SCIENCE AND TECHNOLOGY

FOR

STANDARD 7

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STAGES OF A SCIENTIFIC INVESTIGATION

There are six stages of scientific investigation.
These are:

1. Knowing the problem
2. Making a prediction
3. Planning the investigation
4. Carrying out the investigation
5. Making meaning of the results
6. Making conclusions

These six stages can be summarized into three main stages which are:

- ✓ Planning stage
- ✓ Implementation stage
- ✓ Concluding stage

PLANNING STAGE

This stage involves a number of steps.

The first step is to identify the problem to be investigated.

The second step is to write the statement of the problem in the form of a question

The third step is to predict or guess the answer to the question or problem.

The predicted answer is called a hypothesis.

The next step is to identify what is going to be observed and measured.

These are the factors that would affect the results of the investigation which are called variables.

A variable is anything that can change.

The next step is to identify the materials that will be required to carry out the investigation.

The last step of the planning stage is to come up with steps to be followed in the process of collecting data.

The above steps of the planning stage of an investigation are summarised as follows:
Step 1 identifying the problems to be investigated

Step 2 writing a statement of the problem to be investigated in the form of a question

Step 3 predicting or guessing the answer to the question, that is, coming up with a hypothesis

Step 4 identifying the variables

Step 5 identifying the materials required for carrying out the investigation

Step 6 coming up with the procedures for carrying out the investigation

IMPLEMENTATION STAGE

The second stage of a scientific investigation involves implementing the plans that were developed during the planning stage.

This is the stage which the hypothesis are tested by carrying out the investigation.

During this stage, the variables to be investigated are deliberately changed while keeping the other variables constant.

The variables that are changed are observed and recorded as the investigation is being conducted.

The purpose of carrying out an investigation is to collect data through observation.

If one is not satisfied with the data that has been collected, it is necessary to repeat the procedures.

The data that is collected should be organised and presented in a meaningful way.

There are several ways of presenting data. These include tables and graphs.

When presenting data in the form of a graph, it is important to remember that:

* a sharp pencil should be used when drawing graph lines
* each graph should be given a title
* a scale that can give a large graph sould be chosen so that points are plotted accurately
* the vertical and horizontal axes should be labelled and the units for each axis should be shown
* a line of best fit should be drawn if points do not lie on a straight line or smooth curve

When data has been collected, it should be organised in such a way that it is meaningful.

The procedures of organizing data are referred to as data analysis.

One way of analysing data is the use of graphs.

Once the data has been analysed, there is need to interpret it.

The interpretation of data involves determining the relationship between variables using the analysed data.

The methods of determining the relationships between variables include:

- Looking for patterns of data in a table
- Interpreting the shapes of graph lines

In summary, the implementation stage of scientific investigation involves the following:

Step 1 carrying out the investigation according to the plans.

Step 2 collecting data and presenting it in a meaningful way.

Step 3 analyzing the collected data.

Step 4 interpreting the analyzed data.

CONCLUDING STAGE

The last stage of a scientific investigation is the concluding stage.

During this stage, the hypothesis is evaluated against the interpretation of the data.

That is, the relationship between variables that has been determined from the data is compared with the hypothesis of the investigation.

If the determined relationship from the analysed data agrees with the hypothesis then the hypothesis becomes the conclusion of the investigation.

If the hypothesis is different from the relationship determined from the results of the investigation then the hypothesis is not true.

What is important is that the conclusion must be based on the results of the investigation and not on the investigator's wishes.

UNIT 2 HUMAN DEVELOPMENT

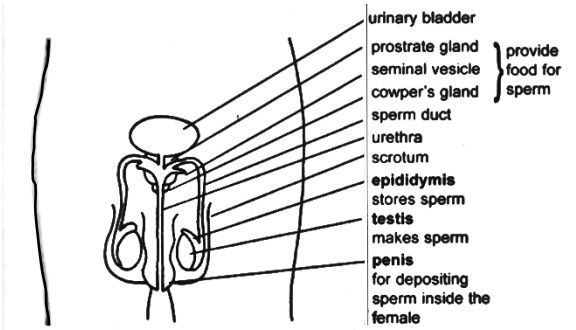
REPRODUCTIVE PARTS OF HUMAN BEINGS

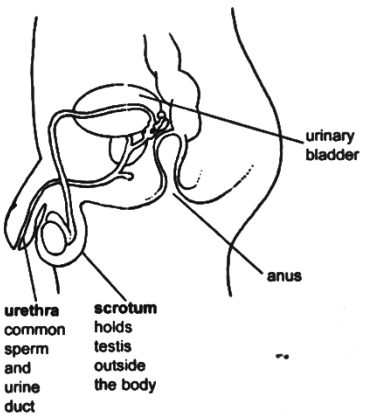
The male reproductive parts or organs are:

- the testes
- the penis

The testes produce and store the sperm.

The penis is for reproduction and for passing out urine.





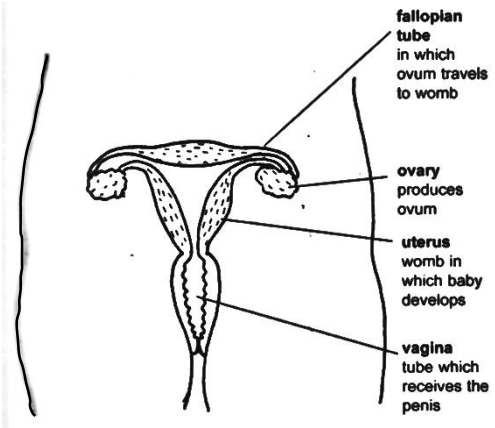
The female reproductive parts are:

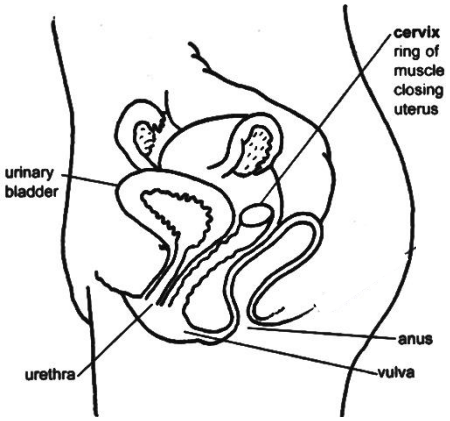
i. the ovaries
ii. the fallopian tubes or oviducts
iii. the uterus
iv. the vagina

Egg cells are produced in the ovaries.

The egg travels through the oviducts or fallopian tubes.

The vagina is the passage for sperm during sexual intercourse and is also the birth canal.





