SCIENCE LESSON NOTES FOR TERM 1,2 &3

MUSCULAR AND SKELETAL SYSTEM

Definition of the skeleton.

- A skeleton is a frame work of bones in the body.
- A skeleton is a structure that supports the body

Types of skeletons

They include;

- Hydrostatic skeleton
- Exo skeleton
- Endo skeleton

1. **Hydrostatic skeleton.**

- This is a type of skeleton where the body of an organism is filled with a liquid under pressure.
- Organisms with hydrostatic skeleton include;
  - Earth worms.
  - Slugs.
  - Snail
  - Intestinal worms
  - maggots

2. **Exo skeleton.**

- This is a type of skeleton found outside the body of a creature.
- Exo skeleton is common with all arthtopod e.g. house flies, grass hoppers, mosquitoes spider , crab e.t.c
- Exo skeleton provides support and protection to soft parts of an insect, centipede, (arthropods) etc.

3. **Endo skeleton.**

- This is a type of skeleton found inside the body of an organism.
- Organisms with endo skeleton include, man(human beings) cows, goats e.t.c
- Endo skeleton is made of bones and cartilages.

The structure of the human skeleton

BONES

- Bones are hardest tissues found in animals with back bones (vertebrates).
- Bones contain living cells which are supplied with food and oxygen by blood vessels.
- Bones are made from mineral salts and proteins.
- Mineral salts include calcium and phosphorus.

Types of bones

Bones are classified according to their shapes as:

(a) Long bones

These are found in the arms and legs.

Examples of long bones

- Radius.
- Ulna
- Femur
- Fibula
- Tibia
- Humerus

NB: The femur is the longest and strongest bone in the body.

(b) Short bones

These are found in the feet and hands.

They include; - Metacarpals.

- metatarsals.

NB: The general name given to bones of the fingers and toes is phalanges

c) Flat bones

These include; - the scapular (shoulder blade)
- Bones of the skull.

d) Irregular shaped bones

These are found in the wrist and ankles like the carpals and the tarsals.

Sesamoid bones – are completely made of tendon
- Knee cap

JOINTS

Definition of a joint:
- A joint is where two or more bones meet in the body.

Types of joints

These include: - Movable joints
- immovable joints

1. Movable joints
- These are joints which allow movement.
- Movable joints are held together by ligaments and tendons.

Examples of movable joints
- Hinge joint.
- Ball and socket joint.
- Pivot joints.
- Gliding / plane joints.

Hinge joint
- This is a type of movable joint which allows movement in one plane.

Examples of hinge joint
- The elbow joint.
- The knee joint.

NB: They are called hinge joints because their movement is like that of a door on its hinges.

Illustration of the structure of hinge joints.

Ball and socket joints
- This is a type of movable joints which allow movement in three planes (all round movements). i.e. forward, backward, side ways and in circular form.

Examples:
- The shoulder joint.
- The pelvic girdle (hip joint)

They are called ball and socket because the ball shaped end of one bone fits into a socket in the other bone.

Illustration of the structure of ball and socket joint.

Pivot joints

- This is a type of joint which allows rotation of certain parts of the body on other parts.
- An example of pivot joints is the neck vertebra.
- Pivot joints helps us to nod our heads.

Gliding joints / plane joint

- This is a type of joint where two moving bones are flat and slide over one another easily.
- Gliding joints are found in the wrist and ankles.

Illustration of the structure of gliding joints.

Importance of joints.

- Joints allow movements in the body.
- Joints help us bend our body parts

Features of a typical movable joint

1. The cartilage and synovial fluid – reduce friction in the joint.
2. Ligaments – structures which join bones together at a joint.
3. Tendons – structures which join muscle to bone.
4. Synovial membrane / synovium – is a capsule of fibrous material whose inner membrane secretes synovial fluid.

2. **Immovable joints**

- This is a type of joint that does not allow any movement because they are tightly fixed together.
  Examples:
  - The suture joints found in the skull.

  An illustration to show the structure of the suture joints of the skull.

MUSCLES

- A muscle is an elastic substance found in the body of animals.
- Muscles are connected to the bones by tough fibrous tissues calledtendons.
- Muscles only relax and contract.
- There are three types of muscles namely;
  (i) Voluntary or skeletal muscles
  (ii) Involuntary or smooth muscles.
  (iii) Cardiac muscles.

(A) VOLUNTARY OR SKELETAL MUSCLES

- These are muscles whose movement can be controlled.
- They are always attached to the skeleton.

Examples of voluntary muscles:

- The biceps muscles of the hand which connects the scapula to the radius.
- The Triceps muscle of the hand which connects the scapula, the humerus and ulna.

Diagram showing the arm and its parts.

(i) When the arm is straight.

(ii) When the arm is bent.

(B) INVOLUNTARY OR SMOOTH MUSCLES

- These are muscles whose movement is automatic.
- We have little or no control over them.

Examples of the involuntary muscles:

- Muscles of the walls of the alimentary canal.
- Muscles of the reproductive system.
- Muscles of the blood vessels.
- Muscles of the excretory system.

(C) CARDIAC MUSCLES

- These are muscles whose movement is made by the muscles themselves.
- We do not have any control over these muscles.

Examples of cardiac muscles.

- Muscles of the heart;
  - These have the capacity to contract and relax throughout life without getting tired.
  - They only stop when the person is dead.

FUNCTION OF MUSCLES.

- They help in joining bones in our body.
- They help in movement (Locomotion)
- They help animals to perform work.
- They aid in movement of food through the alimentary canal
- Some muscles help in controlling blood pressure
- They are used in storage of oxygen

NOTE:

- Antagonistic muscles are muscles which work in pairs.
- When one relaxes the other contracts.
- Examples are the Biceps and Triceps muscles of the arm.

Importance / functions of the skeletal and muscular system

- They help in body movement
- They give the body shape.
- They protect the inner delicate organs of the body.
- Help in manufacturing of blood cells.
- Provide room for muscular attachment

POSTURE:

- Posture means the position of the body for everything we do.
- There is correct posture for sitting, standing, walking, running and sleeping.

IMPORTANCE OF GOOD POSTURE:

(i) We look smart.

(ii) Muscles of the abdomen and diaphragm become strong.

(iii) Good posture keeps the organs of the intestines in proper position.

(iv) Good posture helps the skeleton to develop in the right way.

(v) Bad posture leads to indigestion and deformities of the skeleton.

Diagrams showing good posture for sitting, **standing, walking, lifting.**

DISEASES AND DISORDERS ASSOCIATED WITH THE SKELETAL AND MUSCULAR SYSTEM.

(i) POLIO.

- It is caused by a virus passed out by an infected person in faeces.
- The virus can get into our bodies through drinking contaminated water.
- The virus can also get into our bodies by eating contaminated food.
- The disease affects bones especially the limbs. That is why it is called the disease of the limbs or bones.

Signs and symptoms.

- Paralysis or weakness in one or more bones.
- Fever.

Prevention and control of polio

- Immunisation with polio vaccine by giving drops in the mouth.
- Use latrines wherever possible.
- Wash hands with soap and water before eating food.
- Drink boiled water.

(ii) TUBERCULOSIS OF BONES

- Tuberculosis is caused by a bacterium called a mycobacterium.
- The bacterium was first discovered by Robert Koch in 1882.
- The bacteria is spread through air.
- There are several types of mycobacterium.
- There is one which causes Tuberculosis of the lungs and the other which cause Tuberculosis of the spine or backbone.

Symptoms of tuberculosis of bones.

(i) Long lasting painful backache.
(ii) A lump grows on the spine.
(iii) Pain in the backbone while walking.
(iv) Paralysis of the legs and failure to walk.

Prevention and control of tuberculosis

(i) Immunisation with BCG vaccine on the right upper arm at birth.
(ii) Isolate the infected person.
(iii) Treatment of the infected person.
(iv) Drink boiled or pasteurized milk because the bacteria also attacks cows and can be spread through un boiled milk.

(iii) 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 them stiff and also breathing becomes difficult.

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

Signs and symptoms of tetanus.

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

Prevention and control of tetanus.

- Early immunization 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 person
- Avoid sharing towels , basins , beddings with an infected person.
- Treat early cases with antibiotics

RICKETS

- It is a deficiency disease which affects bones especially during pregnancy when the mother did not have enough foods containing **Vitamin D,Calcium** and **phosphorous.**
- It causes oxbow legged or knock-knees legs.
- In adults, rickets can cause common fractures.

Signs and symptoms of Rickets.

- Weak bones especially leg bones.
- Poor teeth formation.
- Fractures very common to one person.
- Oxbow legs.
- Knock-knee legs.

Prevention and control of Rickets.

- Include foods containing vitamin D, Calcium and Phosphorous in the diet.

Dis-orders of the skeletal and muscular system.

- Fractures.
- Sprains.
- Strains.
- Dislocation.

HOW TO MAINTAIN PROPER SKELETAL AND MUSCULAR SYSTEM.

(a) Eat foods containing a balanced diet especially mineral salts like calcium and phosphorous and also food containing vitamin D.
(b) Have children taken for early immunization against tuberculosis, Polio and Tetanus.
(c) Carry out regular body exercises. Exercises are important because;

- The heart muscles grow stronger and larger.
- The heart delivers more blood to the muscles.
- More enzymes are made in the muscle tissue to break down glucose and fatty acids.
- Ligaments and tendons become stronger to reduce chances of injury
- Joints become more flexible.
- Weight is lost, i.e. you don't become extra fat.
- The risk of heart attack is reduced.
- Digestion of food is carried out quickly and easily.

MATTER AND ENERGY

- Matter is anything that occupies space and has weight.

Properties of matter

- Matter occupy space.
- Matter has weight
- Some matter expand on heating e.t.c

States of matter:

- Solids.
- Liquids.
- Gases.

Energy:

- Energy is the ability to do work.

Types of energy

1. Kinetic energy
2. Potential energy

- Kinetic – is possessed by body in motion.
- Potential – Possessed by a body at rest (stationary)

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KINDS OR FORMS OF ENERGY:

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

ELECTRICITY:

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

USE OF ELECTRICITY:

Electricity is used in;

- Lighting.
- Cooking.

- Operating machines.
- Heating.
- Protection / security fences.

Advantages of using electricity

- It is quick or fast to use.
- It is clean and smokeless.
- It is environmental friendly.
- It is easy to operate.

Dangers or dis-advantages of using electricity.

- It can shock and kill.
- It can burn property.

Types or forms of electricity

There are two types of electricity

- Static electricity
- Current electricity

Static electricity.

- This is the type of electricity where electrons do not flow.
- Static electricity is produced by friction between insulators.
- Lightning is an example of static electricity in nature.

Examples of static electricity.

- Lightning in nature.
- Rubbing insulators against each other.

LIGHTNING AND THUNDER

- Lightning is caused when clouds become heavily charged with static electricity by means of friction.
- This is when positively charged clouds rub against negatively charged clouds.
- When positively charged clouds meet negatively charged clouds, a huge spark of light is seen and this is what we called lightening.
- During lightning the surrounding air becomes strongly heated, expands and contracts suddenly which causes a vibration that produces sound called thunder.
- The continuous noise is due to the echoes.
- Lightning is seen before thunder is heard because light travels faster than sound in air.

Advantages of lightning in nature.

- It converts atmospheric nitrogen into nitrates for plants to use.

Dangers caused by lightning.

- It damages buildings.
- It can cause fires.
- It can kill both animals and human beings

Prevention of dangers caused by lightning.

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

Current electricity.
- Is the type of electricity where electrons flow through a conductor.

Types of current electricity.
- They are two types of current electricity:-
  (i) Direct current electricity (DC).
  (ii) Alternating current electricity (AC).

DIRECT CURRENT ELECTRICITY.
- This is the type of current electricity which flows in only one direction, that is from the source to the appliance.

