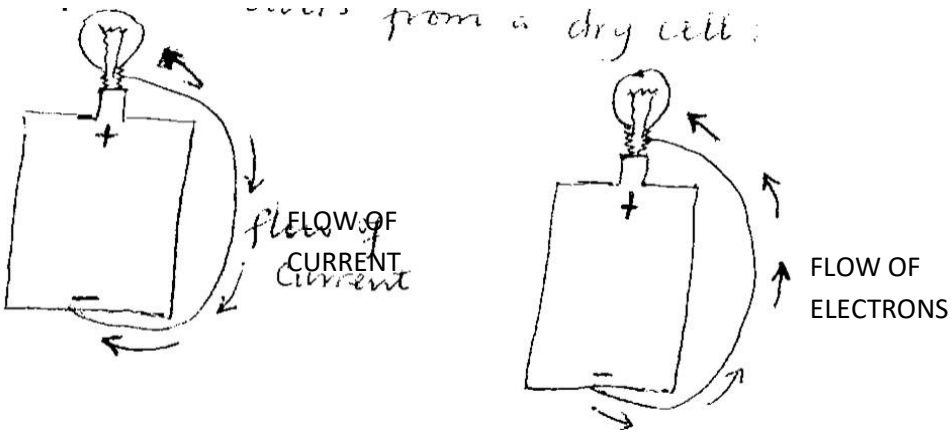
ELECTRIC CIRCUIT

What is an electric circuit?

- An electric circuit is a path by which electric current flows.

OR

- It is a path through which electricity passes. For electricity to flow, the circuit must be complete, ie the path starts and ends at its source. **Simple circuit from a dry cell**.

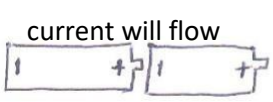


Note:
Current flows from the positive terminal to the negative terminal.

- Electrons flow from the negative terminal to the positive terminal.
- For current to flow easily, the positive terminal must be connected to the negative terminal if you are using more than one dry cell, eg
- Electricity will flow if the dry cells are connected in series as shown in (a), but it will not flow as shown in (b) and (c).

A

current will flow



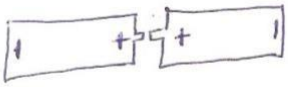
B

current will not flow



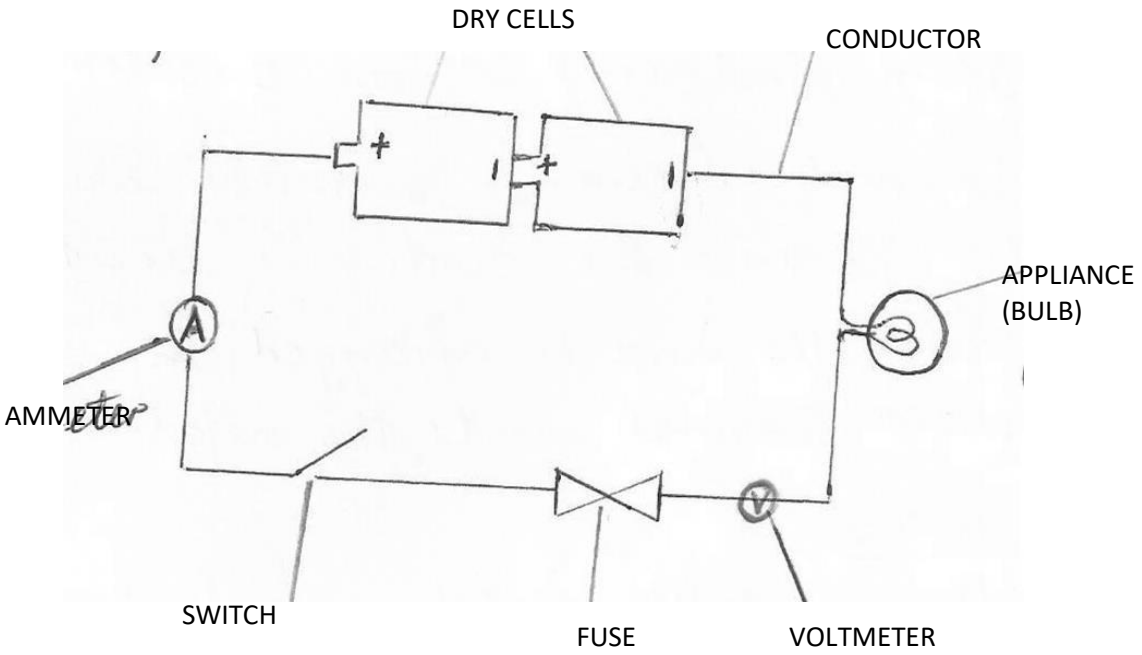
C

current will not flow



Components of an electric circuit

- Conductor (wires)
- A fuse
- Source of electricity (batteries / dry cells)
- An appliance (bulb)
- An ammeter
- Voltmeter



Functions of each part of the circuit

- **Ammeter**: It is used to measure electric current or flow of current.
- **The switch**: it breaks and complete the circuit at one's own will.
- **The bulb**: Once the circuit is complete, the bulb produces light. A bulb has the ability to change electric energy to heat then to light energy.

The bulb will stop lighting if any of the following takes place:

- When the filament burns out or if it blows.
- When the fuse blows, burns out or breaks.
- When the dry cells become exhausted.
- If it is not fixed properly.
- If the dry cells are not arranged properly.
- If the circuit isn't complete.
- If the conductor / wire isn't connected properly,

- **Dry cells**
  - Produce electricity for the appliance.
  - Store electricity in form of chemical energy.
  - Convert or change chemical energy to electric energy once the switch is closed or pressed.
  - The cells must be arranged in series in that the positive terminal meets the negative.
  - A fuse
  - It is safety device which breaks the circuit in case of too much flow of current.
  - It is simply a wire made of an <u>alloy</u> of tin and lead (solder)
  - The alloy has a low melting point. So, it easily melts and breaks the circuit

How does a fuse work?

A fuse wire melts and breaks the circuit if current is greater than rated value flows through it.

This prevents large current from harm or damage.

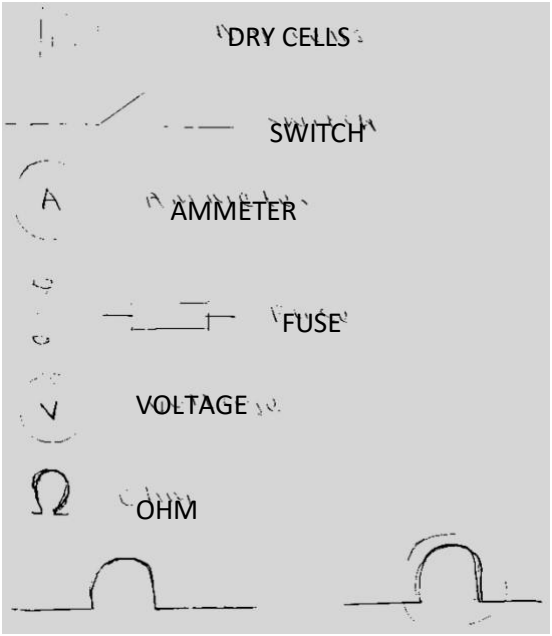
Advantages of fuses

- Reduces the risks of electric fires in houses.
- They protect the delicate electric equipment (appliance) by breaking the circuit before damage is done.

Reasons why a fuse may blow or break.

- Old and weakened wires
- Overloading the circuit
- Presence of a short circuit
- Too much flow of current from the source.

ELECTRIC SYMBOLS



BULB

Electrical Resistance

- This is the opposition to the flow of current in an electric circuit. Any electric opposes the flow of current and therefore produces heat.
- Electric resistance is measured in units called Ohms by an instrument called Ohmmeter.
- The higher the resistance, the greater the amount of heat produced or the longer the wire, the greater the resistance.

NB: Ohm's law states that the ratio of the potential difference across the ends of a metal conductor to the electric current flowing through the conductor is a constant.

- The filament of bulbs, water heating elements, elements of electric flat Iron, heating coils or cookers and coils, ovens, etc are made of coiled wires to increases in length and give more heat.

Thinner and longer wires give or offer greater resistance while thicker and shorter wires have less resistance.

Therefore heat produced by long and thinner wires is greater than that produced by shorter and thicker ones.

Electric Pressure / Electromotive Force (emf)

Is the force that drives current through the resistance of the circuit.

Electric pressure is measured by an instrument called voltmeter and it give its units in volts. This is meant that the emf of our domestic electricity is 240 volts or the voltage of electricity consumed in our homes is 240 volts. **Conductors and insulators**

Conductors or good conductors are substances, which allow electricity or electric current to flow through them e.g

- All metals are good conductors of electricity. The order of conductivity from the best is silver, copper (Cu), aluminum (al), tungster, nickel, zinc (Zn), lead (Pb), brass, Iron (Fe), Platinum, etc.
- Silver is the best conductor but it is very expensive. This is why most electric overhead cables are made of either copper or aluminum because they are cheap. - All salts in solution form eg sodium chloride in water. - All acids eg Hydochloric acid, dilute sulpharic acid,etc
- Water (but not distilled water) why? It doesn't contain mineral salts. Note: All liquid conductors of electricity are known as electrolytes. **Insulators:**

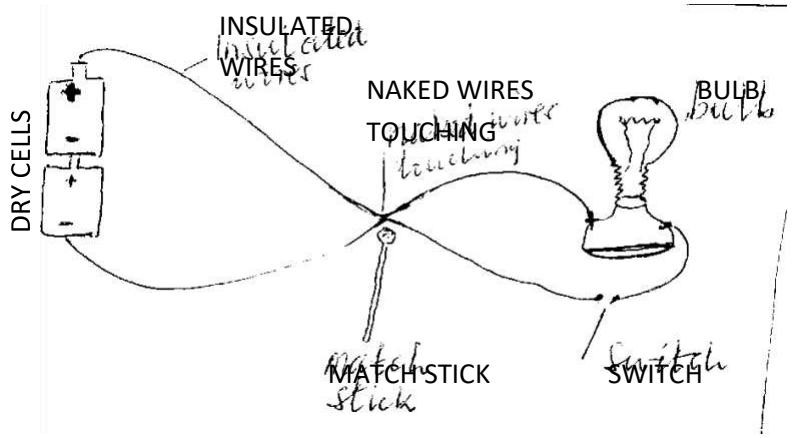
Insulators are substances, which don't allow electricity to flow through them.