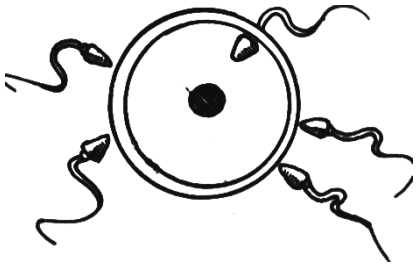
FERTILIZATION IN HUMAN BEINGS

Reproduction in human beings involves special sex cells.

These sex cells are the egg and sperm.

The sperm is the male sex cell while the egg is the female sex cell.

During mating, the penis is inserted into the vagina. The seminal fluid which contains millions of sperm is then released into the vagina.

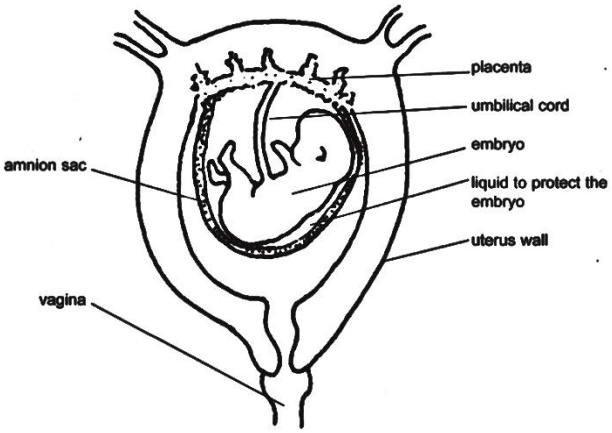


Sperm and egg cell unite

Fertilization is the union of the sperm and egg (ovum).

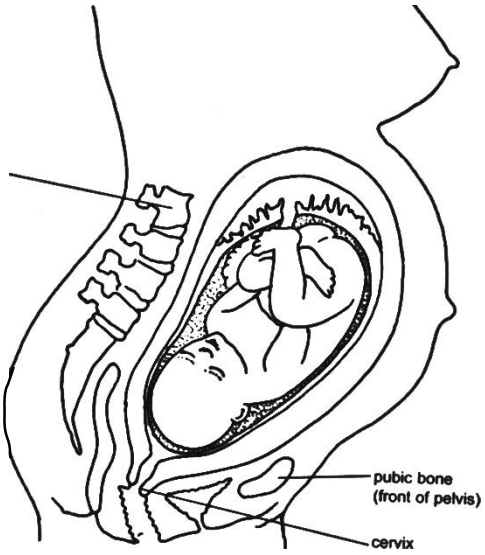
After fertilization has happened, the fertilized egg moves down the fallopian tube to the uterus as it develops into an embryo.

In the uterus, the embryo attaches itself to the wall. The umbilical cord joins the embryo to the mother.



An embryo attached to uterus wall

The developed embryo usually takes about nine months before it is ready to be born.



When a baby is born it grows into a child, an adolescent and finally becomes an adult.

MISCONCEPTIONS ABOUT PREGNANCY

Some teenagers have misconceptions about pregnancy.

They think that a girl cannot have pregnancy if she does the following:

- has sexual intercourse once
- stands up and urinates soon after sexual intercourse
- washes the vagina soon after sexual intercourse
- wears a herbal string around her waist
- has sexual intercourse while standing
- has sexual intercourse while in water

UNIT 3: THE HUMAN NERVOUS SYSTEM

THE HUMAN BRAIN

The human brain is located in the skull.

It consists of three main parts:

- Cerebrum
- Cerebellum
- Medulla oblongata

CEREBRUM

Cerebrum is the front and largest part of the brain.

It is responsible for:

- Thinking
- Speech
- Movement of muscles
- Control of senses

CEREBELLUM

Cerebellum is the middle part of the brain.

It is responsible for:

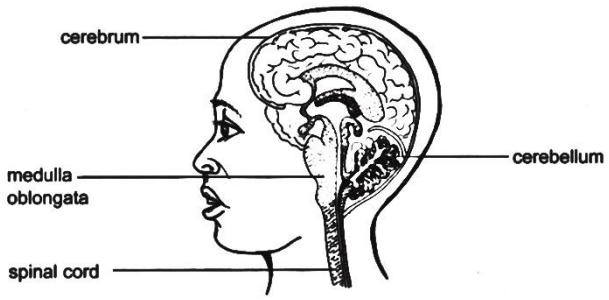
- controlling balance
- posture
- coordination.

MEDULLA OBLONGATA

Medulla oblongata is the part below the cerebellum

It is responsible for:

- controlling body activities such as heartbeat, breathing, blood pressure and digestion.

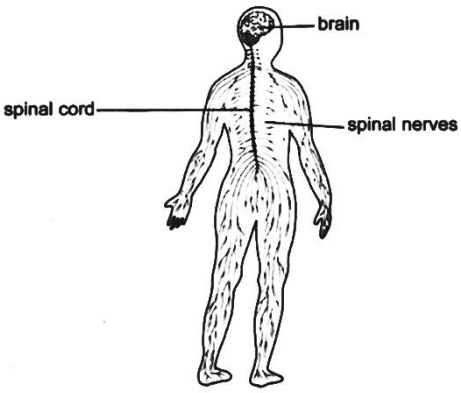


the human brain

THE RELATIONSHIP BETWEEN THE BRAIN AND SENSE ORGANS

The brain is connected to different sense organs through nerves, via the spinal cord.

The sense organs are eyes, ears, skin, nose and tongue.



the brain and the sense organs

EFFECTS OF DRUG AND SUBSTANCE ABUSE ON THE BRAIN

- Mental disorders
- Poisoning
- Suffocation
- Intoxication
- Damage of nerve cells and brain cells
- Injury
- Depression
- Death

CAUSES OF DAMAGE TO THE BRAIN

- Neck and back injuries
- Blows to the head
- Diseases

WAYS OF TAKING CARE FOR THE BRAIN

- Getting plenty of rest
- Doing regular exercises
- Eating meals that are well balanced at regular times
- Avoiding smoking and drinking alcohol
- Avoiding abusing of drugs and substances
- Reducing levels of stress and relaxing

UNIT 4 FLOWERING AND NON-FLOWERING PLANTS

CLASSIFICATION OF PLANTS

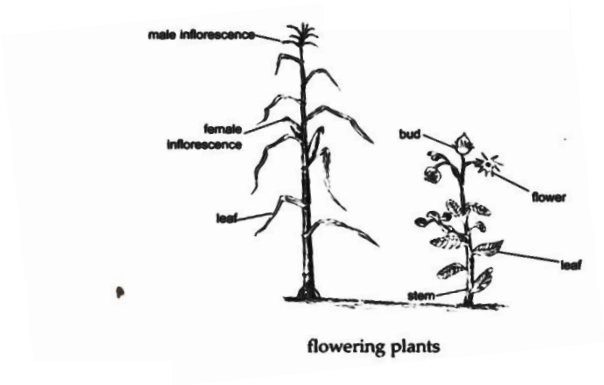
There are two major groups of plants:

- Flowering plants
- Non-flowering plants

FLOWERING PLANTS

Flowering plants produce flowers.