SOURCES OF DIRECT CURRENT.
- Dry cells.
- Simple or wet cells.
- Accumulators.

ALTERNATING CURRENT ELECTRICITY.
- Is the type of current electricity which flows in both directions, that is forward and backward.

SOURCES OF ALTERNATING CURRENT ELECTRICITY.

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

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

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

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

5. Geo-thermal electricity:
- Is the type of electricity produced by steam from hot springs.
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AN ELECTRIC CIRCUIT

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

A simple electric circuit (diagram)

Parts of an electric circuit and their uses:

Ammeter:Measures electric current in a circuit.

Conducting wires: Is a medium for conducting current from the source to the appliance.
Switch: Completes or breaks the circuit at ones will.
Fuse: Is a safety device which breaks the circuit in case of too much current flow.
Dry cell: Stores chemical energy that is changed to electric energy when the circuit is complete (produces electricity).

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

NB:

- In a simple electric circuit, electricity / current flows from the positive terminal to the negative terminal.
- Electrons flow from the negative terminal to the positive terminal.

Illustration to show flow of currect and electrons)

SYMBOLS USED IN AN ELECTRIC CIRCUIT

- Cell.
- Switch.
- Fuse.
- Light bulb
- Ammeter
- Volt meter

ENERGY CHANGES IN A CIRCUIT

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

Types of a circuit

(a) **Parallel circuit**: Is one in which all positive terminals are connected by one conductor and all negative terminals are connected by one another.
(b) **Series circuits:** Is one in which the positive terminal of one cell is connected to the negative terminal of another cell to form a battery.

SHORT CIRCUITS

- Is a path of electricity with low resistance to electric pressure.
- Is a short path taken by electricity
- A path with low resistance to flow of current.

An illustration about a short circuit

CAUSES OF SHORT CIRCUITS

- Use of naked wires when installing a circuit.
- Pouring water in electric appliances.

- Poor wiring.
- Use of faulty electrical appliances

DANGERS OF SHORT CIRCUITS.
- Short circuits may cause fire that may destroy property.
- Short circuits lead to destruction of electrical appliances.

HOW TO PREVENT SHORT CIRCUITS:
- Installation or wiring in a house should only be done by experts.
- Proper insulation of electric wires

Insulators / conductors:

Conductors

Are materials which allow electricity to flow through them.
- Examples (Liquid conductors / Non metallic conductors)
- Water
- Acids
- Alkalis
- Carbon
- Wetwood

Examples of metals that conduct electricity
- Silver
- Copper
- Lead
- Iron
- Zinc
- Tungsten

Note :
1. Distilled water doesn't conduct electricity because it lacks mineral salt.
2. Copper is commonly used because it is cheaper
3. silver is not commonly used because it is expensive.

NB : Application of conductors
- When cooking
- Ironing

Insulators
- Are materials which do not allow electricity to flow through them

Examples
- Rubber
- Glass
- Plastic
- Dry clothes
- Dry wood

NB :
Use

They protect users from electric shock / circuits.
They prevent short circuit

Electric cells:

- Is a device that stores and produces electricity.
- There are two types of electric cells.
  (a) Primary cells.
  (b) Secondary cells

PRIMARY CELLS

- These are cells that cannot be recharged once they are used up.

Examples of primary cells

- Simple cells or wet cell.
- Dry cell.

Parts of a simple cell. (diagram)

1. Copper rod: It acts as the positive terminal (Anode)
2. Zinc plate: It acts as the negative terminal (cathode)
3. Dilute sulphuric acid: Acts as an electrolyte .

- An electrolyte is a liquid that allows electricity to pass through e.g. Lemon juice, salt solution, sulphuric acid, water e.t.c.
- A simple cell is not efficient because of two factors.
  (a) Polarization.
  (b) Local action
- Polarization is when bubbles of hydrogen gas cover the copper rod stopping the flow of electrons.
- Local action is when bubbles of hydrogen gas are seen coming off the zinc plate.

Disadvantages of simple cells.

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

Dry cell (diagram)

Parts of a dry cell and their functions.

Brass cap:

- Is the positive terminal conductor of electricity in a dry cell.

Pitch or top seal:

- Prevents ammonium chloride jelly from drying up.

Ammonium chloride paste:

- Helps in the transfer of electrons.

Electrolyte:

- Reduced the internal resistance of the cell.
- Absorbs hydrogen.

Manganese oxide

- Prevents a build up of hydrogen gas around the carbon rod.

- It is a depolarizing agent.
- Depolarization leads to leaking of cells when exhausted.

Carbon rod:
- Is a non-metallic conductor of electricity found in a dry cell.
- It is made form graphite.

Zinc can:
- It acts as the negative terminal.

SECONDARY CELLS:
- These are cells which can be recharged once exhausted.

Examples of secondary cells
- Lead acid battery
- Telephone batteries.

AN ELECTRIC BULB.
- Is an electric appliance that changes electricity to heat and light energy.

Parts of an electric bulb (diagram)

Brass cap: Enables the bulb to be fixed in the lamp holder.
Sealing tube: Enables air to be removed from the bulb and this prevents the filament from combining with oxygen.
Coiled filament:
- The filament changes electrical energy to heat and then light energy.
- The filament is coiled to increase resistance to electric pressure.
- The filament is made up tungsten which has a high melting point.
- Tungsten is got from a mineral called wolfram.

Glass bulb
- Holds a mixture of two gases. Argon and Nitrogen.
- These gases prevent the evaporating of tungsten.

An electric torch:
- A torch uses dry cells. In most cases, the dry cells are placed in series.

Parts of the torch (diagram)

- **The switch**: Breaks and completes the circuit at a users wish.
- **The Bulb**: Changes electric energy into heat and heat to light energy.
- **The dry cells**: changes the stored chemical energy to electric energy.(produce electricity)
- **The reflector**: The reflector directs lights into a diverging beam

- **The cover and springs**: Completes the circuit and also keeps the dry cells tightly closed.

Reasons as to why a torch may fail to work:

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

CALCULATION OF VOLTAGE:

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

PLUGS AND SOCKETS:

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

THREE PIN PLUG

- Three pin plugs are used in flat irons, cookers, water, heaters, coils, hot plates, electric kettles e.t.c

WIRING A THREE PIN PLUG / CABLE / GRID.

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

Devices connected to production of electricity (Devices that produce electricity)

(i) Generator:

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

How to make a generator produce more electricity:

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

(ii) Dynamos.

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

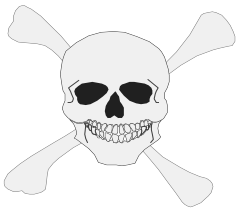
Safety precautions in handling electricity / electrical appliances

- Switch off electrical appliances incase of a problem
- Do not touch live bare electric wire.
- Never throw objects on the main power line
- Have all electric repairs done by experts

- Never operate electrical equipment with wet hands.
- Never push metallic objects into electric sockets.

Illustration showing dangers of electricity

Danger



Hatari

MAGNETISM

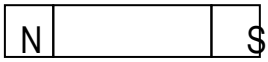
Magnetism is a force in a magnet that has the ability to push or pull magnetic substances.

Magnet

A magnet is a piece of metal with the ability to attract magnetic substances

A magnet is made up of two poles named the North pole and south pole.

Illustration



Magnetic substances are materials which are attracted by a magnet.

Examples

- Iron
- Steel
- Lead
- Cobalt

Non magnetic materials are materials which are not attracted by magnets

- Rubber
- Plastic
- Paper
- Cloth
- Wood

A Properties of magnets

- A freely suspended magnet faces in the North – south direction (illustration)
- Magnets are strongest at poles (illustration)
- Like poles of a magnet repel while unlike poles attract each other (illustration)
- Magnetic lines of force run from North pole to south pole (illustration)
- Magnetismcan pass through a non magnetic material (illustration)
- When a magnet is broken into pieces each piece becomes an independent magnet (illustration)

Types of magnets

- Natural magnets
- Artificial magnets

Natural magnets:

- These are magnets that exist on their own in nature without man making them.
- They are: (a) Lodestone (Magnetite)

(b) The earth

Artificial magnets:

- These are magnets made by man.
- They are named according to their shapes.
- These include;
  (i) Horse shoe magnet
  (ii) Bar magnet
  (iii) Needle magnet
  (iv) Cylindrical magnets
  (v) Electro magnets.

TYPES OF ARTIFICIAL MAGNETS

- These are:
  (i) Temporary magnets. – Are magnets which lose their magnetism easily eg electro magnet
  (ii) Permanent magnets.
- Permanent magnets retain their magnetism for a longtime.
  Examples
  - Horse shoe (diagram)
  - Bar magnet (diagram)
  - Cylindrical magnets (diagram)
  - Needle magnet (diagram)

Advantages and dis-advantages of temporary magnets.

TERMS USED IN MAGNETISM:

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

WAYS OF MAKING MAGNETS.

(i) Stroking method
(ii) Induction method
(iii) Electrical method

NOTE: All methods above should be accompanied with illustration.

WAYS OF DESTROYING MAGNETS (DEMAGNETIZATION)

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

WAYS OF PROTECTING MAGNETS AGAINST DEMAGNETIZATION.

(i) By painting them to prevent them from rusting.
(ii) Keeping them in iron keepers. (an illustration of the iron keepers)
(iii) Storing them while facing in the north-south direction.

(iv) Storing them with unlike poles together.
(v) Protecting them against strong heat.

USE OF MAGNETS (ELECTRICITY & MAGNETISM IN MODERN WORLD).

(i) They are used in compasses to show direction.
(ii) They are used in telegraph and telephone receivers to amplify sound.
(iii) They are used in generators to produce electricity.
(iv) They are used in industries to pick heavy metallic magnetic objects.
(v) They are used in electric bells.
(vi) They are used in hospitals to remove magnetic materials from the eye.

Electrical method

Is a method where current is used to make a magnet. The magnet made is called an electro magnet.

Illustration

Ways of increasing the strength of an electro magnet

- Increasing the voltage
- Increasing the turns in the solenoid

Advantage of using an electro magnet.

- Its strength can be increased

NB; An electro magnet can be demagnetized by passing it through alternating current.

Examples of equipment that use electro magnets

- Electric bell
- Sound amplifiers
- Generators

Use of electromagnets

- It is used in lifting heavy metallic scrap during smelting
- Used in electric bells

Electric bell

An illustration of an electric bell

How it works

Generating electricity using a dynamo

- A dynamo is an electrical generator which produces electrical energy in form of direct current
- It converts mechanical energy to electrical energy.
- It helps in production of electricity when the magnet is made to rotate.
- Dynamos are found in bicycles and vehicles

Illustration

ENERGY RESOURCES IN THE ENVIRONMENT

Definition of energy resources:

- These are resources which provide useful energy to man.

Definition of a resource.

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

Examples of energy resources

- Water, sun, wind, fossils, animals, plants and uranium

Types of energy resources.

(i) Renewable energy resources.
(ii) Non renewable energy resources.

RENEWABLE ENERGY RESOURCES

- These are energy resources which can be replaced naturally once they are used up.
  They include:
  - Sun
  - Wind
  - Running water
  - Plants
  - Animals.

NON RENEWABLE ENERGY RESOURCE

- These are resources which cannot be replaced by nature once they are used up.
  They include:
  - Fossils
  - Uranium
  - Fuels.

ENERGY RESOURCES FROM THE SUN.

- The sun is the main source of energy.
- The sun produces solar energy which is used to produce electricity.
- It also produces heat and light energy.
- The sun provides solar energy
- Sun light energy is used by plants to make food
- Heat from the sun is used to dry harvested crops , clothes
- Sun light energy is used by the skin to make vitamin D.
- Light energy enables us to see
- Heat from the sun helps in rain formation

NB : Solar electric devices change solar energy in to solar electricity.

ENERGY RESOURCES FROM WATER.