- They can also be called bad conductors of electricity.

Examples include; rubber, pepper, dry wood, plastic, cloth and air. **Short circuits:**

- A short circuit is an electric part with low resistance to the flow of current.''
- The shorter the path, the least the resistance. So the flow of electricity is grater when the path is longer. When the path is shortened, the circuit is said to be short.
- When the two uninsulated wires carrying current touch each other, a short circuit is produced. This is why wires are insulated.
- The insulation may get destroyed with time and this may cause short circuit. **Causes which may lead to short circuits**.
- Dampness or rain which spoils the insulation.
- Pushing metallic objects in the sockets.
- Age of too old wires.
- Over loading the circuit.
- Damage made by rats or cockroaches to the insulation.
- A result of fault in the appliance like radio, cooker, electric flat Iron, etc.
- Poor wiring during electric installation.

Experiment to show a short circuit



When the switch is closed, the bulb doesn't light up. The match stick instead lights up showing a short circuit which produces heat and fires sometimes. **Signs of short circuits**

- Over heating in the circuit.
- Too much or little flow of electricity in the circuits.
- Some electric appliances may give electric shock.
- Some electric appliances may fail to work. **Dangers of short circuit**
- They cause buildings to burn.
- They cause fire which destroys property.
- They damage electric appliances **Prevention of short circuits**
- Using properly insulated wires.
- Having electrical installations done by experts only.
- Having electrical repairs done by qualified personnel. **Types of Electric cells**

There are two types of electric cells namely:

- Primary cells
- Secondary cells.

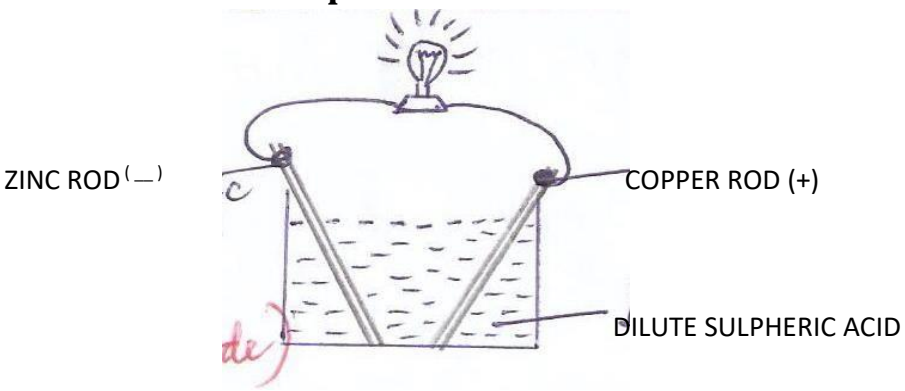
Primary cells: These are electric cells which produce electricity by chemical reactions.
There are two examples of primary cells namely;

- Simple cells or wet cells
- Dry cells

Simple cells / wet cells

- A simple cell is an example of a wet cell.
- It was first discovered by an Italian Scientist called Alesandro Volta in 1800.
- A simple cell consists of a <u>zinc plate</u> and <u>copper plate</u> dipped in dilute sulpheric acid
- The zinc and copper plates are both called <u>electrodes</u> or <u>poles</u>. An electrode is a piece of metal placed in an electrolyte to conduct electric current.
-

An illustration of a simple cell.

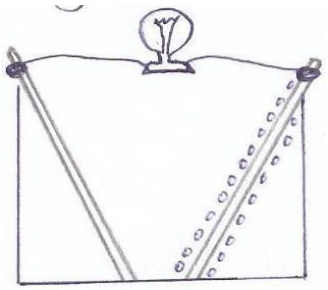


A simple cell is not efficient because of the factors namely

- Polarization
- Local action <u>Polarization</u>

This is when bubbles of hydrogen gas cover the copper rod and stop the flow of electrons.

- If the bulb is connected across the cell, it begins to grow but after only a few seconds, it becomes dimmer and dimmer until it finally goes out. This is because palarisation sets back the Electromotive force, which is slightly less than 1 volt and also the gas insulates the copper plate.

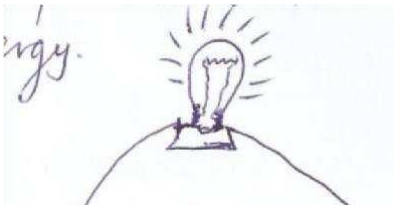


Local action

This is when bubbles of hydrogen are seen coming off the zinc plate. This is caused by the presence of the impurities in the zinc, like carbon, which sets up local cells at the zinc plate thus washing it.

A home made simple cell

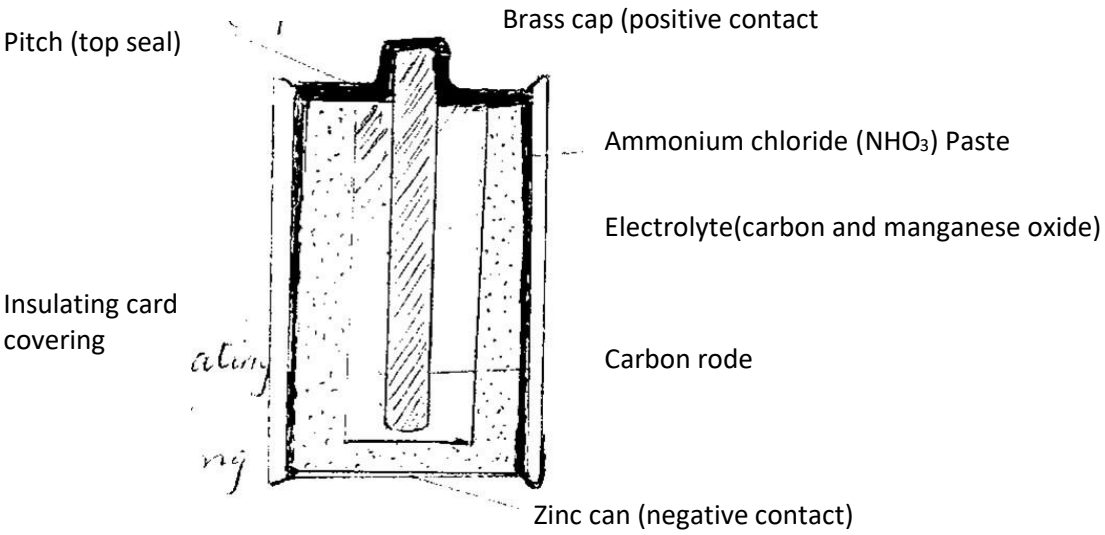
This can be made from an orange, grape fruit or lemon.
Simple cells convert chemical energy into electric energy.



Demerits of simple cells

- It is bulky
- It can be used only in the upright position. It produces electricity for a short time.

Structure of a Dry cell.



- A dry cell is an example of a primary cell.
- It has the capacity to produce an electric pressure or an electromotive force (emf) of 1.5 volts when still new.
- The electromotive force decreases as one continue to use it.

Functions of each part of a dry cell

a) Brass cap – the contact for the p[positive terminal.
b) Pitch or top seal – prevents ammonium chloride jolly from drying up.
c) Ammonium chloride paste – helps in the transfer of electrons.
d) Electrolyte – it is made up of powdered carbon and manganese oxide. The powdered carbon provides a partial conductor across the inside of a cell and; - Reduces the work of the cell in moving electrons - Reduces the internal resistance of a cell.
- Absorbs hydrogen.

The manganese oxide prevents a build up of hydrogen gas around the carbon rod by changing it to water ie it oxidizes hydrogen. So manganese oxide is a polarizing agent. This is the reason why dry cells leak when they are exhausted.

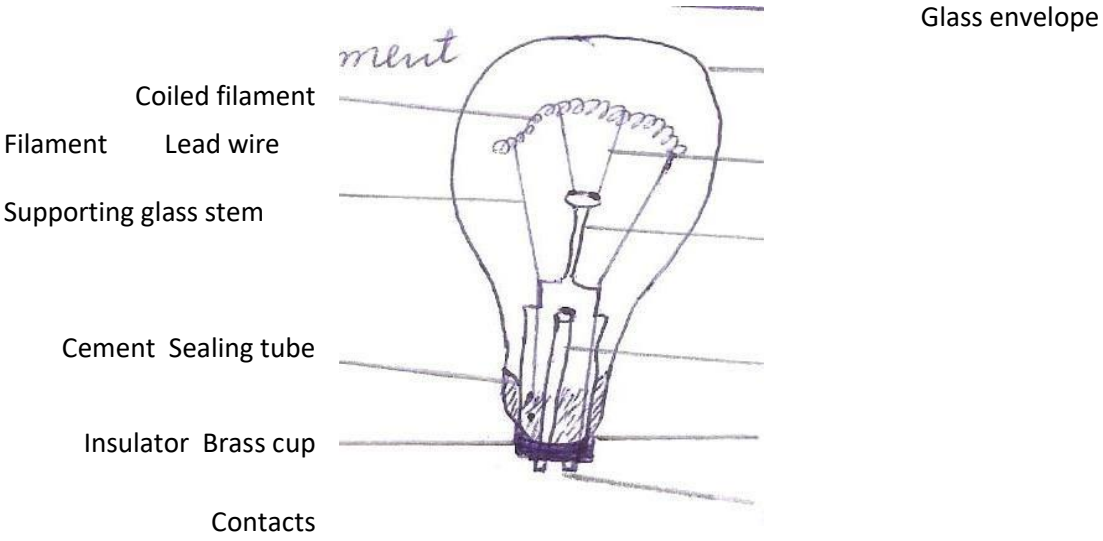
e) Carbon rod – it is the positive element and a non – metallic conductor of electricity found in a cell. Carbon rod is made up of graphite.
f) Zinc can – it acts as the negative element and it is the container in which the contents of the cell are put.