Examples of flowering plants are maize, rice, mangoes and beans

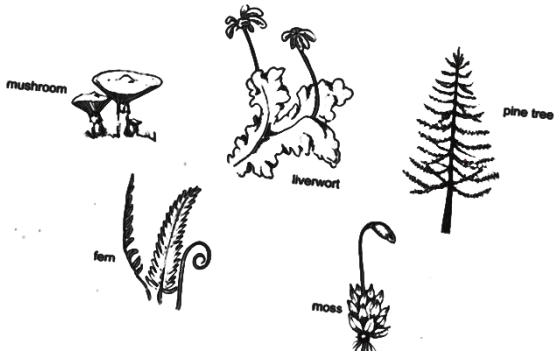


flowering plants

NON-FLOWERING PLANTS

Non-flowering plants do not produce flowers.

Examples are algae (ndele), mosses, liverworts, ferns, mushrooms, lichens, pine and cedar.

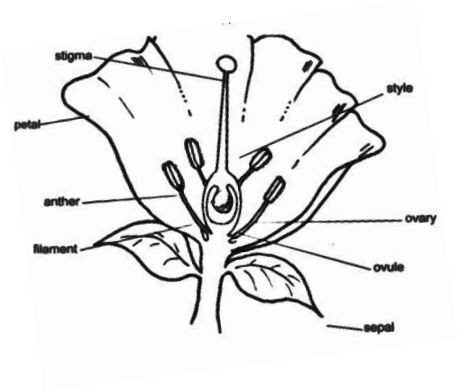


USES OF FLOWERING AND NON-FLOWERING PLANTS

- Provision of food
- Source of medicine
- Provision of building materials
- Source of fuel
- Source of paper making materials
- Source of furniture
- Source of clothes
- Sources of income
- Helps in prevention of soil erosion

PARTS OF A FLOWER

A flower has internal and external parts.



The stamen is the male part of a flower consisting of the anther and the filament.

The pistil is the female part of the flower. It consists of the stigma, style and ovary.

The ovary keeps ovules which develop into seeds.

The ovary becomes a fruit.

The stamen, petals and sepals wither and fall off when the fruit has been formed.

FUNCTIONS OF THE PARTS OF A FLOWER

Part of a flower	**Function**
Flower stalk	Holds and connects the flower to the whole plant
Sepal	Encloses and protects the developing flower before it comes out
Petal	Attracts pollination agents such as birds and insects
Ovary	Keeps ovules which grow into seeds
Anthers	Produce pollen grains
Filaments	Holds anthers

Stigma	Receives pollen from anthers
Style	Connects stigma and the ovary
Ovules	Develop into seeds

UNIT 5: POLLINATION, FRUIT AND SEED DISPERSAL

POLLINATION AND FERTILIZATION

Flowers are important parts of plants.

They are reproductive parts.

Reproduction takes place through the processes of pollination and fertilization.

POLLINATION

Pollination is the transfer of pollen grains from anthers to the stigma.

There are different types of pollination.

These are:

- Self pollination
- Cross pollination

Self pollination is the transfer of pollen grains from anther of a flower to the stigma of the same flower or another flower on the same plant.

Cross pollination is the transfer of pollen grains from the anther of a flower to the stigma of another flower on another plant of the same kind.

Things that help the transfer of pollen from anthers to the stigma are called agents of pollination.

These include bees, butterflies, birds, wind and water.

INSECT AND WIND POLLINATED FLOWERS

Insect pollinated flowers are different from wind pollinated flowers.. The following table shows some of the differences.

INSECT POLLINATED FLOWERS	WIND POLLINATED FLOWERS
Flowers are large to be easily seen	Flowers are usually small
Petals are usually brightly coloured	Petals are dull coloured
They produce scent to attract insects	They have no scent
They produce nectar	They have no nectar
Small quantities of sticky pollen are produced	Large quantities of light pollen grains are produced
Anthers hold firmly	Anthers hang loosely so that pollen can be blown away easily

FERTILISATION

Fertilization is the union of male gamete and female gamete.

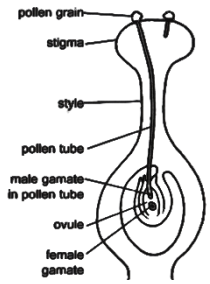
When a pollen grain lands on stigma, it grows to form a tube called a pollen tube which grows towards the ovule.

The pollen tube continues to grow down the style until it reaches one of the ovules in ovary.

When this happens the male part (male gamete) contained in the pollen tube unites with the female part (female gamete) inside the ovule to form a zygote.

The zygote develops into a seed.

The following instruction shows pollen tubes growing towards ovules.



After fertilization has taken place, the petals, stamen and style wither. The ovary then develops into a frui**t.**

HOW FRUITS AND SEEDS ARE DISPERSED

Fruits and seeds can be scattered from the parent plant.

Dispersal is the scattering of fruits and seeds from the parent plant.

There are different ways and agents by which fruits and seeds can be dispersed.

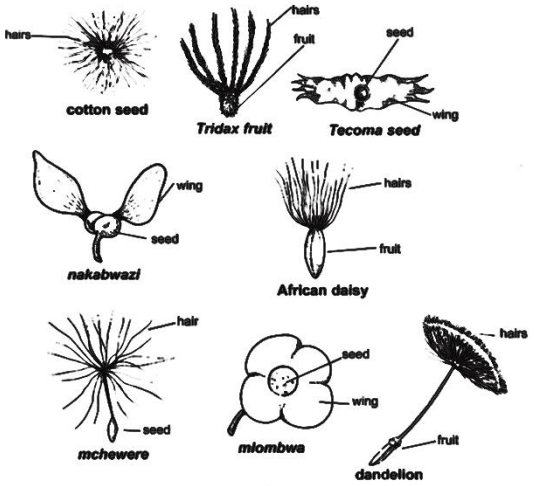
These include wind, animals, explosive mechanism and water.

Fruits and seeds which are dispersed by wind are light and have wing-like structures or hairs.

These features help the fruits and seeds to be carried away from the parent plant by wind.

Examples of fruits and seeds which can be dispersed by wind are those from cotton, Tridax and m'bawa.

The following illustration shows some of the examples of wind dispersed fruits and seeds.