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

Tide

Is a regular rise and fall in the level of the sea caused by the pull of the moon and the sun.

Tidal energy is used to produce electricity.

3. Energy resources from fossils
   - Fossils are remains of plants and animals buried underground
   - Fossil fuels are fuels that are burnt to produce energy

     Examples of fossil fuels
   - Crude oil (petroleum)
   - Coal
   - Natural gas

Fossil fuels like crude oil and coal are used in the production of thermal electricity.

Natural gas

- This is mined from areas where petroleum is found. The gas is mainly used for lighting and heating.
- It can be used for cooking and running power stations.

Coal

- This is a hard black material found below the ground.
- It is a solid fossil fuel formed from the remains of living things.
- Coal can be burnt to supply heat in power stations.

Dangers of fossil fuel

- They lead to pollution
- They are non bio degradable
- Bio fuel

Energy resources from plants.

- Energy resources from plants include:-
  - Wood fuel
  - Bio gas
  - Food

Fuel

Liquid	**Solid**	**Gas**
Petrol Diesel Kerosene Aviation fuel	Coal Charcoal Firewood Sawdust Briquettes	Methane Natural gas

Bio fuels

Are made from plant wastes and animal wastes.

Examples of bio fuels

- Bioethanol
- Bio diesel

Bio ethanol – is a liquid that is made from sugarcane through the process of fermentation.

NB: Maize can also be used to make bio ethanol.

- It can be used as a fuel in vehicles

Bio –diesel

Is a fuel made from vegetable oils or animal fat.

WOOD FUEL

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

Conservation of wood

- Conservation of wood means using wood sparingly without wasting it.
- Talking about wood conservation means its management and sustainable use.
- Wood supply can be conserved by:
  1. Afforestation.
  2. Re-afforestation.
  3. Agro forestry e.t.c

Wood fuel conservation:

This can be done through;

- Using energy saving stoves;- these use little fuel materials like charcoal and fire wood.
- They also keep heat for a very long time.
- Using saw dust.
- Coffee husks.

Food from plant energy

- The plants manufacture starch through photosynthesis.
- The starch is eaten by animals to gain energy.
- The feeding relationship in living things is called a food chain.
- An example of a food chain; how living things get energy i.e. plants → Grasshopper → man

BIO GAS

- We get bio gas from leftovers and wastes from the food we eat. Animal wastes can also be used to get bio gas.
- The wastes and plant remains from which we get bio gas include; banana peelings, potato peelings, cow dung, chicken wastes, pig wastes e.t.c

How Bio gas is made

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

Use

- Used for cooking , lighting
- Heat is used to provide warmth.

STRUCTURE OF THE BIO GAS DIGESTER

ENERGY RESOURCES FROM ANIMALS.

- Animals get energy by feeding on plants.
- Energy from animals can become available to people in the following ways.
- People eat animals as food to release energy stored in the muscles.
- Animals are used to perform tasks like transport and pulling of loads.
- Animal wastes can be used to produce bio gas.

ENERGY RESOURCES FROM WIND.

- Air (oxygen) is used in respiration to support life and burning.
- Carbondioxide is used to put off fire.

- It is also a raw material for photosynthesis.
- The energy of air is used to drive out vapor from clothes to make them dry.
- Wind energy enables boats and dhows to sail in water
- Wind is used to run wind mills.
- Wind is used to power water pumps

Structure of a wind mill

Importance of energy resources

- Radiant heat from the sun keeps the earth warm
- Use of renewable energy resources like windconserves the environment.
- People earn income by setting up bio gas technologies
- Plants are a source of food to people.
- They increase production rate when machines are used.
- Electricity produces heat and light which is used for domestic use.
- Residues in bio gas digesters are used as fertilizers.
- Wind mills can be used to pump water.
-

TERM II
MACHINES

What is a machine?

- A device or tool used to simplify man's work.

How do machines simplify work?

- By reducing the forced used to do a piece of work.
- Changing the direction of forces.
- Increasing the speed of doing work.

Types of machines.

What are the types of machines?

The two types of machines are

a) Complex machines – are those made of many component parts and need training to use them. Eg tractor, sewing machine.
b) Simple machines – are those with few parts and do not need special training to use them. Eg knife , panga , hoe

Common terms used in machines.

(i) Work:- is a product of force and distance moved by the load.
Work can also be defined as the result of any action requiring energy.
Work done = force x distance.
Work is measured in units called joules

(ii) Force: is a push or pull exerted on an object. Force measured in Newtons (N).
NB: 1kg ≈ = 10N.

(iii) Power: Is the rate at which energy is changed from one form to another i.e. rate of doing work.
Power is measured in units called watts (W) or Kilowatts (KW).
NB: 1KW = 1000w.

(iv) Mass: is the quantity of matter contained in a body. Mass is measured in grams.

TYPES OF SIMPLE MACHINES.

What are the main groups of simple machines?

The six main groups of simple machines are;

(i) Levers
(ii) Inclined plane (The slope)
(iii) Wedges
(iv) Screws
(v) Pulleys
(vi) Wheels and axle

a) LEVERS

What is a lever?

- Rigid Bar (rod) turning freely at a fixed point called pivot (fulcrum).
- Name the main parts of a lever. The main parts of a lever are;

(i) Load (L) – the force (weight) that is to be overcome.
- some times load is called resistance.
(ii) Effort (E) – the force we exert (apply) when using a lever.
(iii) Fulcrum (F) is a fixed turning point.
(iv) Effort arm – the distance from effort to the fulcrum.

(v) Load arm – is the distance from load to the fulcrum.

CLASSIFICATION OF LEVERS

- Levers are grouped according to position and arrangement of load, fulcrum and effort.
- They are classified into three groups, namely;
  - First class lever.
  - Second class lever.
  - Third class lever
- The classes are determined basing on the force that lies between the other two.

FIRST CLASS LEVERS (**EFL / LFE**)

- This is where the fulcrum lies between the load effort.
- Examples: First class levers are;
  (i) Crow bar. (ii) scissors (iii) Pliers (iv) See saw
  (v) Lid opener (vi) Beam balance
- How do first class levers simplify work?
  - By reducing the load arm and increasing effort arm so that less force is used.
  - Load and effort move in different directions.

NB : A pair of scissors and pliers are called double lever because they have two stiffrods with one turning point

SECOND CLASS LEVERS (**PLE/ ELP)**

- This is where the load is placed between the pivot (fulcrum) and effort.
- What are the examples of 2nd class levers?
  (i) Wheelbarrow (ii) Human foot (iii) Bottle opener (iv) Oar of a boat
  (v) Nut cracker.

How does a second class lever simplify work?

- Makes load and effort move in the same direction.
- Reduces the load arm and increases effort arm so that less effort is used.

THIRD CLASS LEVER

- This is the lever where the effort lies between the load and fulcrum.

Give the examples of third class levers.

(i) Pair of tongs (i) Pair of tweezers (iii) Human arm
(iv) A spade when in use (v) fishing rod (vi) A hoe in use

What is the advantage of using a third class lever?

- The effort moves through a shorter distance.

MOMENTS

What is a moment?

- This is the turning effect of a force about a point.
- A force acting on a point left of the pivot tends to turn it anti clockwise while a force acting on the right tends to turn the lever clockwise.
- For the lever to balance or be in equilibrium, the left side moments must be equal to the right side moments.

The Law of levers

- The sum of clockwise moments equals the sum of anticlockwise moments. OR the product of clockwise moments is equal to the products of anticlockwise moments i.e. Load X Load arm = Effort x Effort arm.

WORKED EXAMPLES ON LEVERS.

- A man weighs 80kg and sits 4m away from the pivot of a sea saw. Where will his wife who weighs 60Kgs sit in order for them to balance?

Solution:

Load = 80Kg
Load arm = 8m

Effort = 60Kg

Effort arm = Xm

Load x Load arm = Effort x Effort arm
80 x 4m = 60 x X

320 = 60x

$\frac{320}{60} = \frac{60x}{60}$

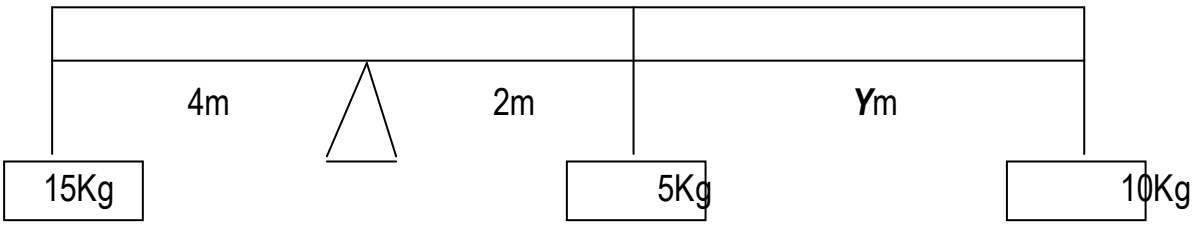
$5\frac{1}{3} = X$

The wife should be $5\frac{1}{3}$m away from the fulcrum.

EXERCISE

Example 2.

Calculate the value of Y needed to balance the scale.



(L x LA) = (Ex EA) + (E x EA)
(15 x A) = (5 x 2) + (10 x (2 + y))

60 = 10 + 20 + 10Y

60 = 30 + 10y

60 - 30 = 30 - 30 + 10y

30 = 10y

$\frac{30}{10} = \frac{10y}{10}$

$3 = y$

$\therefore \quad Y = 3m$

Exercise

TERMS USED WITH MACHINES

Mechanical advantage (MA)

- This is the number of times a machine simplifies a given work.
- MA is the ratio of load to effort i.e.

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

  NB: If the MA of machine is greater than 1 less effort is used. Whereas when the MA is less than one a lot of effort is needed.

  Worked example:

  An effort of 40N is applied to a lever to overcome a load of 200N.

  Calculate the MA of the machine.

  Solution: $MA = \frac{\text{Load}}{\text{Effort}}$

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

  $= 5$

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

2. VELOCITY RATIO: (VR)

- This is the ratio of the distance effort moves to distance moved by the load.

  $VR = \frac{DME}{DML}$ i.e. $\frac{\text{Distance Effort moves}}{\text{Distance load moves.}}$

  The velocity ratio of a lever is the $\frac{\text{ratio of length of effort arm}}{\text{Length of Load arm}}$

3. EFFICIENCY OF A MACHINE

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

   Efficiency of a machine is always expressed in % and is normally less than 100 due to friction.

- The output is the work done on the load by the machine.
- The input is the work done by the effort on the machine.

How can the efficiency of a machine be improved?

- Replacing and repairing worn out parts.

- Regular oiling (lubrication) to minimize friction.

Efficiency = output x 100.
Input

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

Efficiency = Load x Load distance x 100.
Effort x Effort distance.

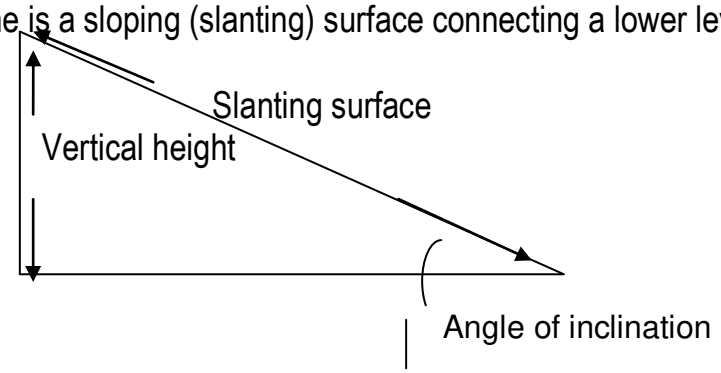
= 120N x 3m
30N x 15m

= 4 x 100.
5

= 80%

INCLINED PLANES /SLOPES.