A dry cell stores chemical energy.

Secondary cells

- These are cells which can be recharged by passing an electric current through them from either a dynamo or an alternating current.
- Secondary cells store electric energy in chemical form.
- Secondary cells are also called storage cells or accumulators because they don't produce electricity of their own, they just store. Examples include a car battery or lead accumulator, which is always being recharged by a car dynamo.

An electric lamp bulb



Functions of some parts of an electric bulb

a) Brass cap – enables the bulb to be fixed into the lamp holder.
b) Sealing tube – enables air to be removed from the bulb. This prevents the filament from combining with oxygen.
c) Coiled filament – it is made of tungster which has a high melting point of 3500^0C. When current goes through the filament, it becomes white hot at a temperature of about 2700^0C and so produces light. But 90% of the electric energy is lost so heat and only 10% is converted to light.

Tungster is got from a mineral called wolfram.

The filament changes electric energy to heat energy and then light energy.

d) Glass envelope – it holds a mixture of two gases called argon and nitrogen which prevents the evaporation of tungster and enables the tungster to burn at a much higher temperature. The higher the temperature, the grater the electric heat converted into light.
e) Supporting glass stem – it holds the filament in position.
f) Lead wires – they take electric energy to the filament.

The Torch

A torch uses dry cells. In most cases, the dry cells are placed in series. This torch works on the principle that electricity travels in a complete circuit.

Functions of some parts on a torch:

- Switch – breaks and completes the circuit.
- Bulb – changes electric energy into heat energy and light energy.
- Dry cells – changes stored chemical energy into electric energy.
- Reflector – directs light into a diverging beam.

- Cover and spring – completes the circuit and also keeps the dry cells tightly closed.

However, the torch may fail to work if; -

The bulb is not fixed properly. - The dry cells are not arranged properly -

The cover is not properly fixed.

If it starts working properly and then later fails. -

The bulb could have blown

- The dry cells could have become exhausted **Merits / advantages of using current electricity**.
- It is easy to use compared to charcoal or firewood.
- It is quick so it saves time.
- It helps to conserve the environment by saving trees for firewood and charcoal.
- Neat and clean work is produced using electricity.
- It can easily transform into other forms of energy eg electric to heat, electric to light, electric to sound, electric to magnetic.
- It does not pollute the environment.

Equipments / appliances which use electricity in our homes

- Telephone receiver, radio, receiver, flat iron, television set, juice blender, electric kettle, water heater, micro wave oven.

Demerits / disadvantages of using electricity

- It causes fire
- It shocks and kills people once used carelessly
- Poor people can't afford paying bills, so it is expensive.

Devices connected to electricity:

a) Generator – it produced electricity by changing mechanical energy in form og kinetic energy to electric energy. This is done by rotating coils of wires in a strong magnetic field.

A generator can be made to produce more electricity by -

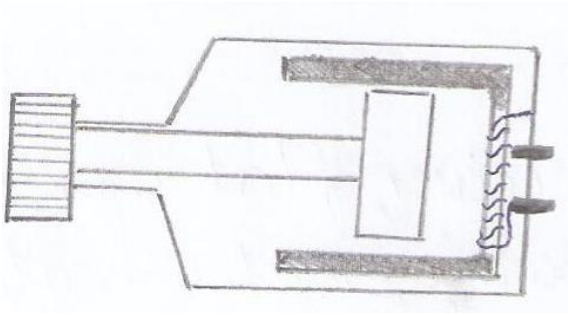
Increasing the number of turns in the coils.

- Increasing the magnetic field.
- Increasing the speed of rotation.

b) Dynamos

A dynamo produces electricity by converting mechanical energy in the form of kinetic energy of a rotating coil into electric energy.

A small simple kind of dynamo is found on a bicycle and bigger ones on vehicles. Those in vehicles, help in recharging the batteries. **A bicycle dynamo**



Electric motors

Electric motors are the reverse of generators and dynamos. Generators and dynamos use mechanical energy to produce electricity while motors use electric energy to produce mechanical energy.

Uses of motors

- They start engines of cars
- They move buses / trains
- They are used in lifts, vacuum cleaners, egg beater, electric sewing machines, radio cassettes, etc.

Static electricity:

It is a form of electricity in which electrons don't move, ie static means not moving or stationary. - It has two static charges, positive and negative charges.

- The positive and negative charges.
- The positive and negative charge attracts each other while positive and positive or negative and negative repel each other. Like charges repel each other while unlike charges attract each other.
- Static electricity is produced by friction.

Note:

Static is always made when insulators are rubbed together.

- One insulator gains electrons and becomes negatively charged while the one which loses electrons becomes positively charged.
- Different charges, (positive and negative), attract each other while some charges, negative and negative or positive and positive repel each other.
- Static electricity is also called stationary electricity.
- The negative charges are called electrons while the positives are called protons.

Differences between static and current electricity

Static	Current
Occurs in insulators ie plastics	Occurs in conductors ie metallic cables
The charge is on the surface of the insulator	The charge is inside the conductor.

The charge doesn't flow from one point to another	The charge flows along the conduoctor ie the entire conductor is filled with the charge.
Static electricity has both protons and electrons active.	Current electricity has only electrons active.

LIGHTNING

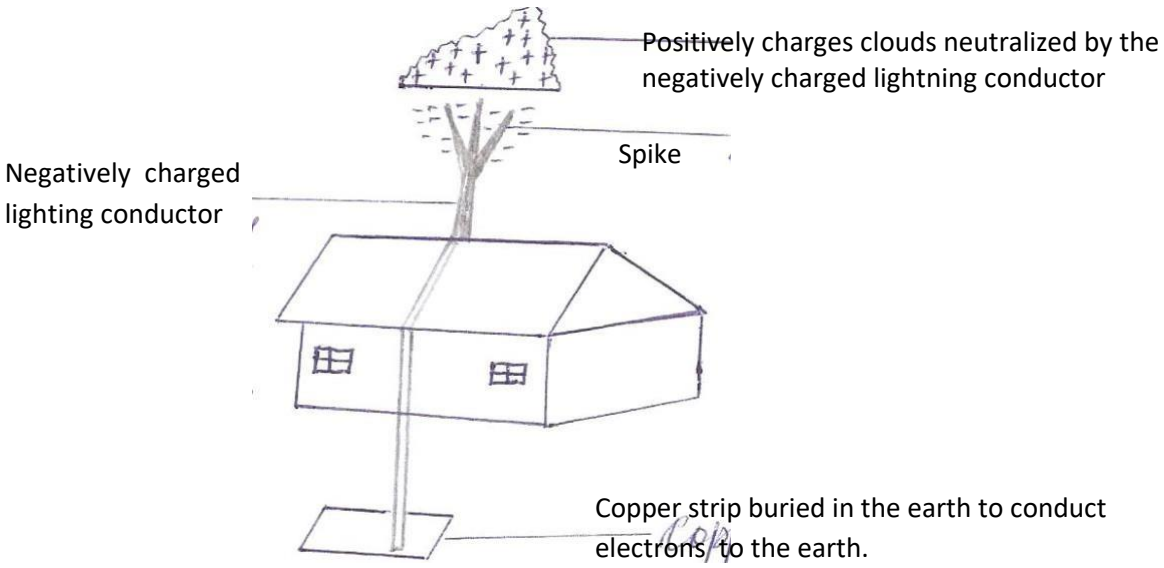
- It is a form of static electricity.
- It is sometimes referred to as a form of electricity in nature.
- It is caused when clouds become heavily charged with static electricity by means of friction between the clouds and big masses of air in space. The clouds may be charged either positively or negatively.
- When a positively charged cloud meets a negatively charged cloud, attraction occurs and a huge spark passes between the two clouds.
- This spark may sometimes pass to the ground, which we call lightning or the electrons may jump from the clouds to the earth or from the earth to the clouds.
- During this passage of lightning, the surrounding air becomes strongly heated and expands suddenly and then contracts quickly as is cools, the air is thus set vibrating producing or continuous noise is due to echoes.

Effects of lightning:

- Can cause damage to buildings.
- Can set things on fire eg trees and buildings. So it is not advisable to stand under trees when it is raining because lightning may strike the tree. **Advantages of lightning**
- During lightning, nitrogen is transformed into nitrates and fixed into the soil.

Prevention of lightning:

Lightning usually strikes the tallest point.
To prevent this, a lightning conductor or lightning ancestor is used on the tallest point of the building.
It consists of a spiked rod attached to a long copper or aluminum rod, one end of which is buried in the earth.
If lightning strikes the building, it passes harmlessly through the rod and into the earth.



Rules governing electricity – the nevers

- Never touch a switch with wet hands because water conducts electricity.
- Never over load connections
- Never put anything in the fuse box or meter box.
- Never connect an electric appliance you're not sure of.
- Never touch an electric plug while bare footed
- Never stand under trees when it is raining, lightning may strike the tree.
- Report to UMEME offices near you for any broken mains or hanging wires or ring 185 across all networks.

MAGNETISM

A magnet is a piece of metal which has the ability to attract other magnetic materials / substances.

Magnetic materials are substances which are attracted by a magnet.

Examples include, steel, nickel, cobalt and iron.