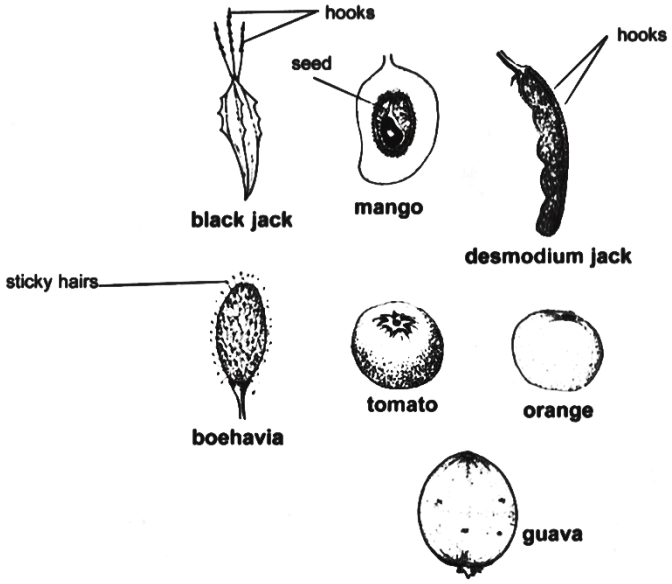
fruits and seeds that can be dispersed by wind

Fruits and seeds that are dispersed by animals are either succulent or have hook-like features or sticky fluid which make them to stick to the body of animals or clothes.

Large, brightly coloured or scented fruits also attract animals and in the process dispersion can take place.

Examples of fruits and seeds that are dispersed by animals include oranges, tomatoes, black jack, guavas, mangoes, hedgehog grass and peaches.

The following illustration shows some examples of fruits and seeds that can be dispersed by animals.

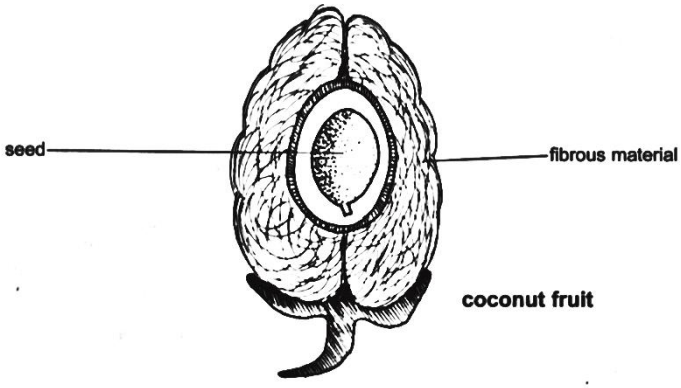


fruits and seeds that can be dispersed by animals

Fruits and seeds that can be dispersed by water are less dense than water.

An example of fruits that can be dispersed by water is a coconut fruit.

The following illustration shows a coconut fruit.



a fruit that can be dispersed by water

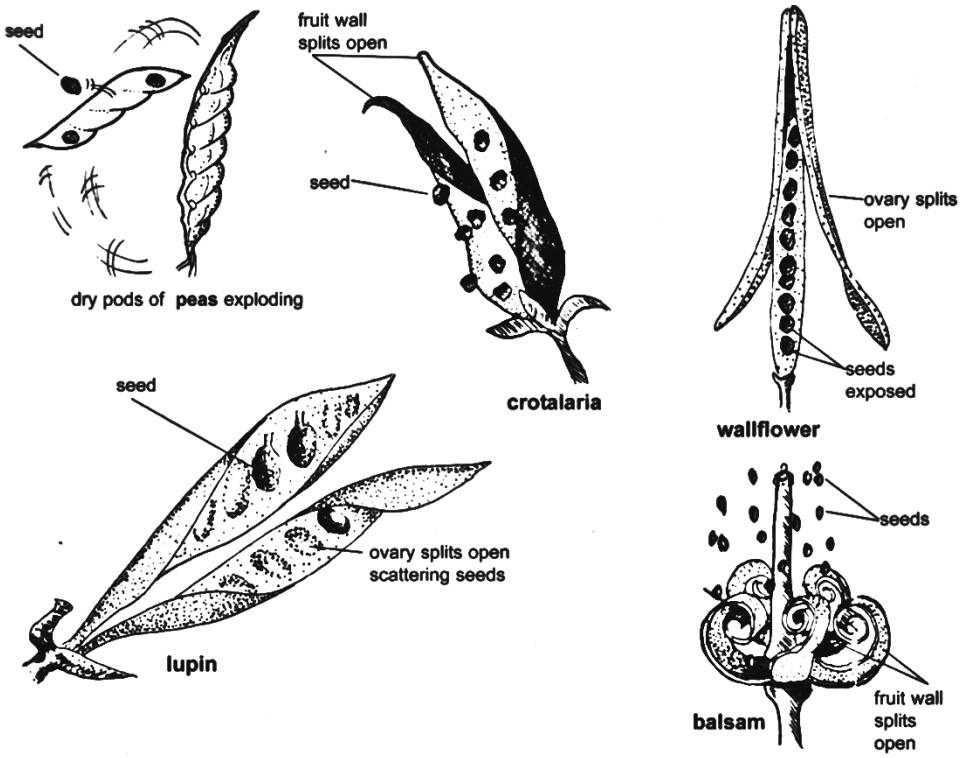
Some fruits and seeds are dispersed by explosive mechanism (bursting).

These fruits and seeds have pods.

When the pods have dry, they suddenly open and scatter the seeds away from parent plant due to the expansion and contraction of the pods.

Examples of seeds that can be dispersed in this way are castor oil, peas, beans and chitedze.

The following illustration shows some seeds that can be dispersed by explosive mechanism.



Fruit dispersal and seed dispersal are important because they help to scatter fruits and seeds thereby reducing the competition for space, air, moisture and mineral salts.

Plants grow well when they are well spaced.

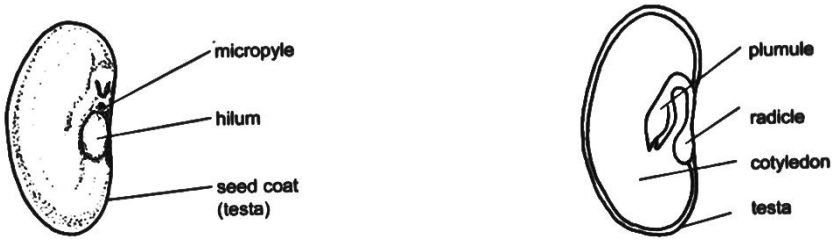
UNIT 6 SEED GERMINATION

CONDITIONS FOR SEED GERMINATION

For a seed to germinate, it requires moisture, warmth and air.