- An inclined plane is a sloping (slanting) surface connecting a lower level to a higher level.



- The vertical height of the inclined plane is the distance moved by load while the slanting surface is the distance moved by the effort.

How do inclined planes simplify work?

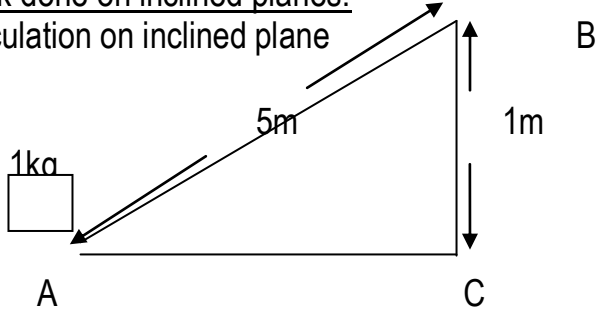
By increasing the length of the plane and reducing the angle of inclination.

Give the examples of inclined planes. (illustrate them)

- Stair case (steps)
- Winding road (uphill).
- Ramp
- A ladder leaning against the wall.

Work done on inclined planes.

Calculation on inclined plane



Calculate the work done if the load is moved from A to B.

Work done = force x distance
= 10N x 1m

= 10Joules

Velocity ratio = $\frac{DEM}{DLM}$

= $\frac{5m}{1m}$

= $\frac{5}{}$

USES OF INCLINED PLANE.

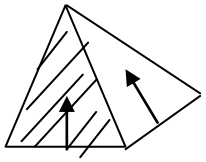
- Loading heavy goods onto Lorries.
- Climbing tall buildings.
- Helps vehicles ascend (climb) steep hills.
- For builders to carry materials to higher levels.

Exercise.

WEDGES

What is a wedge?

- An inclined plane with two sloping surfaces i.e. double inclined plane.



Give the examples of wedges, illustrate them. (diagrammatically)

- An axe
- A panga
- Bullet
- Knife
- Scissors
- Nails
- Chisel

Uses of wedges:

- For splitting logs of wood
- For cutting objects.
- For sewing
- For digging

SCREWS.

What is a screw?

- An inclined plane wound round a rod.
  Illustration.

Examples of machines that use screws: (illustration)

- Bolts and nuts
- Bottles lids
- Motor car jack
- Spiral stair cases.

Uses of screws

- Car screw jack is used to lift vehicles.
- To hold two or more things together.
- To drill holes in wood or metal.
- To tighten bottle tops.

WHEELS ANDAXLE

What are wheels and axle?

These are machines which are composed of two rotating wheels fixed together.

The wheel is fixed on a small wheel called axle or shaft onto which it rotates.

Examples of wheel and axle machines.

- Car steering wheel.
- Handle of bicycles.
- Pedal and chains of bicycles
- Door knobs
- Windlass.
- Sewing machine
- Windmill

Application of wheels and axle in daily life.

- Used in windlasses to draw water.
- Sprocket wheels and chains used driving bicycles.
- Car steering wheels.
- Door knobs used to open doors.

GEARS AND BELT DRIVES.

- What are gears?
- Gears are special forms of wheels with teeth around their edges.
- They are sometimes called cog-wheels or toothed wheels.
- If teethed-wheels are connected with chains / belts they move in the same direction.
- When cog-wheels are joined together, the teeth interlock.
- As one wheel rotates, it turns the other but they move in opposite directions.

Examples of machines that use gear wheels

- Watches
- Gear boxes
- Motor cycles
- Bicycles
- Electric toys
- Bulldozers.

What are the advantages of using gear wheels?

- They help to multiply force.
- They change the direction of movement (rotation)
- They multiply the speed of rotation.
- They can slow the speed of rotation.

DRIVE BELTS:

- Drive belts transmit motion from one wheel to another.
- Both wheels move in the same direction.
- If a driven wheel has 48 teeth and the driving wheel has 12 teeth, the driving wheel will make 4 revolutions in each single revolution of the driven wheel.

EXAMPLES OF ACHINESS THAT USE DRIVE BELTS.

- Bicycles.
- Sewing machines.
- Grain mills.
- Cooling fan of car radiators.
- Conveyor belts – that move things from one place to another as in escalators, bottling line in factories, moving luggage in air posts e.t.c.

PULLEYS:

What is a pulley?

- A freely rotating wheel with a grooved rim.
- A rope / chain passes over the grooved rim.
- The groove prevents the rope from sliding.
- The frame to which the pulley is fixed in called a block.

There are three types of pulleys.

What are the types of pulleys?

- Single fixed pulley
- Single movable pulley.
- Block and tackle / multiple/ fixed movable pulleys

a) SINGLE FIXED PULLEY.

- In a single fixed pulley, the block in attached to a frame and only the wheel moves.
- A single fixed pulley acts as a first class lever, with the axle at the centre as a fulcrum.

- A single fixed pulley changes the direction of force.
- By pulling down wards it is easier to raise an object.
- It has a mechanical advantage of one.

Question: Find the effort applied to pull a load of 50kgf using a single fixed pulley.

$MA = \frac{L}{E}$ $\quad MA = 1$ $\quad L = 50kg$

$1 = \frac{50kgf}{E}$ $\quad E = ?$

$E \times 1 = \frac{50 \times E}{E}$

$E = 50Kgf$

The force needed to lift the load is the same as the load.

b) SINGLE MOVABLE PULLEY.

- In a movable pulley, the whole pulley block moves along the rope.
- It does not change the direction of force, both load ad effort move in the same direction.
- It has a mechanical advantage of 2.
- The effort needed is half the load.

Qn: What force will be needed to raise a load of 50kgf using a single movable pulley.

$MA = 2$ $\quad L = 50Kgf$ $\quad E = ?$

$MA = \frac{L}{E}$ $\quad 2 = \frac{50}{E}$

$2 \times E = \frac{50}{E} \times E$ $\quad \frac{2E}{2} = \frac{50}{2}$ $\quad \frac{1}{1} \quad \frac{1}{1}$ $\quad E = 25Kgf$

- Single movable pulley acts as a second class lever with the fulcrum and effort at either sides of the wheel.

Double pulley system (combined fixed and movable pulley)

This is the type of pulley system composed of movable and illustration

BLOCK AND TACKLE

- This is the type of pulley system which consists of several movable pulleys and several fixed pulleys

The mechanical advantage of a block and tackle is determined by the number of wheels in the block.

Uses of pulleys in daily life.

- They are used by break down vehicles to pull stranded vehicles.

- They are used in lifts / elevators.
- They are used on cranes to lift and load heavy loads.
- They are used in scaffolds by painters to paint tall buildings.
- They are use on flag poles to raise flags at school.
- They are used in curtain boxes to draw curtains.

FRICTION

What is friction?

- A force that tends to oppose motion between objects.

Name the types of friction:

- Static friction; is the friction between two surfaces which are trying to move but have not yet started moving.
- Dynamic friction; is the friction between two surfaces when one is moving over the other.
- Viscosity friction is the friction in liquids and gases.

What are the advantages of friction as a useful force?

Friction helps us in:-

- Walking without sliding.
- Movement of vehicles.
- Lighting a match stick.
- Braking of moving vehicles.
- Climbing trees.
- Writing using a pen.
- Grinding corn, grain, flour etc.
- Washing clothes.

Name the demerits (disadvantages of friction as a nuisance force.

- Friction reduced the speed of movement.
- Reduces the efficiency of machines.
- Causes unnecessary heat in machines.
- Causes wear and tear of things.
- Delays work.
- Makes one use a lot of effort.

Ways of increasing friction.

- By putting treads on tyres or shoes.
- Putting grips on handles of objects.
- Putting spikes or studs on playing or sports shoes.
- Making surfaces rough.
- Putting tarmac on road surfaces.

Ways of reducing friction.

- Making rough surfaces smooth.
- Oiling or greasing (lubrication) of moving parts.

- Using ball bearing.
- Using rollers.
- Streamlining the bodies of moving vessels.

BODY SYSTEMS

Definition of a system.
A group of organs specialized to perform a similar function.

Examples;
- Digestive.
- Reproductive.
- Muscular and skeletal.
- Nervous.
- Circulatory.
- Respiratory.
- Endocrine.
- Lymphatic.
- Excretory system.

EXCRETORY SYSTEM.
- Excretion is the removal of waste products from the body.
- Excretory system is a body system that deals with the removal of 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.

The Epidermis:
- 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.

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

Malpighian
- 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.

On cold days.

- 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.

Diseases of the skin.

The skin is commonly affected by diseases like;

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

Disorders of the skin

- Dandruff
- Pimples
- Bruises
- Cuts
- Corns
- Acne
- Herpes zoster

Care of the skin:

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

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 KIDNEYS

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

Illustration of the internal structure of the kidney.

Parts of the kidney and their functions.

1. Renal artery:
   Is a branch of aorta that supply oxygenated blood to the kidney.

2. Renal vein:
   Takes deoxygenated blood from the kidney to the vena cava.
3. Cortex: Blood is filtered to remove Urea, Uric acid, excess salts and water.
4. Medulla – Is a region where selective re-absorption takes place by the nephrones.
5. Pelvis- Urine is collected here from the numerous nephrones.
6. Urethra: is a passage of urine to the Urinary bladder.
   NB: Urine is formed through ultra-filtration and selective re-absorption in the kidney
7. The Urinary bladder: Is an elastic and muscular sack that stores urine briefly.

Diseases of the kidney.

1. Cancer of the kidney.
2. Kidney failure.
3. Kidney stones.
4. Bilharzias

Waste products excreted by the kidney.

- Uric acids.
- Urea.
- Excess salts.
- Excess water.

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 slats.
4. It helps in detoxication process.
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 no body 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 no body 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.
- 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)	-
• Pneumonia	
• Bronchitis	

Care for the respiratory system.
- Eat a balanced diet.
- Perform regular exercise.
- Eat meals containing low animals fats.
- Avoid smoking.

Advantage of regular body exercises.
- The heart muscles grow stronger and larger.
- The heat delivers more blood to the body muscles.
- They reduce the level of fats in the body.
- The risk of high blood pressure and heart diseases is reduced.
- Ligaments and tendons become stronger and reduce chances of injury.
- Joints become flexible.
- Weight is lost.

FORMS OF ENERGY

Energy – Energy is anything that enables man to do work.

Examples of forms of energy.
1. Light energy.
2. Sound energy.
3. Electricity.
4. Heat energy.
5. Chemical energy.
6. Mechanical energy.
7. Solar energy.
8. Magnetism.

LIGHT ENERGY.

Light is a form of energy which enables our eyes to see objects.
Light is a form of energy which stimulates sense of seeing.

How we see objects.

- We see objects when they reflect light in our eye.
- Light travels from the objects to our eyes.
- Some objects give out their own light while others reflect light falling on them from other sources.

Sources of light.

- A source of light is an object which gives out light.

There are two types of sources of light.

(i) Natural sources of light.
(ii) Artificial sources of light.

Examples of natural sources of light.

- The sun.
- The stars.
- Erupting volcanoes.
- Glow worms.
- Fire flies.

Examples of artificial sources of light.

- Electric bulbs.
- Torches.
- Lamps.
- Candles.
- Fires
- Charcoal stoves.

These sources of light can either be luminous or non-luminous sourced of light.

Luminous sources of light

These are sources of light which emit (send) or produce their own light.
They are also called direct sources of light.

Examples of luminous objects.

- The sun.
- The stars.
- Red hot charcoal.
- Fire flies.
- Hands and fingers of some clocks and watches.
- Some kinds of rocks.

- Working filament of the bulb.
- Bulbs.
- Burning charcoal.
- Erupting volcanoes.

NB:

Among luminous sources of light, some emit light when they are red hot. These sources are called incandescent sources of light.

Examples of incandescent sources of light.