Non – magnetic substances are those materials or are substances which are not attracted by a magnet eg copper, lead, plastic, aluminium, paper, rubber, etc,

Magnetism is the property of a magnet, which enables it to pull or push other magnetic substances or materials

OR
Is the ability of a magnet to attract other magnetic substances.

Types of magnets

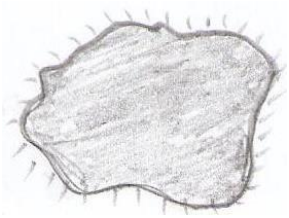
There are two types of magnets namely;

- Natural magnets
- Artificial magnets **Natural magnets:**
- Earth
- Lodestone

The Earth

It is the natural magnet because it has the magnetic North and South pole. This is why a freely suspended bar magnet points in the north pole and south pole direction. The north pole of the earth attracts the south pole of the suspended magnet.

Lodestone:



Lodestone dipped in iron fillings.

It is a magnetic ore which occurs naturally on earth. It was first seen in Magnesia which is now Malaysia.

It has the North pole and South pole and when it rests, it points in the North to South direction. (N – S)

Artificial Magnets

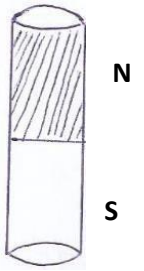
They are divided into two namely

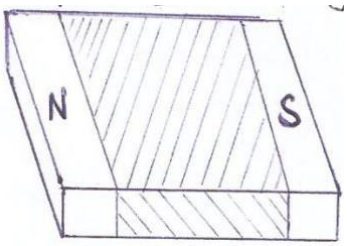
- Permanent magnets
- Temporary magnets **Permanent magnets**
- They are made of man from steel and other strong magnetic alloys.
- They keep their magnetism for years provided they are carefully stored and handled properly.

Examples a) Bar magnets

This is a bar uniform cross – section. The cross – section may be rectangular or cylindrical.

Shapes of bar magnet

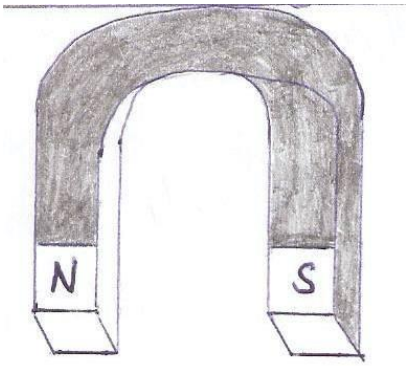




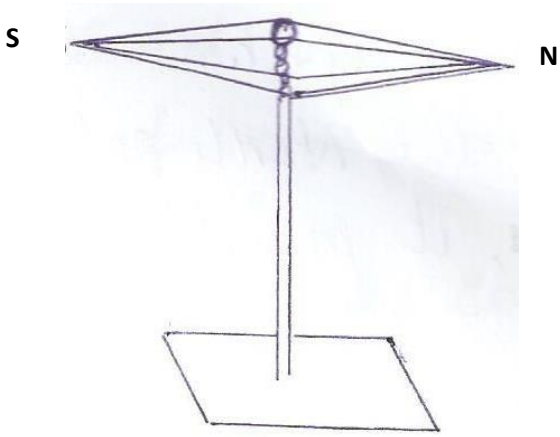
Rectangular bar magnet

Cylindrical magnet

b) Horse shoe magnets



(iii) Compass needle/magnet needle

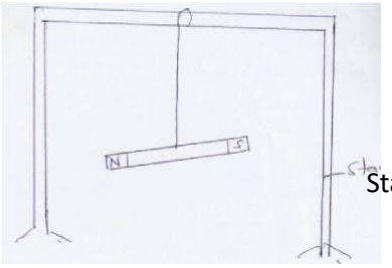


Temporary magnets:

- They are those that lose their magnetism very easily.
- They lose their magnetism as soon as electricity making them become magnetized is withdrawn.
- They are mainly made from iron for example electro magnets.

Electromagnets

- They are temporary magnets
- They are made by using soft iron in a solenoid. The iron becomes magnetized when an electric current passes through the coil.
- If the current is switched off, the iron loses its magnetism.
- Electro magnets are usually very powerful but they can be made even stronger by:-
  a) Increasing the number of turns in the coils.
  b) Increasing the voltage in the electric force.



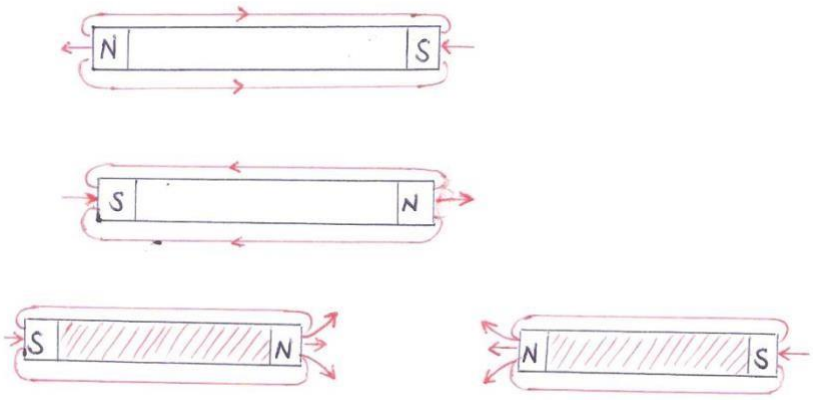
Properties of a magnet

- A freely suspended magnet will always point in the north and south direction.
- A freely suspended magnet rests pointing North – South direction (N – S)

- Magnetism can pass through non – magnetic substances.

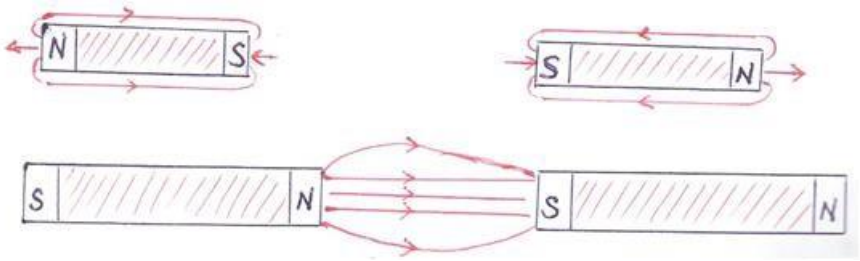
- Magnetism is concentrated in the ends or the attraction of a magnet is greater in its ends (poles). Magnetism is strongest at the poles of a magnet.
- The low of magnetism states that like poles repel while unlike poles attracts, ie (North and South attract), North and North) or (South and South repel).
- Lines of force in a magnetic field, run from north pole to south pole of a magnet.

- A magnet field is any region around a magnet in which the lines of force act. a)



The lines of force of two magnets with like poles repelling ie a north pole with a north pole.

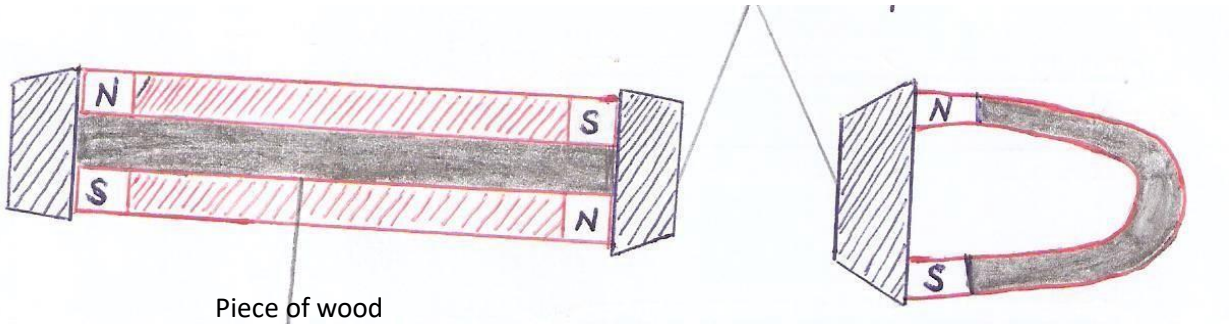
c) The lines of force of two magnets with like poles repelling ie a south pole with a south pole.



d)

The lines of force of two magnets with unlike poles attracting ie a north pole with a south pole

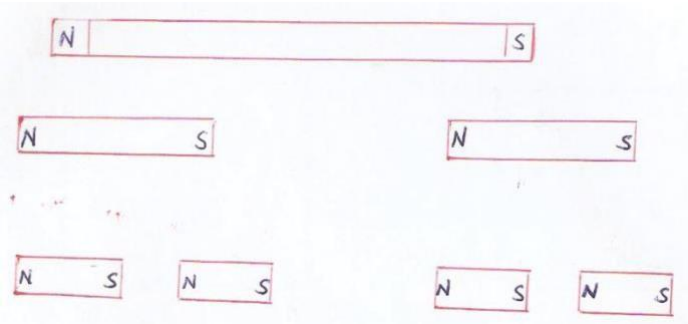
- Magnetism can pass through non – magnetic materials like cardboards, wood, paper, etc, but cannot pass through magnetic materials like iron, steel, nickel and cobalt because the magnetism is attracted by those magnetic substances.
- Magnets become weaker with age. This can be prevented by using iron keepers to absorb magnetism and help to preserve its strength. In case of bar magnets, the unlike poles must be arranged near each other. Iron keepers



- sides.

Properties of Iron and Steel

Iron	Steel
It makes temporary magnets	It makes permanent magnets.
It easily loses magnetism by induction	It keeps magnetism by induction.
It is easily induced.	It takes long to be induced.