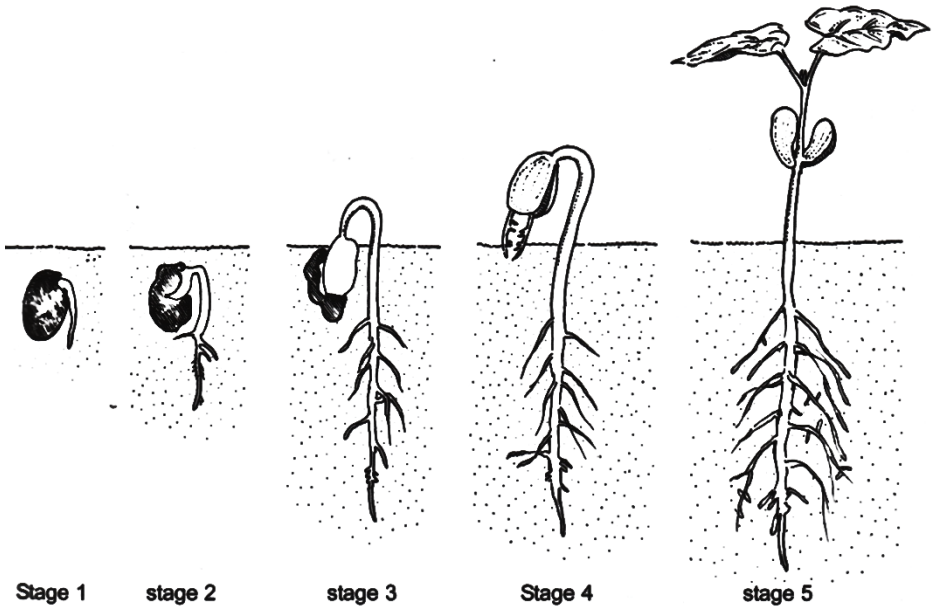
It is possible to show through experiments that these conditions are necessary for seeds to germinate.

The illustrations below show the external and internal parts of a bean seed.



During germination, a bean seed undergoes five stages.

The illustrations below show the stages.



FUNCTIONS OF PARTS OF A SEED

Parts of a seed	**Function**
Seed coat or testa	Protects the inner parts of the seed from damage
cotyledon	Contains food reserves which are used during germination
Plumule	The upper parts of the embryo which grows into the shoot
Radicle	Develops into the root system
Micropyle	Allows water and air to enter the seed
Scar (hilum)	For attachment to the pod

UNIT 7 TECHNOLOGIES THAT CAN BE MADE IN THE SCHOOL FOR MARKETING

TYPES OF TOYS

Toys can classified in a number of ways.

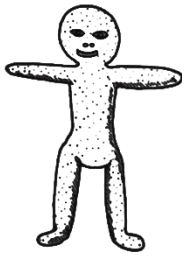
One way of classifying toys is based on the materials which have been used to make them.

Toys can be made from materials such as wood, rubber, maize pith, wire, clay, paper, plastic and cartons.

The table below shows the classification of toys based on materials used.

Materials used	**Types of toy**
Wood	Wooden toys
Wire	Wire toys
Clay	Clay toys
Paper	Paper toys
Plastic	Plastic toys
Rubber	Rubber toys
cartons	Carton toys

The following are examples of toys made from different materials.

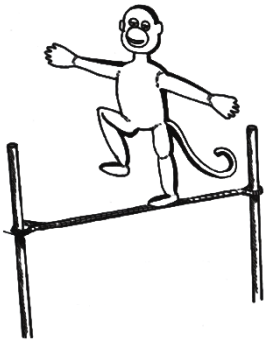


a doll

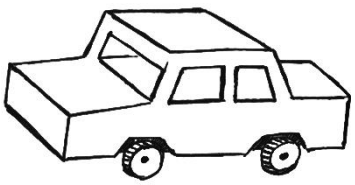
a toy boat

a cycling toy

a squeezy acrobatic to



a balancing toy monkey



a toy car

FACTORS TO CONSIDER WHEN COSTING TOYS

- Amount of materials used
- Time spent in making the toys

- Attractiveness of the finished product
- Age group meant for the toy
- Availability of the toy
- Durability of the toy
- Quality of the materials used
- Demand
- Cost of the materials, if bought

WAYS OF MARKETING TOYS

- Advertising
- Making a display of the finished products
- Organizing a showcase

UNIT 8 CLASSROOM TECHNOLOGIES

CLASSROOM TECHNOLOGIES

There are different technologies that are used for teaching and learning in a classroom such as papers, radios, computers, calculators, rulers, chalkboards, pens, dusters, pairs of compasses and pencil sharpeners.

Teaching and learning can be difficult without these resources.

Where these resources are not available, it is necessary to improvise them.

Some problems of the technologies that are used in the classroom and their possible solutions.

Technologies	**problems**	**Possible**
Chalkboard	➢ Not durable ➢ Lack of care ➢ Lack of maintenance	➢ Hiring specialist contractors and evaluating their work. ➢ Use of proper materials on the chalkboards ➢ Proper storage for portable chalkboard ➢ Maintaining the chalkboard when need arises
radio	➢ High cost ➢ Theft ➢ Lack of care ➢ Personalizing use ➢ Poor reception	➢ Resource mobilization by involving PTA ➢ Civic educate the stakeholders ➢ Maintain a tracking ledger ➢ Have a strong room ➢ Have a time table for using the radio
ruler	➢ Some learners cannot afford them	➢ Improvise
paper	➢ Expensive ➢ Abuse of the resources	➢ Practice paper recycling ➢ Civic educate the stakeholders

IMPROVISATION OF CLASSROOM TECHNOLOGIES

Some of the technologies used in the classroom can be improvised.

Examples of technologies that can be improvised are chalkboards, rulers, pental markers, papers and protractors.

a. Improvised portable chalkboard

An improvised portable chalkboard consists of stands which are made of bamboo or planks and a board painted black or green.

b. Improvised chalkboard ruler

A chalkboard ruler can be made from a straight plank and marked using a standard ruler.

Other materials that can be used are bamboo, cardboard paper and a hard plastic strip.

ADVANTAGES AND DISADVANTAGES OF IMPROVISED CLASSROOM TECHNOLOGIES

Advantage	Disadvantage
➢ Materials are locally available ➢ Encourage creativity ➢ Assist in the teaching and learning process	➢ Usually not durable ➢ Time consuming when making the technologies ➢ May not be precise

CARE AND STORAGE OF CLASSROOM TECHNOLOGIES

Different improvised materials might require different ways of storing and safe keeping.

The materials can be stored in boxes, on stands, shelves or hangers.