- The sun.
- The stars.
- Hot filament of bulbs.
- Hot charcoal e.t.c

Non-luminous objects.

These are sources of light which do not emit their own light but just reflect light from another source. They are also referred to as indirect sources of light or reflectors.

Examples of non-luminous objects.

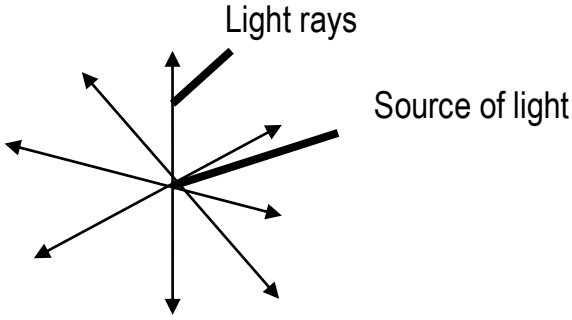
- The moon.
- The planets.
- Plane mirrors.

Importance of light.

- Light enables us to see objects using our eyes.
- Plants use sunlight to carry out photosynthesis.
- Heat and light from the sun help the eggs of reptiles, amphibians and fish to hatch.
- Our bodies use sunlight to make vitamin D.

Transmission of light (how light travel)

- Light travels in straight lines to all directions from the source.



Experiments to show that light travels in straight lines.

Light travels in a straight line in any transparent medium e.g. glass, air, water and vacuum.

We cannot see around corners behind corners because light travels in straight lines.

- The experiment above shows that light travels in straight lines.

- The three card boards have holes in their centre at exactly the same position.
- If arranged in a straight line, light travels through the holes from the candle to eye.
- When you shift one of the candles slightly, you will not see the light.

Experiment two.

- In (i) when the tube is straight light can be seen.
- In (ii) when the tube is bent, light can't be seen.
- This is why we can't see around corners.

NB:
We hear sound around corners because sound travels in waves but we can't see around corners because light travels in straight lines.

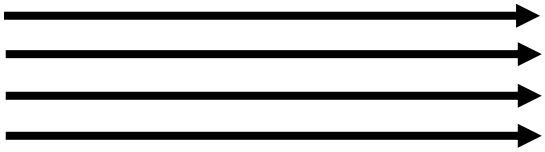
Rays and beams of light.
A ray of light is a line along which light travels.
A ray of light is represented by an arrow.



A ray of light.
A beam of light
A beam is a group of light rays.
There are three types of beams of light.

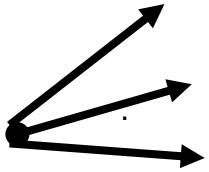
(i) Parallel beams.
(ii) Diverging beams.
(iii) Converging beams.

(a) **A parallel beam**
This is a type of beam where the light rays travelling from the source can not meet.



A parallel beam.

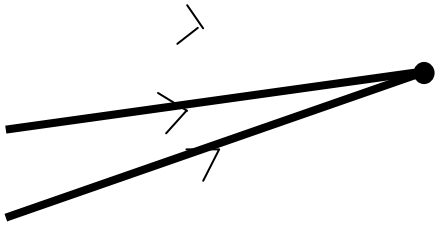
(b) **A diverging beam**
This is a beam where the light rays from the source spread out (diverge) e.g. car head lamp, bicycle head lamp and torches.



Source of light

(c) Converging beam.
This is a beam of light where the light rays from the source come towards a point (converge).





Speed of light

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

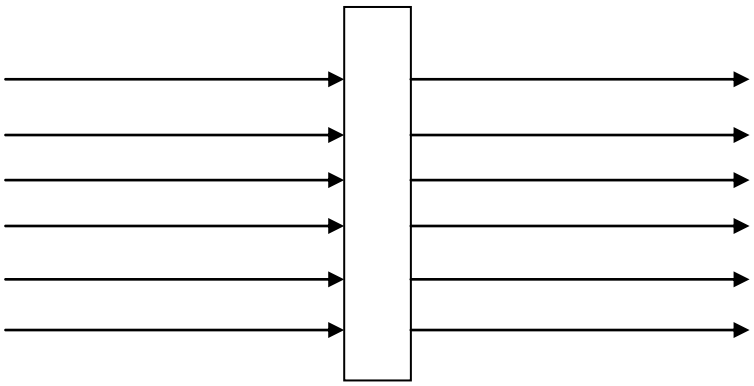
- We hear thunder after we have seen lightning.
- At a race track, we see the flash of starter's gun before we hear the bang.
- The sound of an axe is heard after we have seen the axe strike when cutting.

Effects of light on different materials.
When light meets an object, one of the following will happen.
- Light can be absorbed, diffused or scattered.
- Light may be allowed through transmission.

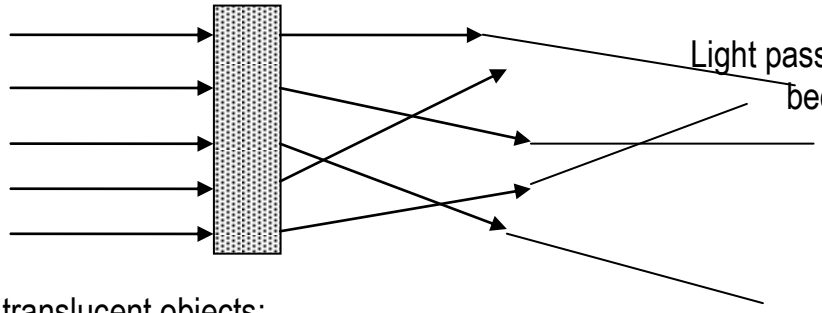
Materials which affect light are grouped into:
(i) Transparent objects.
(ii) Translucent objects
(iii) Opaque objects.

Transparent objects
These are objects which allow most of the light to pass through and we can see through them.

Examples of transparent objects.
- Glass
- Water
- Air etc.



Translucent objects
These are objects which allow some light to pass through but we cannot see through clearly.
We can not see through them because they diffuse or scatter light rays in all directions.



Examples of translucent objects:

- Frosted glass.
- Waxed paper
- Cloth
- Tissue paper
- Light bulbs.

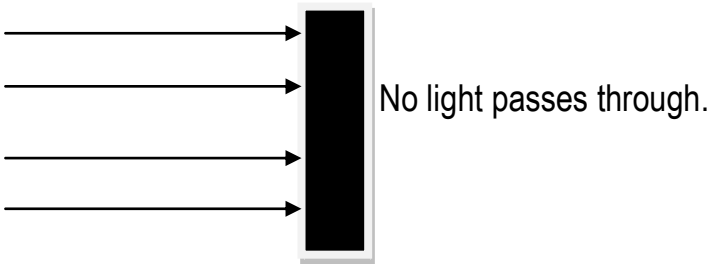
Opaque objects.

These are objects which don't allow any light to pass through them.

- We cannot see through them because light travels in straight lines.
- Opaque objects instead form shadows.

Examples of opaque objects.

- Wood
- Stones
- Metals.
- Walls.
- Bricks etc.



Shadows

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

- When the source of light is a small point, a sharp complete shadow is formed called a total shadow or umbra.
- When the source of light is big, a total shadow called umbra is surrounded by half or partial shadow called penumbra.
- If the source of light is put further away from the opaque object, the shadow will be smaller.
- If the source of light is nearer the opaque object the shadow is bigger than the object.

Eclipse

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

Note:
- The sun is stationary (in one place)
- The earth revolves round the sun on its fixed path called orbit.
- The moon revolves round the earth but its orbit is not fixed.

Eclipse of the sun-solar Eclipse.
- It occurs when the moon comes in between the sun and the earth.
- When this happens the sun casts the shadow of the moon onto the earth.

Illustration.

P – Penumbra (partial eclipse)

U – (total eclipse)

Annular eclipse of the sun.
- It occurs in the same way as the solar eclipse. But when the moon is far away from the earth and the umbra fails to reach the earth.
- When this happens the earth only receives the penumbra and the sun will be encircled by a ring.

Eclipse of the moon – Lunar eclipse.
The eclipse of the moon occurs when the earth comes in between the sun and the moon.
This happens only when there is a full moon.

The moon is in total eclipse so it doesn't reflect any light.

Reflection of light.
Reflection is the bouncing back of light rays when they strike a shining opaque object.
Types of reflection.
There are two types of reflection.
Regular reflection.
- Is the type of reflection where the beam of light is sent back in a definite direction.
- It is produced when light falls on a smooth shinny surface e.g. mirrors.
- We are able to view ourselves in plane mirrors because they are highly polished and give a regular reflection.

Irregular reflection.

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

Reflection principles and its laws

- AO - Incident ray.
- OB - Reflected ray.
- ON - Normal
- i - angle of incidence.
- r - angle of reflection
- O - Point of incidence

Laws of reflection:

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

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

Qn:

The incident ray makes an angle of 60^0 to the mirror. What is the angle of reflection?

The normal makes 90^0 to the mirror

$60^0 + i = 90^0$.

$60 - 60 + i = 90^0 - 60^0$

$i = 30^0$.

$\angle$ of incidence = $\angle$ of reflection.

$\therefore \angle$of reflection $= 30^0$.

Reflection of light by different materials.

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

Image and Objects:

An image is a light picture.

Characteristics of images formed by plane mirrors.

- The distance of the object from the mirror is the same as the distance of the image behind the mirror.
- The images are laterally inverted.
- The image is the same size as the object.
- The image is always upright / erect.
- The image is virtual i.e. cannot be cast on the screen.

Use of plane mirrors.

- They are used to see certain parts of the body that we cannot see directly. E.g. behind the head.
- They are used in periscopes.
  A periscope is an instrument which consists of a tube with two mirrors fixed inside facing each other and inclined at 45^0.
  The mirrors are parallel to each other.
- A periscope is used to see around corners by soldiers in trenches and in submarines.

Illustration

Curved mirrors.

- These are mirrors which are sphere like in shape.
- They obey the laws of reflection.
- The different types of curved mirrors are made by silvering on one side.

Types of curved mirrors.

- There are two types of curved mirrors.
  (i) Concave mirrors.
  (ii) Convex mirrors.

(a) Concave mirrors (converging mirrors)

- It is made by silvering the outside of the sphere.

Characteristics of images formed by concave mirrors

- The image is larger than the object (magnified).
- They are erect (upright)
- They are laterally inverted.
- They are virtual (i.e. Formed behind the mirror so they cannot be cast on the screen)

A beam of light on the concave mirror.

Uses of concave mirrors.

- They are used by barbers as shaving mirrors.
- They are used by dentists.
- They are used in search lights, electric torches, head lamps as polished and silvered concave metals
- They are also used in telescopes.
  Telescopes have large concave mirrors, which assist in focusing beams of light from heavenly bodies.
  Telescopes help in studying about the stars and planets.

Convex mirrors (Diverging mirrors)

They are made by silvering the inside of the sphere.

Characteristic of images formed by convex mirrors.

- The image is smaller than the object – diminished.
- The image is upright – erect.
- The image is laterally inverted.
- The image is virtual – behind the mirror.

A beam of light on a convex mirror.

Use of convex mirrors.

- They are used as a driving mirror on vehicles.
  (a) They form upright images.
  (b) They give a wide view of the distant object.
  (c) They are used in super markets to see what customer do.
  (d) Security mirrors in bus and cars.

Refraction of light.

- Refraction is the bending of light as it passes from one transparent medium to another.
  e.g - From air to gas
  - From air to water.
  - From glass to water.

  Refraction is caused by change in speed of light as it passes from one transparent medium into another which have different densities.
  - BO is the ray of incidence it is in air.
  - O is the boundary and point of refraction.
  - NR is the normal.
  - i is the angle of incidence.
  - r is the angle of refraction.
  - OC is the refracted ray. It is in water

Note

When a ray of light passes from one medium to a more optically dense medium, the ray bends towards the normal and vice versa is true.