Methods of making magnets

There are basically four methods or ways of making magnets namely;

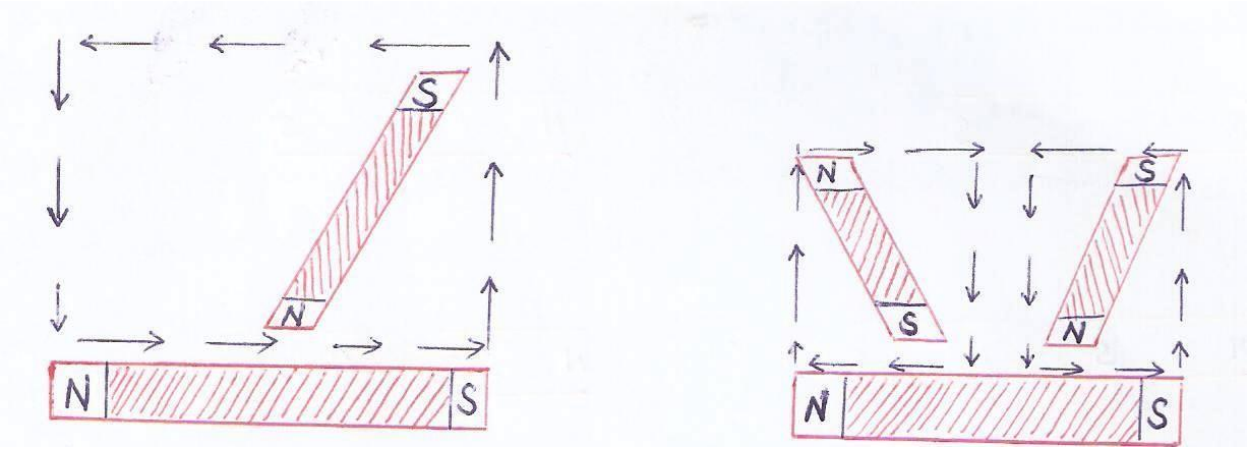
- Single touch / single stroke method
- Double touch / double stroke method - Induction method - Electric method.

Single touch method

This is done by stroking a magnetic substance with another magnet in the same direction with the same pole of the magnet. The end of the magnetic substance last touched or stroked becomes the opposite pole of the magnet used.

Double touch method / double stroking:

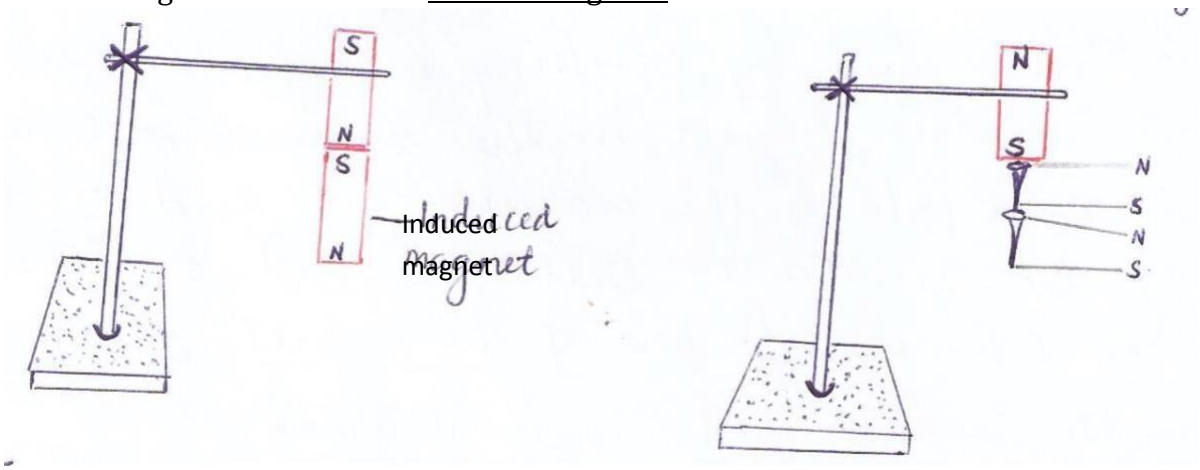
- This method is done by stroking using two bar magnets.
- Unlike poles and opposite direction must be kept and followed. Still opposite poles are produced at the point last stroked.

The 

induction method:

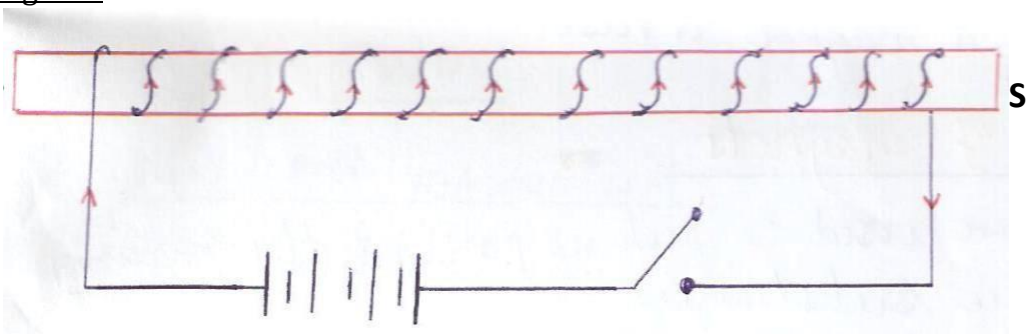
- This is achieved or done by attaching a magnetic substance (steel bar) on to a permanent magnet.
- The magnetic substance becomes magnetized by induction. The unlike poles are immediately formed to the ends of the magnet.

Note: the new magnets are known as <u>induced magnets.</u>



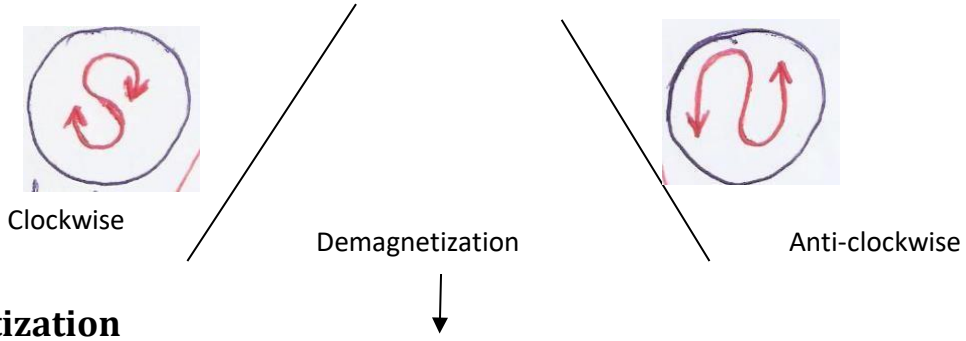
The electrical method

- This is done by placing a steel or iron bar in a coil of wire called a solenoid and electric current passed through the coil.
- This is the best method of making magnets, but the magnets made by this method are called <u>electro magnets.</u>



The polarity of an electromagnet can be found using the following rule;

- If current flows clockwise, the end where current enters the solenoid, becomes the North pole and if it flows anti – clockwise, the end acts like a South pole.



Demagnetization

Demagnetization or demagnetizing is a way of making a magnet to lose its magnetism. This can be done in the following ways:

- Placing a magnet inside a solenoid through which alternating current is flowing.
- Keeping a magnet in East to West direction and then hammering it.
- Hammering a magnet.
- Heating / boiling in water / leaving it in sunshine for a long and then allow it to cool. - Any rough treatment like boiling (constant dropping on the floor) - Keeping the poles together for a long time.
- Leaving a magnet to rust. **Uses of magnets**
- They are used to pick up pins, needles or any other magnetic substances.
- Used in hospitals to remove iron fragments from eyes, wounds, etc.
- Keeps doors of cabinets and refrigerators closed.
- Magnets hold kitchen knives, spoons, etc. onto the walls.
- They are use in compasses in aeroplanes and submarines to find direction.
- Used in earpieces and telephone receivers.
- Used in generators in the production of electricity.
- Used in loudspeakers and microphones.
- Used by watch repairer, cobblers and shoe makers to hold tinny nails.

Uses of Electromagnets

- They are used in electric bells
- Powerful electro magnets are used in cranes to lift iron steel.

Self Testing Exercise 2

1. What is an electric current?
2. What is the difference between static electricity and current electricity?
3. Name any one source of electricity.
   - Why is plastic used to cover electric wires?

TOPIC THREE ENERGY RESOURCES IN THE ENVIRONMENT

What is a resource?

A resource is any component of the environment that man uses to satisfy his needs.

What is an energy resource?

It is any component that man uses to produce energy. Energy is the ability to do work.

Examples of energy resources

- Plants
- Animals
- Mineral
- Sun
- Air / wind
- Water
-

Water as an energy resource

- Fast flowing water can be used to generate hydro electricity.
- Tides can be used to generate tidal energy.
- Steam can be used to drive steam boats and engines.

a) Hydro electricity

This is the type of electricity produced from the power of fast flowing water.

How hydro electricity is produced

Running water is used to turn turbines which in turn drive generators to produce hydro electricity.

b) Steam

Steam is produced when water boils and evaporates.

Steam passes kinetic energy. **How steam is useful**

- Steam can be used to drive steam boats and ships.
- Steam is used to run nuclear reactors being heated by uranium to produce electricity.
- Some times goes down and raises up

  This is caused by attraction of the moon and the sun.

  When water raises above the sea shores it is trapped and falls into reservoir which is used to turn turbines.

ENERGY RESOURCES FROM MINERALS

PETROLEUM / CRUDE OIL

Petroleum / crude oil is an energy resource dug from underground.

It was formed from animals which lived millions of years ago and decomposed, sunk down due to the changes in the earth, crated a lot of heat and pressure on them which causes them to change into oil.