UNIT 9 THE HUMAN DIGESTIVE SYSTEM

MEANING OF DIGESTION

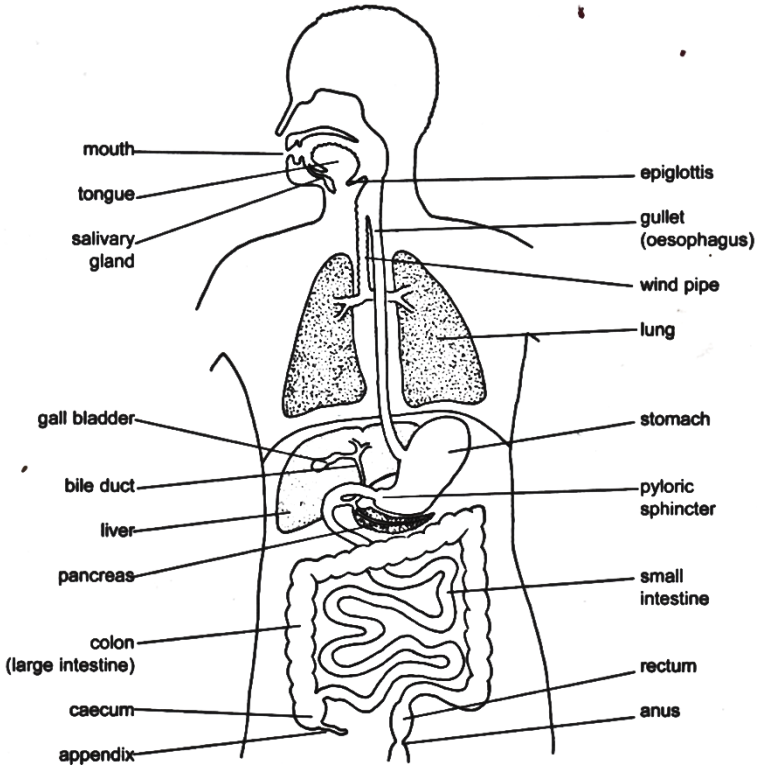
Digestion is the process by which insoluble food, consisting of large molecules, is broken down into small soluble molecules.

The small molecules, in solution form, pass through the walls of the intestine and enter the blood stream.

Digestion and absorption of food take place in the alimentary canal**.**

PARTS OF THE DIGESTIVE SYSTEM

The digestive system consists of the alimentary canal and related organs.



the human digestive system

FUNCTIONS OF PARTS OF THE HUMAN DIGESTIVE SYSTEM

- Mouth : where food is physically broken down and mixed with saliva
- Tongue: helps to shape food into boluses for easy swallowing
- Epiglottis: a flap which directs food into the oesophagus (gullet)
- Stomach: muscular sac which stores food for a short time
- Pyloric sphincter: a ring of muscles which controls the passage of food
- Bile duct: a passage through which bile passes to the small intestines
- Pancreas: a gland that secretes pancreatic juice
- Small intestines: where digestion of food is completed and digestible materials are absorbed
- Large intestine (colon): absorbs water from the undigested food
- Rectum: keeps undigested residues ready to be expelled at intervals through the anus
- Anus: where undigested residues are expelled from the body**.**

PROBLEMS OF THE DIGESTIVE SYSTEM

- Constipation : a condition where one has difficulties in emptying the bowels
- Haemorrhoids (piles): a condition which results when a constipated patient uses increased effort to remove hard faeces. It is characterized by swelling of veins near the opening of the anus.
- Intestinal ulcers: open sores in the intestines.
- Intestinal parasites (such as roundworms and hookworms): they interfere with the digestion and absorption of food.

- Diarrhoea: an intestinal infection characterized by watery faeces

CARE FOR THE DIGESTIVE SYSTEM

- Eating foods rich in dietary fibre such as fruits and vegetables
- Resting after taking meals
- Taking a lot of fluids including water
- Doing exercises regularly
- Washing foods before eating, especially fruits, to avoid intestinal infections
- Eating complete meals at regular intervals during the day

UNIT 10 VERTEBRATES

VERTEBRATES

Vertebrates are animals with a backbone.

CLASSIFICATION OF VERTEBRATES

Vertebrates are classified into five groups which are mammals, fish, amphibians, reptiles and birds.

The following table shows the group of vertebrates, their characteristics and examples.

Vertebrates	**General characteristics**	**Example**
Fish	➢ Scaly bodies ➢ Gills and fins ➢ Laying eggs	Chambo, cat fish, utaka and usipa
amphibians	➢ Moist skin ➢ No scales ➢ Four limbs ➢ Webbed feet ➢ Presence of lungs ➢ Laying eggs ➢ Live on land and water	Toad and frog
Reptiles	➢ Dry scaly skin ➢ Laying eggs ➢ Presence of limbs in some animals ➢ Breathing using lungs	Snake, tortoise, chameleon and lizard
Birds	➢ Presence of feathers ➢ Scaly feet ➢ Beak ➢ Two legs	Chicken, duck, pigeon and peacock

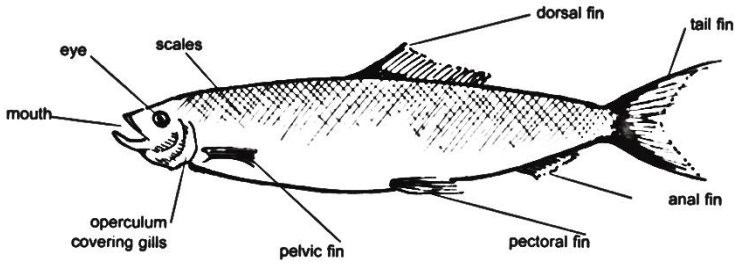
Mammals	➢ Having mammary glands (breasts) ➢ Hair or fur on the body ➢ Presence of external ears with a soft flap called the pinna ➢ Bearing live young ones	Mouse, pig, monkey and people

MOVEMENT OF FISH

Fish move in water by swimming.

They have fins and a streamlined body which make them possible to move rapidly in water.

The following illustration shows the external parts of a fish.



external parts of a fish

TYPES AND FUNCTIONS OF FINS

The key function of fins is to help the fish balance and turn as it swims.

a. Dorsal fin
   Dorsal fin protects the fish against rolling, and assists in sudden turns and stops.

b. Ventral (pelvic) fin
   Ventral fin assists with moving up and down through the water, turning sharply and stopping quickly

c. Caudal (tail) fin
   Caudal fin is the main propelling fin in most fish

d. Anal fin
   Anal fin helps to maintain stable equilibrium

e. Pectoral fins
   A pair of fins used for balancing and braking

f. Adipose fins
   Adipose fin's function not yet proven by scientists. Some said it serves as a pre-caudal flow

PROTECTION MECHANISMS USED BY SOME VERTEBRATES

Vertebrates have different mechanisms for protecting themselves.

These include biting, changing colour (camouflage), producing a hissing sound, running away, good eye sight and hiding.

UNIT 11 INVERTEBRATES

INVERTEBRATES

Invertebrates can be classified into four groups, namely, protozoa, worms, molluscs and arthropods.

1. *Protozoa*

These are also called microscopic animals.

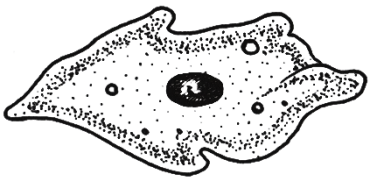
Some of them live in seawater or fresh water while others live in bodies of other animals.