The law of refraction

- The incident ray and the refracted ray are on opposite side of the normal.
- The incident ray, the refracted ray and the normal all live in the same plane.

Refraction of light through a glass block / prism.

- **IR** is the incident ray in air.
- **RR** is the refracted ray. It is within the glass.
- **ERR** is the emergent refracted ray, it is in air.
- **i** is the angle of incidence.
- **r** is the angle of refraction.

Effects of refraction.

(i) A swimming pool appears shallower than its real depth because of refraction. This is seen by placing a stone in a glass, and then view it from the top.

(ii) A ruler or stick partly dipped at an angle into some water in a glass appears bent or broken due to refraction.

(iii) Refracted stick fixed vertically and partly dipped in water appears to be shorter than it's real length.

(iv) A mirage is an optical illusion caused by the bending of light rays due to layers of air having different densities and temperature e.g. sheet of water seen on a high way during a hot day. It appears like a pool of water seen ahead on the road on a hot day.

Effects of mirages.

- Mirages may lead to accidents on high ways.
- Mirages cause false images along high ways in deserts.

(v) Words under a glass block appear to be raised on a different line from those away from the glass because of refraction.

LENSES

A lens is a transparent material with curved side capable of refracting light.

The curved surfaces of a lens help to bend or refract light passing through the lens.

Types of lenses.

There are two types of lenses.

(i) Convex lens.

(ii) Concave lens.

Convex lens (converging lens)

Is a lens which is thicker in the middle and thinner at the edges.

Illustration.

Convex lens (Converging lens)

Convex meniscus

- When a parallel beam strikes a convex lens comes together at a point in front of the lens.

Concave lens (diverging lens)

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

Concave lens concave

Meniscus

NB: The converging meniscus and diverging meniscus are used in spectacles.
When a parallel beam of light reaches the concave lens it spreads outwards after passing through the lens.

Uses of lenses.

- Lenses are used in photographic cameras.
- Lenses are used in microscopes used by doctors to see germs.
- Used in spectacles worn by people with eye defects.
- Used as magnifying glasses.
- Used in projectors which focus information on film slides into big pictures on the screen.
- Used in binoculars to see distant things in magnification.
  In general lenses are used in optical instrument.

Optical instruments.

Optical instruments are instruments which use either lenses, prisms, plane mirrors or curved mirrors.

Examples of optical instruments.

- Cameras.
- Microscopes.
- Spectacles.
- Magnifying glasses.
- Telescopes.
- Binoculars.
- Projectors.

Dispersion of light.

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

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

Colours of the spectrum.

Primary colours and secondary colours.

A primary colour is one that cannot be obtained by mixing other colours e.g. red, blue and green.
A secondary colour is colour made by mixing two primary colours e.g. yellow, magenta, peacock blue pr cyan.

How to make secondary colours.

- Red + green = Yellow.
- Red + Magenta = white.
- Blue + yellow = Cyan or peacock blue.

Illustration:

White is a universal colour.

A pin hole camera

A pinhole camera works on the principle that light travels in straight lines.
That is why an inverted image is formed on the screen.

Characteristics of images formed by a pinhole camera.

- The image is diminished – smaller than the object.
- The image is inverted – upside down.
- The image is real i.e. it can be cast on the screen.

The lens camera:

- A camera is an optical instrument because it uses a convex lens.
- It consists of a light proof box with five functional parts. i.e. the lens, diaphragm, shutter, film and focusing ring.

The structure of a lens camera.

Functions of each part.

- **The film** – Is a light sensitive piece of paper on which an inverted image is formed.
- **The diaphragm** – It regulates the amount of light energy that has been allowed into the lens. It has the aperture (a circular hole) which can be changed according to the amount of light required.
- **The lens** – the lens focuses the image on the film. The film works as a screen. The camera uses a convex lens.
- **The shutter** – The shutter uncovers the aperture for a fraction of a second thus admitting light into the camera. This exposes the film.
- **The focusing ring**. This adjusts the distance of the lens from the film i.e. moving the lens forward or backward.

How the camera works

- Light is allowed into the camera by the lens, diaphragm and shutter, it falls on the film and the film is exposed.
- The exposed film is removed from the camera in a dark place and put a certain chemical to develop it. The result of developing is a negative.
- It is called a negative because the bright parts of the object photographed appear dark and the dark parts appear bright.
- The negative is printed to give a positive (photograph) which has the same shades as the object.

Characteristics of images formed by a camera.

- The images are real.
- The images are inverted.
- The images are diminished.
- **Retina.**
  - This layer contains light sensitive cells called rods and cones.
  - Human being see clearly during day because they have more cones than rods.
  - Cones help in day light and colour light.
  - Rods help in dim and night vision.
  - It is on the retina when the images are formed.
- **Fovea (yellow spot)**
  - It has the highest concentration of cones.
  - It gives accurate interpretation of the image and is where the sharpest image is formed.
- **Blind spot.**
  - This spot doesn't have any light sensitive cell.
  - It is where the optic nerve leaves the eye and also where blood vessels and nerves join the optic nerves.
- **Lens**
  - Refracts light rays and focus the image on the retina.
- **Suspensory ligament**
  - Holds the lens in position by attaching it to the ciliary body.
- **Aqueous and vitrous humour.**
  - These are salt solutions, sugar solution and proteins in water.
  - They refract light to produce an image on the retina.
  - They help to maintain the shape of the eye.
- **The optic nerve**
  - Transports nerve signals to the brain for interpretation.
- **Eyelashes.**
  - They help to trap large air borne particles.
- **Tear glands.**
  - They lie under the eyelids.
  - They secrete a solution of sodium hydrogen carbonate and sodium chloride (Tear).
  - They have an enzyme which kills bacteria.

NB:

The eye has the ability to focus near and far objects on the retina by changing the shape of the lens. This focusing of near and far objects by the lens is called accommodation.

Characteristics of images formed by the eye.

- The images are real.
- The images are inverted.
- The images are diminished.

The Human Eye

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

The structure of the eye.

Front view of the eye

Functions of parts of the eye.

- The eyelids.
  - They cover and protect the eye.
  - Blinking can be voluntary or by reflex action.
  - Blinking distributes a fluid (tears) over the surface of the eye to prevent it from drying.
  - Tears clean up the eye and kills some germs which enter the eye.
- Conjunctiva.
  - Is a thin layer which lies inside the eyelid.
  - It is kept moist and clean by a slow continuous stream of liquid from the tear glands.
- Sclerotic.
  - It is a tough non-elastic coat around the eyeball.
  - It supports and maintains the shape of the eyeball.
- Cornea.
  - It is a transparent part of the sclerotic. It helps to refract and converge light.

Choroid

- It has a dense net work of blood capillaries supplying food and oxygen to the eye.
- It is pigmented black to reduce internal reflection of light within the eye.
- **Iris**
  - It regulates the size of the pupil and controls the amount of light entering the eye.
  - It also determines the colour of the eye.

- **Regulation of the size of the pupil.**

  Dim light **Bright light**

- **Pupil.**

Admits light into the eye.

Similarities between the eye and camera.

The human eye	The photographic camera
- Image falls on the light sensitive retina - Has a convex lens. - It is covered by a black layer choroid. - Iris controls the amount of light by regulating the size of the pupil. - The image is real, inverted and diminished. - The eyelids keep out light. - The ciliary muscles determines accommodation of the lens.	- Image falls on alight sensitive film. - Has a convex lens. - It is covered by a light proof box. - The diaphragm controls the amount of light by regulating the size of the aperture. - The image is real, inverted and diminished. - The shutter keeps out light. - Focusing ring determines the distance of the lens from the film.

Difference between a human eye and camera.

The human eye	The photographic camera
- Distance between the lens and retina is fixed. - Shape of lens easily to focus at different distances. - Lens is soft and elastic. - Image is focused by making lens thicker. - Aqueous and vitreous humour refracts light. - The iris adjust itself.	- The distance between the lens and film changes. - The shape of the lens does not change. - The lens is hard. - The image is focused by moving lens. - Only the lens refract light. - The diaphragm can be adjusted.

Eye defects:

- It is the inability for an eye to focus certain distance normally.

- **Cause**
  - The eye ball being too long or eye lens being too thick.
  - This causes the image from distant objects be brought to focus infront of the retina.
  - Short sightedness can be corrected by wearing spectacles with diverging lens (concave lenes).
- Eye strain.
- Abnormal shape of the eye ball.
- Abnormal shape of the lens.
- Colour blindness.

Examples of eye defects.

- There are four eye defects in common in humans namely.
  a) Short sightedness (myopia)

b) Long sightedness (hypermetropia)
c) Old age sight (presbyopia)
d) Astigmatism.

- **Short sightedness**
  Short sightedness is a condition when a person can only see near objects clearly but cannot see distant objects.

  Normal eye sight.

  Both near and distant objects can be focused on the yellow spot on the retina.

Short sightedness (myopia)

This occurs when the eye ball is longer than the normal or when the lens is too thick and the objects close to the eye can be focused properly but the point of focus for distant objects is infront of the retina.

Correction of short sightedness.

Short sightedness is corrected by wearing spectacles with diverging lenses (concave lenses).

Long sightedness:
Long sight is a condition when certain people can see distant objects clearly but can not see near by objects.
Small or short eye ball or too thin eye lens.
The above causes the image from close objects be brought to focus behind the retina.

Illustration

This occurs when the eyeball is shorter than the normal or when the eyeball is small or the lens is too thin.
Distance objects can be focused properly but the point of focus for close objects is behind the retina.

Correction of long sightedness

Long sightedness is corrected by wearing spectacles with convex lenses.

Old age sight (presbyopia)
When the lens loses its elasticity it can no longer change in shape.
It becomes suitable for only distant vision (long sight). Old age sight people usually require reading glasses which have converging lenses. This happens in old age above sixty years.

Astigmatism.
It is the most common of all eye defect.
It is caused by the surface of the cornea not being perfectly smooth or spherical.
This results is blurred vision.
Astigmatism is corrected by wearing spectacles with cylindrical lenses.

DISEASES OF THE EYE

Conjunctivitis.
- It causes the swelling of conjunctiva.
- It is caused by bacteria or virus.
  There are three types of conjunctivitis.
  - Acute conjunctivitis.
  - Chronic conjunctivitis.
  - Gonorrhoea conjunctivitis.

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

Trachoma
Caused by bacteria.
- It is highly contagious and infectious disease.
- It is common in places with poor hygiene and overcrowding where water is scarce and people don't wash hands and their eyes.

How trachoma spread
- By houseflies.
- Sharing hands with an infected person.
- Sharing of the same basin with an infected person.
- Shaking hands with another infected person.

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

River blindness.
- It is caused by a tiny filaria worm (onchocerca vulvulus).
- It is carried by a small hump called black fly known as a black fly or simulium fly.
- This fly breeds in fast flowing rivers.

Signs and symptoms
- Itching skin rashes.
- Severe skin itching.

Prevention and control.
- Spraying using insecticides against the adult fly.
- Treatment of the infected person.

Other diseases.

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

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

Glaucoma.
- Caused by increased internal pressure of fluids.
- It can come about by itself or progress from another diseases.

Iritis.
The swelling caused by other diseases or injury to eye.

Sty
- This is a small inflammation on the eyelid. It looks like a small boil.
- It is usually a sign of poor general health, anaemia or diabetes.

Corneal ulcer.
It is caused by an injury to the cornea.

Night blindness

Care of the eye.
- Don't rub your eyes with dirty fingers.
- Don't strain your eyes by reading;
  a) Very small prints with too little or direct sunlight.
  b) In moving vehicles.
  c) In wrong postures like in bed.
- Don't expose your eyes to very bright or glaring light.
- Always wash your eye with clean water and soap, every morning and evening.
- Never look directly at the sun, it may spoil your retina.