- Out of petroleum, fuels like petrol, diesel jet fuel and kerosene or paraffin are obtained through the process of fractional distillation in a refinery. Different fuels vapourises (boil) at different temperature.
- From petroleum we get chemicals used to make plastic, polithen sacks, vesseline, ink cosmetics, detergents, polish, tooth paste, synthetic rubber, alprine, grease lubricants, drugs, dyies, insect cides, paints, ferterlizers, etc.
- When mining petroleum natural gas is extracted first from petroleum, purified and put in gas cylinders ready for cooking and lighting.

Coal

This is a plant fossil fuel dug from under ground and it was formed from plants millions of years ago as large forest got buried deep in ground due to land movements of the earth. Due to heat and pressure of them they change it to coal. Coal burns to produce heat.

USES OF COAL

- It is used as fuel in steam engines and locomotives.
- It is used in the processing of iron ore/
- It is used in the making of tar for surfacing roads.
- It is used for (coal gas) cooking, lighting and heating houses worm in artic regions.
- It gives chemicals for drug making, dyes, fertilizers, perfumes, plants, explosive and antiseptics, etc.

URANIUM

- It is a mineral drug from underground
- It appears in many countries including DRC in Africa.
- It is also a fuel because it is used to produce electricity in nuclear power station.
- The electricity produced by burning uranium is called atomic or nuclear electricity.
- Uranium is also used to make atomic or nuclear bombs.
- It is also used as fuel in nuclear powered submarines.

GEOTHERMAL ENERGY

This is the energy got from hot springs. Hot springs discharge water heated by natural processes with the earth.

Hot springs are also called thermal springs.

Hot springs originate when surface water which results from rain / snow sinks into the ground and is heated hot rocks under the ground producing steam which turns the turbines to produce electricity.

Examples of such hot springs in Uganda are on top of mt Elgon and Kitagata in western Uganda.

ENERGY RESOURCES FROM PLANTS

Through photosynthesis, plants use sun light to make food and change it into chemical energy and store in wood.

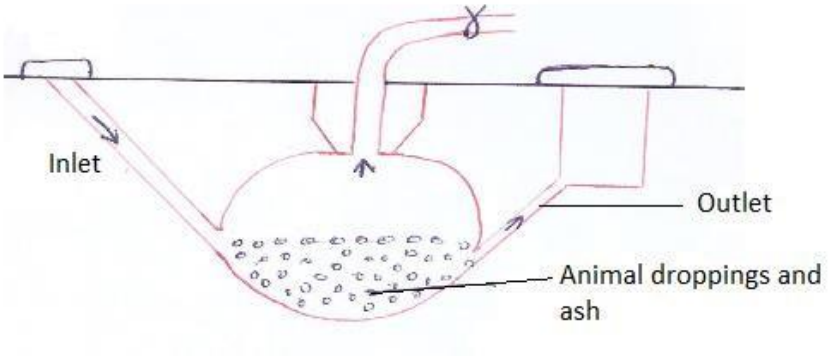
- When we burn wood with limited oxygen charcoal is obtained.
- Fire wood is a good source of heat and light energy.
- We obtain wood from plants for different purposes ie local medicines, laboratory, drugs to cure diseases, wood for furniture, etc.
- Biogas production.

HOW TO CONSERVE PLANT RESOURCES

- Plant young tree to replace those cut ie.
- Cut one and plant 10 or more
- Forests should be gazzeted and protected.
- Fuel serving charcoal and fire wood stoves should be utilized or used.
- Charcoal, fire wood and timber dealers should be restricted and licensed.

ENERGY RESOURCES FROM ANIMALS

- Oxen in many parts of Africa are used for ploughing and pulling carts with goods.
- Donkeys also plough and transport heavy loads.
- Some animals provide meat as a food energy resource.
- Biogas production from animals droppings which are fermented with the help of anaerobes, placed in a properly sealed container buried under ground without 02 called biogas digester.
- Biogas (niethone) is used for cooking, lighting, etc.
- Biomass means the amount of living material found in an area (animal matter / plants) which can be used to produce biomass fuel.



ENERGY RESOURCES FROM WIND

Air is a mixture of gases while wind is moving air.

Wind is useful in the environment and it is a very good source of energy.

- Unlike the earlier sailors on the east African coast who used dhows for transport, wind used to drive wind mills and wind mills are connected to turbines which are also connected to generators that produce electricity.
- Wind mills are also used to turn water pumps and draw water from underground.
- Wind is used in winnowing millet, sorghum, rice to remove chaff from it. - Wind drives away bad smell within the environment - Wind energy is a renewable form of energy.

NB: Wind is formed when air in a certain area is faster than air in another area.
The one which is heated faster moves up because it has become less dense and the air in the second
place which is still cool or denser comes to occupy the first area.

ACTIVITY

Write down any four merits and demerits of wind to man.

TOPIC FOUR
INTERDEPENDENCE OF THINGS IN THE ENVIRONMENT

Environment

Environment is man and his surroundings

Components of the environment

- Plants
- Animals
- Water bodies
- Air
- Soil

NB : Plants and animals are examples of organic

Components of the environment

1. Biotic / Non physical environment is the type of environment which consists of living things eg plants , Animals , Human beings , Bacteria and viruses.

2. A biotic / physical environment

Is the type of environment which consist of non living things eg

- Soil , water, air

NB: All compliments of the environment depend or each other mostly for survival.

Interdependence

This is a situation where living things depend on each other so as to survive. This is a situation where living things depend on non-living things.

How animals depend on plants

- Animals depend on plants for food.
- Animals depend on plants for shelter / habitat - Animals depend on plants for herbal medicine.
- Animals depend on plants for oxygen

Plants depend on animals

- Plants get carbondioxide from animals
- Plants obtain manure from animals
- Animals helps in pollination of plants
- Animals help in seed and fruit dispersal

How animals depend on other animals

- Animals depend on other animals for protection for those that move in herds - Some animals get food from other animals eg scavengers - Some animals use other animals for transport.

How plants depend on other plants

- For support
- Plants depend on other plants as habitat
- Some plants provide shade to other plants
- Segumious plants fix nitrogen in the soil which is used by other plants. **How animals depends on non living things**

- Insects live in soil as habitats
- Birds use space to fly and hunt for food
- Some animals use stones for construction
- We breathe in air (oxygen) for respiration
- Animals drink water to survive

How plants depend on non living things

- Plants obtain food from the soil
- Plants use water and carbondioxide as raw materials for photosynthesis
- Plants depend on wind for pollination and dispersal

How non living things depend on living things

- For protection against soil erosion (plants) protect soil against erosion - Bacteria help in soil formation

<u>Food chain</u>

- A food chain is the way how organisms in an environment get their food.
- A food chain is the flow of energy from one organism to another
- A food chain is the feeding relationship between organism in the environment

<u>Illustration</u>

Grass → Goat → leopard → bacteria

- Grass represents the producer
- Goat represents primary consumer
- Leopard represents secondary consumer
- Bacteria represents decomposer

1. Producer is an organism that make food

2. Primary consumer is an organism that feeds directly on a producer.

3. Secondary consumer is an organism that feeds on a primary consumer.
They are mainly carnivorous

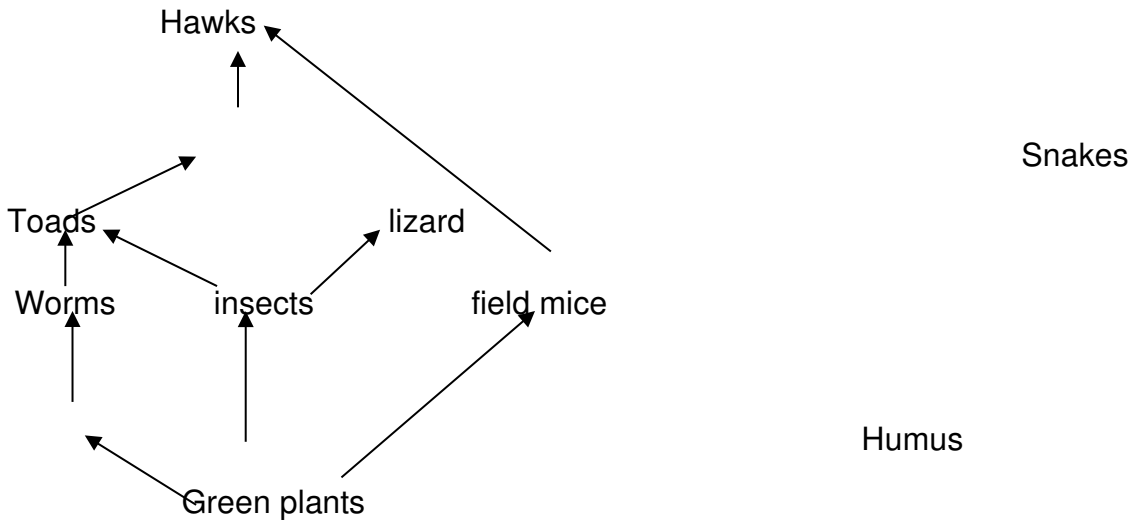
4. Decomposer

Is an organism that causes decay / rotting Food

web

Is a more complicated relationship of how organisms in an environment obtain their food.

Illustration



NB : Eco system - Is a community of organisms in a habitat

Habitat - Is a home of an organism in the environment

GROWING OF TREES

Breeds of trees

1. Indigenous trees
2. Exotic trees

Indigenous trees: These are trees which whose origin is Africa.

Examples of indigenous trees

1. Mivule
2. Mango 3. Jack fruit
4. Musizi

5. Ennongo
6. Mutuba (ficus tree)

Characteristics of indigenous trees

1. They produce hard wood
2. They are resistant to harsh weather conditions
3. They have low growth rate
4. They form thicker canopies

Exotic trees: These are trees which are introduced in the Africa from outside countries.