Examples of protozoa include amoebas, plasmodia and trypanosome.

Amoebas are found in the mud in ponds.

They reproduce by dividing into two in a process called *binary fission*.

Binary fission is an example of asexual reproduction which does not involve the fusion of male and female gametes.



an amoeba

2. Worms

Worms can further be classified into the following groups:

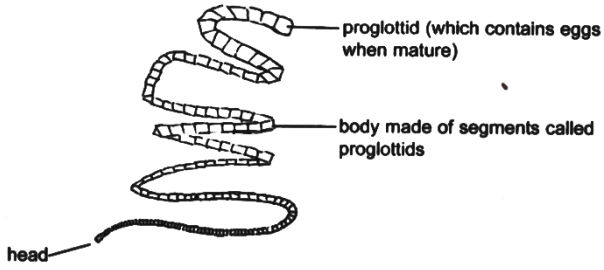
a. Flatworms

Flatworms can be divided into two groups.

These are free-living and parasites.

Planaria are examples of free-living flatworms while flukes and tapeworms are parasites.

Blood flukes cause bilharzia in human beings.



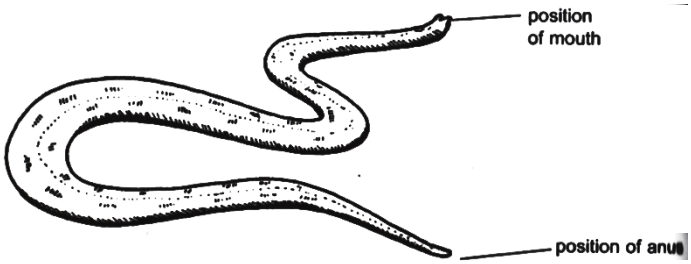
a tapeworm

g. Roundworms

Roundworms are also known as nematodes.

Some of the roundworms are free-living while others are parasites.

Ascaris, hookworms, filarial worms, and pinworms are examples of roundworms.



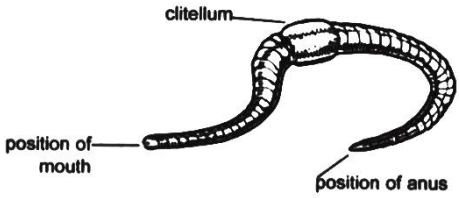
a roundworm

h. Segmented worms

These are also called annelida.

They include earthworms and leeches.

The body of the worm is divided into several segments, hence the name segmented worms.



an earthworm

3. Molluscs

Molluscs are animals with shells.

Molluscs have soft and non-segmented bodies.

Examples of molluscs are snails, octopuses, slugs, oysters.

Many of molluscs live in water.

4. Arthropods

These are animals with jointed legs.

Arthropods form the largest group of invertebrates which include insects, crabs, millipedes and spiders.

THREE MAIN COMMON CHARACTERISTICS OF ARTHROPODS

- segmented body
- have an exoskeleton
- pairs of jointed legs

LIFE CYCLE OF A HOUSEFLY AND A GRASSHOPPER

Insects lay eggs which hatch into larvae.

In some insects larva changes to a pupa that develops into the adult form or imago.

The development in stages of an insect from the young to the adult is called metamorphosis.

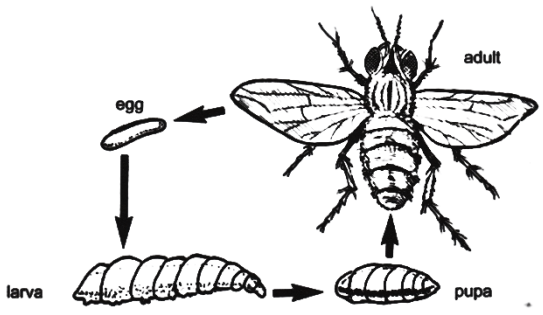
There are two types of metamorphosis, namely, complete metamorphosis and incomplete metamorphosis.

In complete metamorphosis, an egg hatches into a larva, a larva develops into a pupa, which finally develops into imago or adult form.

Incomplete metamorphosis does not have pupa stage.

Insects such as houseflies and mosquitoes undergo complete metamorphosis.

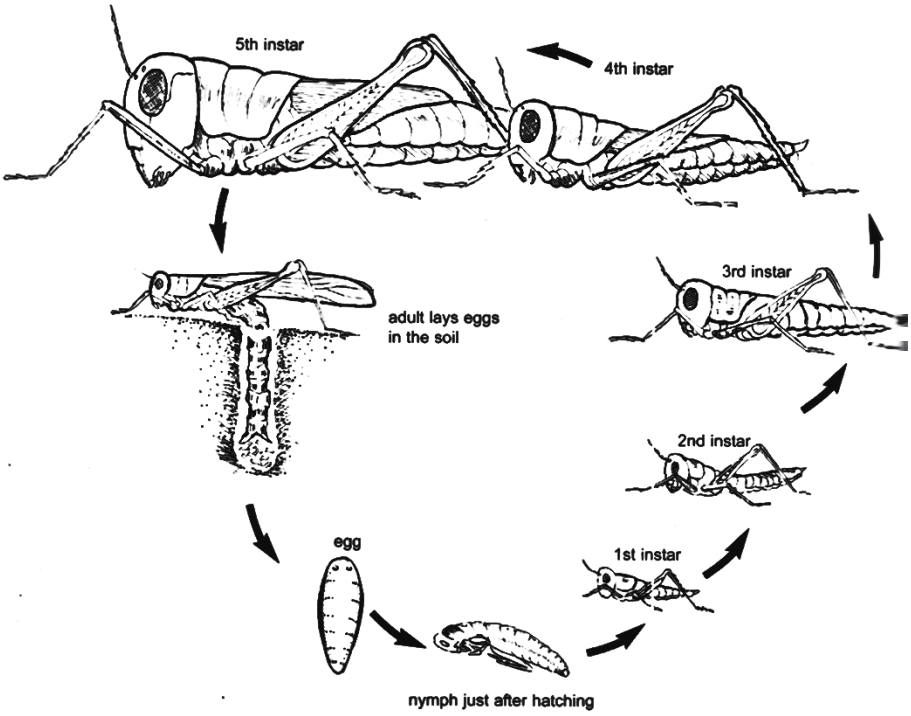
Insects such as grasshoppers, bugs, termites and cockroaches undergo incomplete metamorphosis



life cycle of a housefly

ADVANTAGES OF INVERTEBRATES

- Insects such as honey-bees and butterflies pollinate flowers which lead to the formation of seeds in flowering plants
- Bees produce honey which can be used as food and medicine, and can also be a source of income
- Source of food for humans, for example crabs and white ants
- Some of the invertebrates such as ladybird beetles and certain ants can be used in the biological control of pest – the invertebrates can feed on certain pests
- Some of the invertebrates help in aerating and improving soil fertility, for example, earthworms



Life cycle of a grasshopper

DISADVANTAGES OF INVERTEBRATES

- Some insects such as locusts can damage crops
- Some invertebrates are carriers of diseases, for example, mosquitoes can transmit malarial parasites (plasmodia); houseflies can transmit diarrhoeal diseases such as cholera; and tsetse flies are carriers of sleeping sickness
- Invertebrates such as scorpions, bees and certain spiders can be harmful to humans when they sting or bite
- Worms such as tapeworms, roundworms, pinworms and hookworms can infect humans and other animals and cause suffering.