- If there is anything wrong with your eyes visit an eye specialists.
- When reading use a correct distance of about 30cm.
- Don't share towels or clothes with people who have sick eyes.

TERM III
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 environmentis 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 components of the environment depend or each other mostly for survival.

Interdependence

This is a situation where living things and non-living things depend on each other.

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 exygen

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 (oxgyen) 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

Food chain

- 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

Illustration

Grass → Goat → leopard → bacteria

- Grassrepresents 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

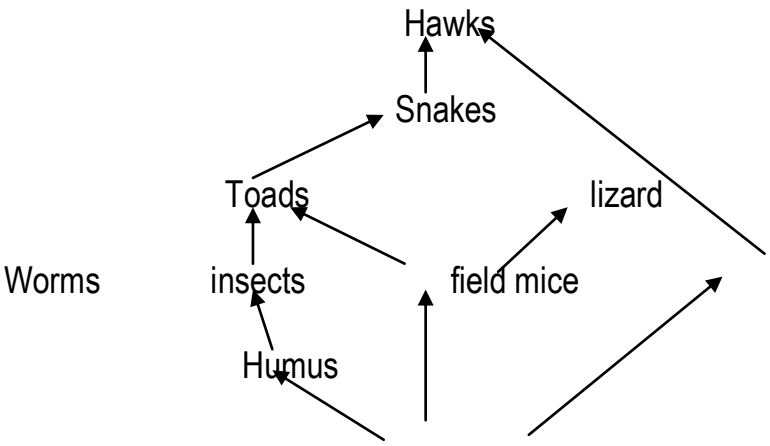
4. Decomposer

Is an organism that causes decay / rotting

Food web

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

Illustration



Green plants

NB : Eco system - Is a community of organisms in a habitat
Habitat - Is a home of an organism in the environment

-

GROWING CROPS AND TREES

AGRO-FORESTRY

- Is the growing of crops keeping livestock and planting trees on the same farm.

Importance of agro-forestry.

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

Examples of indigenous species of trees.

- Mvule
- Mangoes
- Jack fruit.
- Musizi
- Ennongo
- Mutuba (ficus tree)

Examples of Exotic trees.

- Cypress.
- Gingko
- Pine
- Cedar
- Podo
- Eucalyptus
- Fir.

GROWING OF TREES

Selection of planting materials

- Trees grow from seeds or cuttings.

Quality of good seeds for planting.

- The seeds should have a high germinating rate.
- They should be free from pests.

- They should be free from diseases.
- They should not be broken.
- They should be obtained 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 over crowding.
- 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

(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 planted in the spaces left by the felled 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.

COMBINING AGRO-FORESTRY WITH ANIMAL HUSBANDRY.

Advantages

- Trees provide shade to animals.
- Trees provide fencing materials.
- Trees provide oxygen and use up carbondioxide.
- The trees help to control soil erosion.
- Some trees provide food to the animals.

Starting and managing school / home wood lot project

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

Record keeping

Record to keep include

- Type of crops you intend to grow with trees
- Type of trees to be grown
- Number of trees to be planted
- Spacing of trees and crops
- The time you have spent to raise the trees and crops
- Time seeds spend in the nursery garden time.

POPULATION AND HEALTH

Population

Population is the total number of organisms in an area.

Human population

Is the total number of people living in an area.

Health

This is the state of complete physical , mental and social well being.

Common sickness in a home

- Diarrhoea
- Dysentery
- Cholera
- Malaria
- Kwashiorkor
- Typhoid
- Relapsing fever
- Polio

Causes of common sickness at home

- Poor sanitation
- Poor personal hygiene
- Poor nutrition (malnutrition) or inadequate food supply
- Inadequate water supply.
- Lack of enough physical exercise
- Alcoholism and drug abuse
- Living in polluted areas
- Ignorance about some health practice (habit)

Inadequate water supply

It refers to a condition when water is not enough to meet people daily domestic needs.

Causes of poor water supply.

- Drought
- Floods
- Wars
- Overpopulation
- Silting

Solutions / how to overcome inadequate water supply

- Government should provide clean safe water.
- Protection of wetlands and water catchment areas
- Educating people about the importance of protecting water sources.

Effect

- Leads to spread of water cleaned and diarrhoeal diseases.

Poor sanitation

Is the general dirtiness of a place where we live or stay.

Causes of poor sanitation

- Poor disposal of human wastes

- Poor disposal of rubbish
- Sharing a house with animals
- Poor drainage in a home
- Blockage and bursting of sewerage system
- Over crowdingin a home

Diseases associated with poor sanitation

- Diarrhoea
- Dysentery
- Malaria
- Cholera
- Typhoid
- Bilharzias

Solution / How to control poor sanitation

- Using latrines and toilets to dispose human waste.
- Proper disposal of rubbish
- Draining stagnant water
- Treatment of sewage before being disposed off
- Animals should be kept in separate house with people

Effects of poor sanitation

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

Inadequate food supply (Food insecurity)

Is a condition when the food available is not enough to meet the daily nutritional needs of the people in an area.

Causes of inadequate food supply.

- High population increase
- Laziness
- Low level of technology
- Ignorance of good modern farming methods
- Prolonged drought
- Floods
- Wars
- Poor soils (infertile soils)
- Poor attitude towards farming
- Crop pests and diseases

Food security

Is a condition when the food available is enough to meet the daily nutritional needs of people in an area.

Solutions to inadequate food supply
(ways of promoting food security)

- Promotion of family planning

- Provision of soft loans to farmers to increase productivity
- Giving irrigation facilities to people.
- Protection of wetlands to control floods
- Growing crops which are resistant to crop pests and diseases
- Growing crops which are resistant to harsh weather conditions. (drought)
- Sensitizing school children on the value of agriculture
- Hold workshops to sensitize people on better methods of farming.

Anti – social behaviour

These are habits or acts which are not acceptable in a society

Examples of anti social behaviour

- Telling lies
- Bullying
- Stealing
- Arson
- Fighting
- Smoking
- Alcoholism
- Avoiding school (Truancy)
- Child prostitution
- Drug abuse
- Raping
- Wandering (running away from home)
- Abortion

Causes of anti social behaviour

- Over strictness by parents or teachers
- Pampering of children
- Failure to enforce rules in a community
- Poor social environment
- Peer influence
- Ignorance of society rules / laws
- Unfulfilled expectations

Note :

1. Juvenile is a young person below 18 years.
2. Juvenile delinquency are acts / behaviours committed by a young person and are punishable by law

How to control anti social behaviors

- Punishing children for wrong behaviour
- Equal treatment among children

- Encouraging elders to set good examples of children
- Through guidance and counseling
- Encouraging children to do developmental activities in their free time

Sexual deviations

These are abnormal sexual practices

These are sexual behaviours that are not accepted in the community

Examples of sex deviations

- Bestiality
- Masturbation
- Homosexuality
- Oral sex
- Lesbianism
- Incest

Causes of sexual deviations

- Peer influence
- Exposure to pornography
- Poverty
- Ignorance on dangers of sex deviations
- Drug abuse

Ways of avoiding sexual deviations

- Having good friends
- Joining good educative clubs
- Avoid watching and reading pornographic materials
- Providing proper guidance and counselling
- Encouraging sex education to youth in school and at home

Activities that promote health in a community

Care for homes

This can be done

- Proper disposal of wastes
- Drain stagnant water
- Providing good nutrition
- Treating of the sick
- Supply of clean water

Health survey.

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

Information gathered during a health survey.

- Kind of food people eat.
- Kind of houses people use.
- The health facilities in an area.

- Sanitation in the area.
- Immunization coverage.
- Food security in the area.

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

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

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

Information on population.
Kind of information gathered about population.
- Demography.
- Housing information.
- Immunization.
- Available health services.
- Food security.

DEMOGRAPHY.
- This is the study of the population.
- It takes into account the number of births, deaths, marriages and common diseases in a place at a given time, factors that cause change in the population e.g. Migrations, wars, job opportunities e.t.c.

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

Housing information

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

Immunization:

- The information gathered include; the number of children immunized, the ages of the children and the disease immunized against.

Available health services.

Information gathered include:-

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

School health club

This is a group of school members who come together to improve health of people in a school

Activities of a school health club

- Peer education on HIV / AIDS , sanitation , good nutrition
- Carrying out debates on the topics of health related activities
- Organizes health parades
- Sensitization of the public on health issues
- Promoting physical education , sanitation
- Designing health rules.
- Keeping records on different health activities
- Recitation of poems on health related problem.

- to grind corn or maize and pump under ground water.

TOPICAL QUESTIONS

MAGNETISM

1. What is a magnet?
2. Give the difference between a magnet and magnetism.
3. Materials that can be identified by magnets are called magnetic materials. Identify by an example of magnetic materials.
4. Briefly define an alloy.
5. Why are some metals turned into alloys?
6. Give one property of magnets.
7. Explain the following terms;
   a) Magnetic lines.
   b) Magnetic fields.
   c) Magnetic poles.
8. Give one reason why the earth is called with magnet.
9. Draw a bar magnet and show the magnetic lines of force around them.
10. State two types of magnets.
11. Give two methods of making magnets.
12. What is demagnetization?
13. State any one way of demagnetizing a magnet.
14. Give one use of magnets in daily life.
15. Why should materials always be kept away from magnets?

ELECTRICITY AND MAGNETISM

1. Define the term electricity.
2. Suggest two advantages of using electricity.
3. Give one danger of using electricity.
4. Identify the two forms of electricity.
5. State the difference between static and current electricity.
6. What are electric conductors?
7. Explain how the dangers of lightning can be controlled.
8. A part form installing lightning conductors on buildings, how else can we control accidents related to lightning?
9. What is an electric circuit?
10. State importance of each of the following?
    a) A fuse
    b) A switch
    c) Dry cells.
    d) A bulb
11. How is the function of a fuse different from that of a switch?
12. Give one reason which may lead to the blowing of a fuse.
13. Which form of energy is stored in dry cells?
14. State any one energy change in an electric circuit when it is complete.
15. What are primary cells?

MATTER AND ENERGY:

1. State one reason why a piece of wood is regarded as matter.
2. To which state of matter does vapour belong?
3. How does volume of matter differ from its mass?
4. Identify the following forms of energy:
   (i) That stimulates our sense of hearing.
   (ii) Enables one to tell number of people in the compound.
   (iii) That causes a piece of butter to melt.
   (iv) Produced by the flow of electrons.
5. State any one advantage of using electricity as a form energy.
6. Name the type of electricity common between insulators in which electrons do not flow.
7. State any one reason why light is seen before thunder is heard during a rainy storm.
8. Name the kind of alternating current produced in the following;
   (a) Running water?
   (b) Burning fuels?
   (c) Burning atomic uranium
9. (a) In the space provided, draw and show the following parts of an electric circuit.
   (i) Fuse (ii) Ammeter (iii) switch (iv) Bulb

(b) Name any one energy change that takes place in a dry cell when the circuit is complete.
(c) State any two causes of short circuits.

10. (a) Give one reason why the bulb filament is made coiled.
    (b) List down one form of energy produced by a bulb when the circuit is complete.

    (c) State any one factor that may fail a new bulb of a torch to work.

11. (a) Give one reason why pieces of wood cannot be attracted by a magnet.

(c) List down the property of magnets that enable them to attract magnetic substances.
(d) State three ways of destroying a magnet.

ENERGY RESOURCES:

1. How does a resource differ from an energy resource?
2. Give any one reason why plants are regarded as energy resources.
3. State one way how man uses energy from the sun.
4. How is water useful to an energy resource in the environment?
5. Identify any three forms of wood fuel used in production of heat and light.
6. How do energy saving stoves help to conserve the environment?
7. State the role of bacteria in a biogas production.
8. Give any two ways in which wind is an energy resource.
9. Identify two ways how energy from animals can be made available to people.
10. List down any four materials used to generate biogas.
11. What are fossils?
12. How can cutting down of forests affect production of hydro electricity?
13. Give one reason why crude oil is considered a non renewable resource.
14. Match items in list A with those in list B.