Examples of exotic trees

1. Cypress
2. Gingko
3. Pine
4. Cedar
5. Eucalyptus
6. Fir

Characteristics of exotic trees

1. They have faster grow rate
2. They produce soft wood
3. They are less resistant to harsh weather condition
4. They are highly affected by tropical tree diseases.

Agro-forestry

Agro-forestry is the growing of crops together with trees and rearing if animals on the same piece of land.

Importance of agro-forestry

1. Trees planted in agro-forestry are source of wood fuel.
2. Agro-forestry promotes soil fertility.
3. Trees planted in agro-forestry provide shade to animals and other food crops.
4. Agro-forestry is a source of double income to the farmer.
5. trees are source of herbal medicine to people and animals
6. Trees planted are source of timber and other building materials
7. Trees planted in agro-forestry purify air in the environment by absorbing carbondioxide and realizing oxygen.
8. Trees planted in agro-forestry help in rain formation.

9. Fruit trees and crops provide food to farmers.
10. Crops and trees residues are source of food to livestock. 11. Trees planted in agro-forestry control soil erosion

PLANTING

Selection of planting materials

- Trees grow from seeds or cuttings.

Quality of good seeds for planting (planting material).

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

Starting a tree nursery bed.

The following should be present:

- Poles
- Hoes
- Watering jug • Polythene papers.
- Dry grass.
- Water source.
- Seeds or cuttings.

Procedures or preparing a nursery bed for trees.

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

Care for seedlings.

- Constantly water the seedlings.
- Remove any weeds.
- Spray the seedlings to control pests.

- Thin out the diseased or those infected with pests.
- Fence off the nursery bed to protect it against animals.
- Hardening off should be done when about to transport the seedlings.

Transplanting:

- Transplanting is the transfer of seedlings from the nursery bed to the main garden.
- Transplanting is done in the evening because of the following reasons.
  - Reduce the rate of transpiration.
  - Control watering or wilting.
  - Give roots time to set in and start absorbing water.
  - Reduce evaporation of water from the soil

Caring for trees.

This can be done through.

- Slashing.
- Spraying with herbicides.
- Planting cover crops.
- Mulching.
- Mechanical weeding using a hoe.
- Uprooting.

Weeding

- It refers to the removal of unwanted plants from the garden Mulching

- This helps to conserve moisture in the soil.
- This is the covering of top soil with dry plant materials.
-

Pruning

- This is the removal of excessive, unproductive, diseased and damaged branches and leaves of a plant.

Advantages of pruning

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

Thinning.

This is the removal of excess seedlings from the garden.

Advantages of thinning.

- It removes hiding places for pests.
- Creates space for plants to grow bigger.
- Reduces overcrowding.
- Reduces competition for nutrients.

Pests and diseases control in trees.

- These should be controlled mainly by spraying.

Disadvantages of pests.

- Some pests eat and destroy the trees.
- Some pests spread the diseases to crops.
- Pests reduce the quality of yields.
- Pests reduce the speed at which the trees grow.
- They increase the cost of production since pesticides are brought to control them.

Spacing of trees

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

Methods of harvesting trees

(1) **POLLARDING**

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

An illustration about pollarding

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(2) **LOPPING**

- This is the cutting off of the side branches from the trunks.
- Mature branches are harvested as the tree continues to grow. (**diagram)**

Coppicing

- The cutting off the trunk of a tree leaving only a short stump to grow shoots. **Illustration of coppicing.**

SELECTIVE FELLING OF TREES.

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

PREPARING WOOD FOR DIFFERENT USES.

- Timber for building and furniture is sowed into plants of specific sizes.
- They are placed together on flat surface to ensure they remain straight.
- Wood for firewood needs to be split and allowed to dry because wet wood does not burn well. Splitting wood allows water to escape and evaporate easily to allow drying process.
- Wood meant for fencing and electricity poles should have their barks removed and chemicals used for treatment. This prevents attacks from pests and diseases.

STORAGE OF WOOD

- Wood like timber should be stored in a cool dry place to avoid warping or bending.
- Timber should be properly seasoned that is, allowed to dry in a cool dry place and chemicals applied.

Fire wood should be stored in a dry place to avoid getting damp.

a) Wood for firewood
Wood is split using the axe, a panga and stored in the dry place for cooking.

b) Wood for timber
- Trees are cut into logs which are later split into small pieces using a hand saw or sewing machine.
- The timber got is kept under shade, the shade is called seasoning.
- The timber shouldn't be dried under direct sunshine because it causes warping of wood.

Wood warping

This is the twisting of the wood shape due to direct drying of wood under sunshine.

Wood lot

This is a small area that has been set a side for growing trees.

Importance of the wood lot project

- Trees provide firewood for cooking
- Trees provide timber for building and making furniture.
- Trees are a habitat for many insects , small mammals
- Trees help to conserve soil and water
- Trees help to purify air

Factors to consider when starting a wood lot project

- Selection of multipurpose trees , species
- Drought resistant varieties
- Trees that mature faster in a short time

TOPIC FIVE

EXCRETORY SYSTEM.

- Excretion is the removal of waste products from the body before they become toxic.
- Excretory system is a body system that deals with the removal of waste products from the body.

Organs of excretory system.

- The body organs which carry out excretion are; (a) The skin.
  (b) The kidney.

•

(c) The lungs. (d) Liver **THE SKIN**

Illustration of the structure of the skin.

The skin is made of two main layers.

(a) Epidermis.
(b) Dermis.

<u>The Epidermis:</u>

- This is the outer most layer / region of the skin.
- The epidermis is made up of these layers. (i) Cornified layer.
  (ii) The granular layer.
  (iii) The malpighian layer.

<u>Cornified layer:</u>

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

<u>Malpighian</u>

Is a layer of cells which divide actively to produce the epidermis.

- In this layer, there are pigments granules and melanin that determine the skin colour

Granular layer.

- Contains living cells that gradually give way to form the cornified layer.
- Increases resistance to damage and bacterial invasion.
- It reduces the loss of water by evaporation.

The dermis

- This region is the inner most layer of the skin and it stores fats under it.
- This region contains the following parts.
  1. Capillaries; Supply food and oxygen to the skin and removes excretory products. Capillaries help in temperature control.
  2. Sweat glands.
     Secretes sweat, sweat contains excess salts, urea and water.
  3. Sweat duct. Is an opening / pore that lead sweat to the surface of the skin.
  4. Hair follicle. Is a deep pit of granular and malpighian layer cells that multiply to build hair.
  5. Sebaceous glands; These produce oily substances called sebum that keeps the skin water proof.
  6. Sub cutaneous fat; The fat layer beneath the skin act as a heat insulator that helps to control heat loss.
  7. Nerves – Transmit impulses for heat, touch etc.

Functions of the skin.

- Excretes salts, water and some urea.
- Regulates body temperature.
- Stores fats.
- Makes vitamin D by the help of sun light.
- Protects the body against germ infections.
- Is the sense organ for feeling.

Body temperature regulation.

- Blood vessel vasodilate / widens allowing more blood to flow near the surface and more heat is lost by radiation.
- Sweat glands produce more sweat through which heat is lost by evaporation.

- Erector muscles relax causing hair to lie flat on the body to allow wind to easily sweep off heat. <u>On cold days.</u>

- Blood vessel narrow (vasoconstriction) and so blood is withdrawn from the surface limiting heat loss by radiation.
- Decrease in sweat produce thus reducing heat lost by evaporation.
- Through shivering, heat is produced by the contracting muscles.
- Fats under the skin act as heat insulators.
- Erector muscles contract causing hair to erect and trap air around the skin which act as an insulator to heat loss.
- When hair erect, goose pimples appear on the skin.

<u>Diseases of the skin.</u>

The skin is commonly affected by diseases like;

- Ring worm.
- Scabies.
- Athletes foot
- Leprosy.

  Disorders of the skin
  - Dandruff
  - Pimples
  - Bruises
  - Cuts
  - Corns
  - Aene
  - Herpes zoster

<u>Care of the skin:</u>

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

Is made up of organs that eliminate wastes from the body in form of urine.

Other organs of urinary system.

- Kidney
- Ureter

Urinary bladder
- Urethra

Structure of urinary system

THE KIDNEY

- Kidneys are reddish brown bean shaped structure located at the back of the lower abdomen.
- The kidney belongs to the system called the urinary system.
- The chief or main function of the kidney is to filter blood by removing the nitrogenous substance from it.
- The kidney is connected to the aorta by the renal artery which supplies it with oxygenated blood.
- It has got the renal vein which carries the de-oxygenated blood from the kidney to the heart through the venacava.
- Water is lost form the body in form of urine, sweat and faeces. The kidney also removes the Nitrogenous substances from the blood.

- The kidney also removes excess water and mineral salts from the body. It regulates the amount of water, mineral salts and sugars in the body.

THE STRUCTURE OF THE KIDNEY

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Renal artery: It supplies the kidney with the oxygenated.

Renal vein: It transports deoxygenated blood away from the kidney to the venacava.

Ureter: It is a long tube which transports urine from the kidneys to the urinary bladder for storage.

Or: It leads urine to the urinary bladder for storage.

Urinary bladder: It stores urine before it is passed out of the body.

Sphincter muscles: These are muscles that open and relax to control the amount of urine leaving the urinary bladder.

Urethra: This is a tube that passes out nitrogenous substances or urine from the urinary bladder.

THE FUNCTIONS OF EACH PART OF THE KIDNEY

1. Cortex:
   This is the dark outer most layer of the kidney that is responsible for filtering blood by removing the nitrogenous substances.

   Filtration of blood takes place in the cortex of the kidney in the special part called glomerulus which is surrounded with a cup like structure called Bowman's capsule which is surrounded by a dense network of blood capillaries.

2. Medulla

This is the lighter inner part of the kidney where the selective re-absorption of the nitrogenous substances like water and sugar (glucose) that are still needed by the body takes place in the kidney.

3. Pyramid:

This absorbs the urea and other nitrogenous substances from the medulla for storage in the kidney.

4. Pelvis:
   This is where urine is first collected from and stored before being led to the urinary bladder.
5. Ureter:
   This is a tube which leads urine to the urinary bladder for storage.

NB: The reproductive system and urinary system are collectively called Urogenital system.

FUNCTIONS OF THE KIDNEY

1. The kidney filters blood by removing the nitrogenous compound from it.
2. The kidney removes excess water and mineral salts from the body.
3. The kidney regulates the amount water, salts and sugar in the body.
4. The kidney excretes urea from the body.
5. The kidney maintains the concentration of blood in the body.

OSMOREGULATION

This is the process by which the kidney regulates the level of mineral salts and water in the body.

Nitrogenous substances

These are poisonous substances that are removed from the blood by the kidney.

<u>Examples of the nitrogenous substances.</u>

1. Ammonium compounds
2. Mineral salts
3. Urea
4. Uric acid

<u>Components of urine</u>

1. Uric acid
2. Inactive hormones
3. Mineral salts
4. Urea
5. Glucose
6. Poisonous drugs
7. Ammonium compounds

NB:

-
- People urinate more frequently on cold days than hot days because there will be less sweating and therefore most in the human body will be passed out in form of urine.
  People pass out yellowish urine on hot days because the high body temperatures make the mineral salts in the urine to become more concentrated.
- People pass out greenish urine on some occasions as a result of having a lot of glucose in their bodies.

DISEASES OF THE KIDNEY

1. Kidney failure
2. Kidney stones
3. Bilharzia
4. Gonorrhoea
5. Nephritis
6. Cancer of the kidney

Bilharzia

This is the water borne caused by blood flukes or worms called schistosoma worms spread by the fresh water snail.

Bilharzia is spread through drinking un boiled water.

Signs of bilharzia

1. Mild fever
2. Severe pain in the lower abdomen
3. Passing out urine with blood strains

Ways of preventing the spread of bilharzia

1. By drinking properly boiled water
2. By avoiding urinating in the water sources

Kidney stones

This is caused by obstruction of the pelvis by the small stones as a result of salt solidifying from them.

- These stones are made of calcium salts.
- It is prevented by surgical operation of the kidney

Kidney failure

This occurs when the kidney fails to regulate the amount of water and mineral salts in the blood.

Signs of kidney stones

1. Severe pain in the lower abdomen
2. Severe pain at the base of the penis in men
3. Difficulty in passing out of urine
4. Drops of bloods are seen in the urine as one passes out the first drop.

CANCER OF THE KIDNEY

This occurs between the age of 45 years and 60 years. It starts with the appearance of blood in the urine.

- It causes severe pain in the lower abdomen
- It causes blood stains in urine
- It is prevented by surgical operation

THE LIVER

1. The liver is said to be the most important organ in the body because it performs many functions compared to other body organs.
2. The liver is a large reddish brown organ below the diaphragm.
3. It is supplied with oxygenated blood by the hepatic artery. The liver receives blood rich in digested food from the alimentary canal by the help of the hepatic portal vein.

FUNCTIONS OF THE LIVER.

1. The liver regulates blood sugar.
   - Too much sugars and lack of enough sugar in blood causes diabetes. ○ The liver control sugar levels by the help of insulin.
   - Insulin is produced by the pancreases and help to stimulate the liver to remove glucose from blood by converting it into glycogen for storage.
   - The liver deaminates amino acids and convert them into carbohydrates.
   - Alcohol, poisonous substances and poisonous drugs produced during metabolism are ma de harmless by the liver through the process of detoxication.

2. It helps in the process of excretion.
3. Stores vitamins and mineral salts.
4. It helps in detoxication process.

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5. It produces heat energy.

Diseases of the liver.

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

Care of the liver

- Avoid taking too much alcohol.
- Have a balanced diet.
- Always have exercises to keep it in a good working condition.

THE RESPIRATORY SYSTEM.

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

Types of respiration.

- There are two types of respiration i.e.
  1. Aerobic respiration – One which uses oxygen.
  2. Anaerobic respiration –One which does not use oxygen.

- Difference between breathing and respiration.
  1. Breathing is the taking in of air rich in oxygen and taking out of air with more carbondioxide.

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

ORGANS OF RESPIRATION AND THEIR FUNCTIONS

- Epiglottis – Is a flap which protects the opening of the trachea during swallowing of food.
- Nose- The air passage into the trachea.
- It contains cilia and mucus which help to trap germs and dirt which enter the nose.
- In the nose, air is cleaned, warmed and moistened.

- It is not advisable to breathe through the mouth because;
  1. The air will not be warmed so it can chill or make the lungs very cold.
  2. The mouth has no cilia to trap dust and germs.

THE TRACHEA.

- Also called the wind pipe.
- It is a passage of air down the lungs.

- The trachea contain tiny cilia for trapping dirt and germs.
- The trachea is made up of cartilage rings to keep it open.
- It divides into the bronchi which continues to divide into bronchioles and end up into the air sacs / alveoli.

The lungs.

- The lungs are both excretory and respiratory organs.
- This is because they are used in respiration and also putting out waste products.
- The lungs excrete carbondioxide from the body which is a waste product of respiration.
- It is in the lungs where gaseous exchange takes place in the body. However, in the lungs, gases exchange takes place in the air sacs or alveoli.

Adaptations of air sacs / Alveoli to their function.

- They are thin walled to allow gases diffuse through easily.
- They are surrounded by a net work of blood capillaries which supply them with blood.

COMPOSITION OF AIR BREATHED IN AND OUT.

Type of air	Inspired air	Expired air
Oxygen 0_2	21%	16%
Carbondioxide Co_2	0.03%	4%
Nitrogen N_2	78%	78%
Water vapour	Less	More
Rare gases	0.97%	0.97%

Explanation:

- 21% of oxygen is breathed in but only 16% is breathed out because most of it is used by various body reactions.
- 0.03% of carbondioxide is breathed in and 4% is expired because more of it is produced by various reaction like respiration.
- 78% of Nitrogen is inspired and 78% expired because nobody reaction needs nitrogen to occur.
- Less water is inspired but more is expired because more water vapour is produced by different body organs.
- 0.97% rare gases is inspired 0.97% expired because nobody reactions required it to occur.

Mechanism of breathing (expiration and inspiration) Inspiration:

- The volume of the chest and lungs increase.
- The diaphragm and the intercoastal muscles contact.
- The ribs go up and out wards.
- The lungs expand.
- The stomach enlarges and swells.

Expiration:

- The volume of the chest and the lungs decrease.

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- The ribs go down wards and in wards.
- The diaphragm and intercoastal muscles relax.
  The lungs and the stomach go to their original size.

The pleural membranes.

- The lungs are covered by the pleural membranes which secrete fluid called pleural fluid.
- This fluid lubricates and reduces friction between the lungs and the ribs.
- The ribs are held together in position by the intercoastal muscles. Diseases and disorders of the respiratory system.

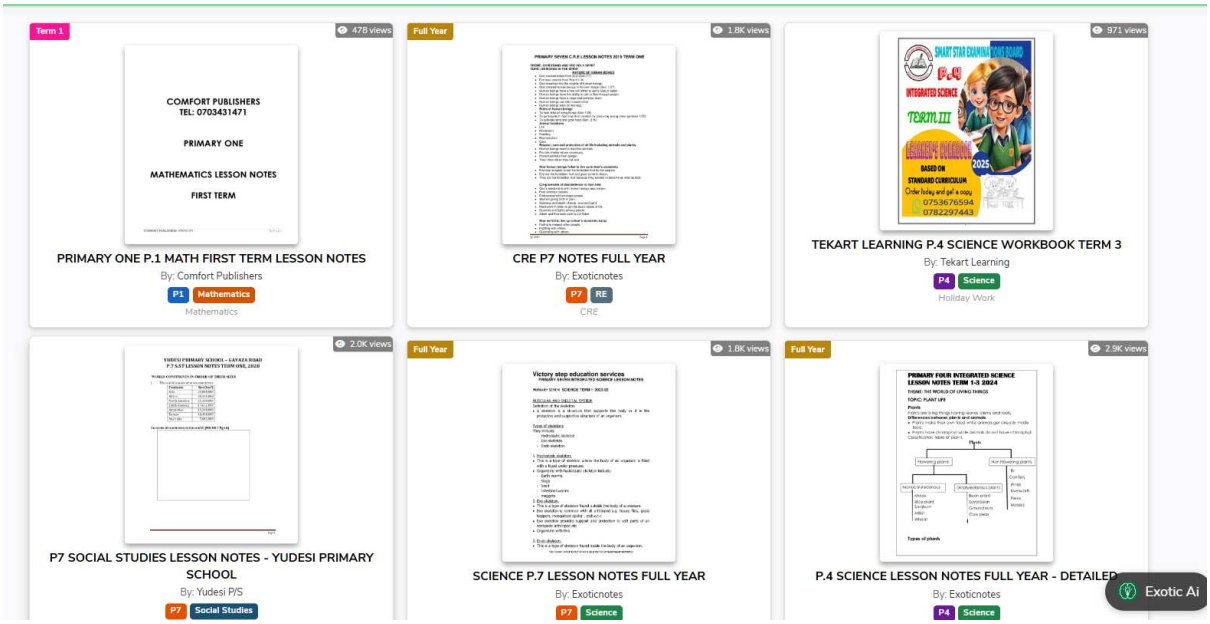
Disorders:

- Hiccups.
- Sneezing.
- Choking.
- Yawning.
- Coughing

Diseases.

Communicable	**Non-communicable**
• Tuberculosis	- Emphysema
• Influenza	- Lung cancer
• Diphtheria	- Asthma
• Whooping cough (pertussis)	- Bronchitis
• Pneumonia	

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