A	B
Thermal electricity	Uranium
Nuclear electricity	Fossil fuels
Hydro electricity	Water
Static electricity	Friction
	Hot springs

15. State any three ways in which wind can be an energy resource in the environment.
16. State the importance of solid residue after the production of biogas to a crop farmer.
17. Identify the value of carbondioxide to man.

POPULATION AND HEALTH

1. Define the term human population.
2. Write down any four health concerns common in your area.
3. Identify any three human activities that can lead to poor sanitation.
4. Suggest one reason why water sources should be protected.
5. Give any two activities which can improve sanitation at home.
6. State any two health dangers which can result from poor sanitation in the community.
7. Mention any three examples of anti social behavior common in a school.
8. Identify any three ways one would avoid anti-social behavior.
9. Give any two natural changes which can result into poor water supply in the community.
10. How has the government of Uganda tried to improve on provision of clean water supply in your community?
11. What health problems can result from poor water supply in your area?
12. List down any two natural changes that can result into inadequate food in a community.
13. Suggest any two ways how government can encourage and promote adequate food supply in the community.
14. Outline two ways how we can promote health in a community.
15. Give any two values of budgeting in a family.
16. State any two values of health surveys in an area.
17. Define the term demography as used in health education.
18. Identify any one health danger of staying in over crowded areas.
19. Give any two reasons why immunization of children is important.
20. State the importance of a child health card to a parent.
21. Why should expectant mothers be immunized with Tetanus Toxoid?
22. How is a health centre important to people in the community?

DIGESTIVE SYSTEM:

1. Define the term digestion.
2. State the role of the following during digestion.

(i) Teeth.
(ii) Tongue.
(iii) Saliva

Study the diagram below carefully and use it to answer the questions that follow.

3. Name the digestive juice produced by part marked P.
4. Give the value of hydrochloric acid produced in part P.
5. State a reason why digestion of proteins begins from the stomach.
6. State the role of structure marked Q.
7. Name the digestive juice produced by structure W.
8. Give the function of the contents in part Z during food digestion.
9. Name the parts marked.
   (i) M (ii) S (iii) P (iv) Q (v) W (vi) Z
10. How is the ileum adapted to its function of food absorption.

SEXUALLY TRANSMITTED DISEASES:

1. What are sexually Transmitted Diseases?
2. Name one sexually Transmitted Disease caused by bacteria.
3. Which blood cells are mainly affected by the HIV germ?
4. Write down one STD caused by a virus.
5. Which venereal disease causes blindness in babies?
6. What is the best way of preventing the spread of sexually Transmitted Diseases/
7. Why should pregnant mothers / women go for HIV tests?
8. Write HIV in full.
9. Besides using condoms and abstinence, mention any other way of preventing the spread of STDs.
10. Identify any one social activity that is most likely to contribute to the acquisition of HIV / AIDS.
11. Why is it important for a couple to go for HIV test before marriage?
12. What is the difference between a person who has AIDS and one who is HIV positive?
13. Besides getting STD's mention one other problem associated with Pre-marital sex in teenage girls.
14. What is counseling?
15. Name any one type of counseling in HIV/AIDS management.
16. Identify one group of people who are most likely to catch HIV/AIDS.
17. Name an STD which causes painful urination in males.
18. Name the germ that causes trichomoniasis.
19. Name one fluid in the body through which HIV/AIDS virus can survive comfortably.
20. A part from being used as an STD control method, give one other importance of using a condom.

Answers.

1. Diseases that are transmitted through having sexual intercourse with an infected person.
2. Syphilis / Gonorrhoea / Lymphogranuloma Venereum
3. White blood cells / Leucocytes.
4. HIV/AIDS/Genital warts.
5. Gonorrhoea
6. Abstain from sex
7. To prevent their unborn babies from contracting HIV/AIDS.
8. Human Immuno deficiency Virus.
9. Early Treatment / faithfulness to your sexual partner
- Using sterilized sharp instruments.
- Screening Blood before blood transfusion is conducted.
- Avoid sharing sanitary items like basins, towels e.t.c
10. Massive circumcision of youths.
- Inheritance.
- Blood pacts (exchange of blood on coffee beans).
- Ear tattooing / Notching.
11. To prevent spread of HIV / AIDS from one person to another.
12. An AIDS victim shows signs and symptoms while an HIV victims' immunity is poor and therefore can be attacked by various diseases.
13. Teenage pregnancy.
14. The process of giving advice to a person / patient to enable him/them overcome fear / stress.
15. Pre-test HIV counseling.
- Post-test HIV/AIDS counseling.
16. Prostitutes / Sexually adventurous young people, Long distance drivers / Alcoholics / Bar maids (attendants)
17. Gonorrhoea.
18. Protozoa.
19. Semen / Blood / Vaginal fluids.
20. Used for family Planning and child spacing.

GROWING TREES (AGRO-FORESTRY)

1. What is Agro-forestry?
2. Give any one reason why people plant trees in their compounds.
3. What are nursery beds?
4. Of what use is a secateurs important in tree growing?
5. State any one quality required of seeds or cuttings to be planted.
6. Define the term "plant staking."
7. Write down any one crop propagated by grafting.
8. How does mulching improve on soil fertility?
9. In which way does crop-rotation help to control crop-pests?
10. How are sweet potatoes propagated?
11. State one value of bush/fallowing as a farming method.
12. How do trees planted in a school garden prevent soil erosion?
13. State the importance of shelter (shade) on a nursery bed.
14. List down any two activities done to care for trees in a nursery bed.
15. Write down any one method of planting crops.

16. State one reason for weeding crops.
17. Mention any one method of harvesting wood.
18. Which method is best for harvesting wood for timber?
19. Why do some fruit trees need pollarding?
20. Match the pests in list A with fruit crops in list B correctly.

List A	**List B**
Mealy bug	Banana
Thrips	cassava
Moles	pine apples
Stalk borer	tobacco
	Maize
	Beans

SIMPLE MACHINES AND FRICTION:

1. What is a simple machine?
2. How do simple machines simplify work?
3. List down two types of simple machines.
4. Name the kind of simple machine in which a stiff rod turns on a pivot.
5. Define the term “fulcrum.”
6. Why are most machines not 100% efficient?
7. Give one example of a device in a third class.
8. Give one use of wedges in our every day lives.
9. Name any one device that uses pulleys.
10. State one advantage that a single movable pulley has over a single fixed pulley.
11. Eric pushed a wheel barrow using a force of 25 Newtons for a distance of 17 metres. Calculate the work done by Eric.
12. Give any one use of pulleys at your school.
13. Why are pairs of scissors and pliers called double levers?
14. Give any two ways of reducing friction in moving parts of a machine.
15. Why are tarmac roads constructed with rough surfaces?
16. State any one importance of friction to man.
17. Give any one reason why friction is regarded as a nuisance force.
18. The diagram below shows a simple machine used to lift a load of 100Kgf using an effort of 50Kgf.
    a) Name the simple machine shown above.
    b) What distance does the load move?
    c) What can you do to use less than 50Kgf to pull the Load?

LIGHT ENERGY

1. Name one natural source of light.
2. Give a difference between a luminous and a non-luminous object.
3. Name the materials which:-
    a) Do not allow any light o pass through them.
    b) Allows some light to pass through them.
4. Briefly explain how a solar eclipse is formed.

5. The diagram below shows a beam of light.

   Name it.

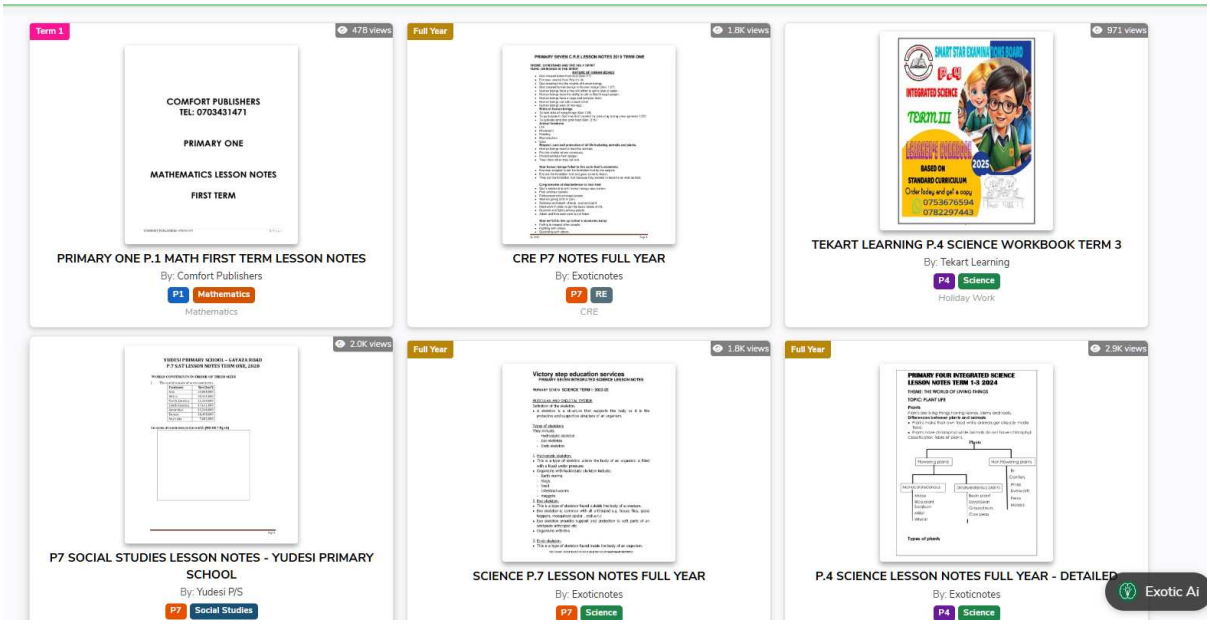
6. How is a shadow formed?
7. Give a difference between reflection and refraction.
8. Given that the angle of incidence is 68^0, calculate the angle of reflection.
9. State any one law of reflection.
10. Give any one way in which images formed in a pinhole camera are different from those formed in a plane mirror.
11. Name the lens used to correct:
    a) Shortsightedness.
    b) Long sightedness.
12. Define the term "dispersion of light."
13. Which part of the eye has a similar function as the film in a photographic camera?
14. Name the eye disease caused by bacteria.
15. Identify one health practice one can perform to promote good health of the eyes.
16. What type of mirrors are sued in a periscope?
17. State the type of surface which causes regular reflection.
18. What type of natural shadow is formed when the moon comes between the sun and the Earth?
19. Name the part of the eye that controls the amount of light entering it.
20. In which way are the vitreous and aqueous humours important to the eye?

LIGHT ENERGY - ANSWERS

1. The sun / stars / Firefly / Glow worms / Erupting volcanoes.
2. A luminous object is one which produces / gives out its own light while a non-luminous object is one that doesn't produce its own light.
3. a) Opaque objects.
   b) Translucent objects.
4. Formed when the moon comes between the sun and the earth.
5. Converging beam.
6. A shadow is formed when light rays are obstructed by an opaque object.
7. Reflection is bouncing back of light rays while refraction is the bending of light rays when they move from one medium to another of different densities
8. $\angle i^0 = \angle r$

   Since $\angle i^0 = 68^0$.
   $\therefore \angle i^0 = \angle y = 68^0$.
   $\therefore \angle r = 68^0$.
9. - Angle of incidence is equal to angle of reflection.
   - The normal, incident ray and reflected ray at the point of incidence all lie on the same plane.
10. Images in the camera are real those in place mirror are virtual.

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