UNIT 12 PARTS OF A PLANT

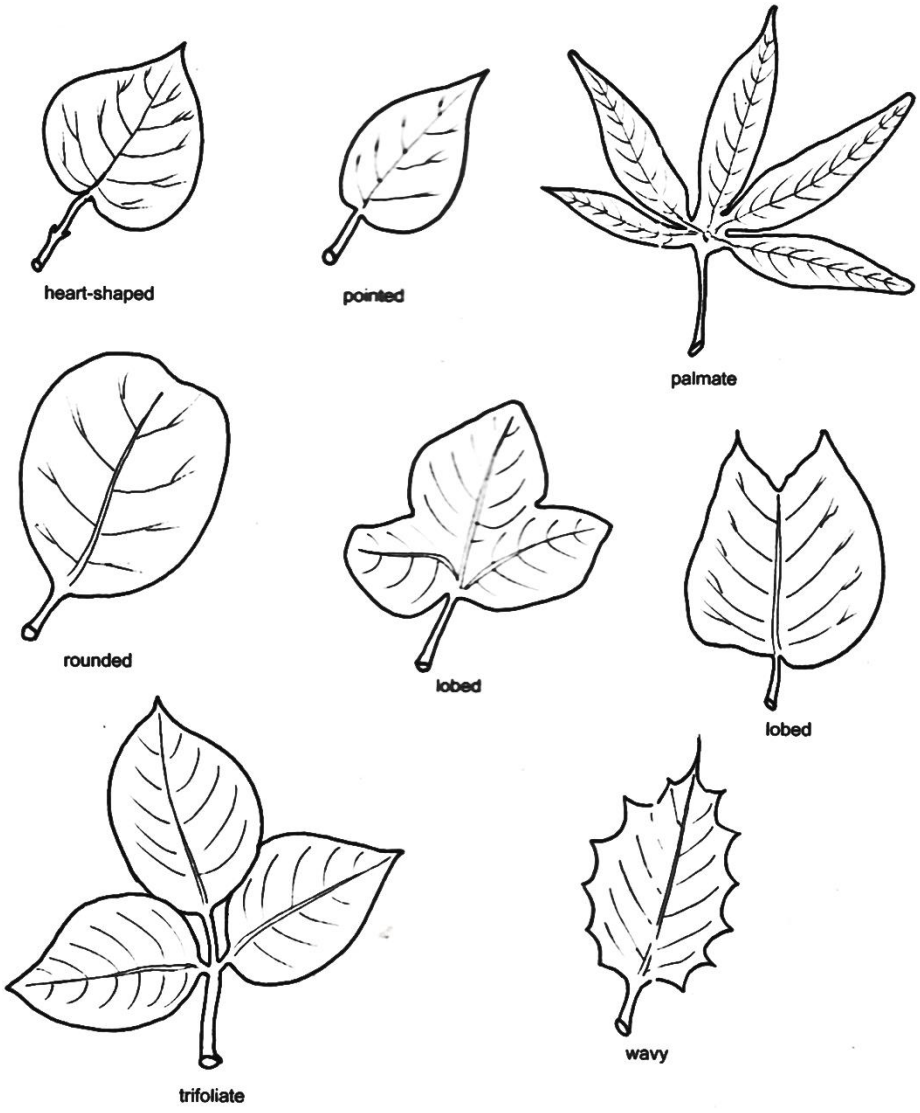
TYPES OF LEAVES AND ARRANGEMENT

There are different types of leaves.

The types can be explained in terms of their shape, arrangement and how they are attached to the stem.

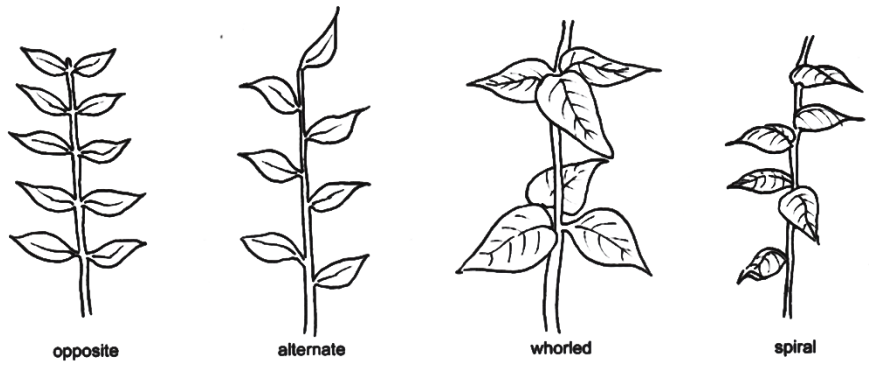
There are various shapes of leaves.

The following illustration below shows some of the shapes of leaves



There are different leaf arrangements.

Some of these are shown in the following illustration below



leaf arrangement

There are two ways in which a leaf is attached to the stem.

One way is when a leaf is attached to a stem with a leaf stalk, for example: mango, tobacco, groundnuts and bluegum leaves.

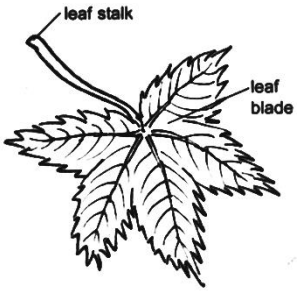
Another way is when a leaf is attached to a stem without a leaf stalk, for example, maize, sisal, onion, and grass leaves.

Some leaves are simple while others are compound.

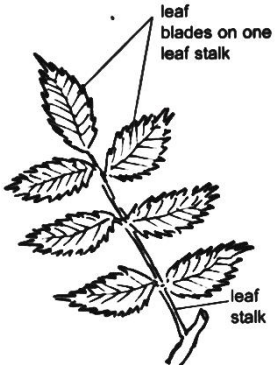
A simple leaf has one leaf blade attached to a leaf stalk.

A compound leaf has more than one leaf blade attached to a leaf stalk.

The following instruction shows examples of simple and compound leaves.



a simple leaf



a compound leaf

TYPES OF STEMS

There are different types of stems.

These include:

- Erect
- Creeping
- Climbing
- Underground

ERECT STEMS

Erect stems stand upright.

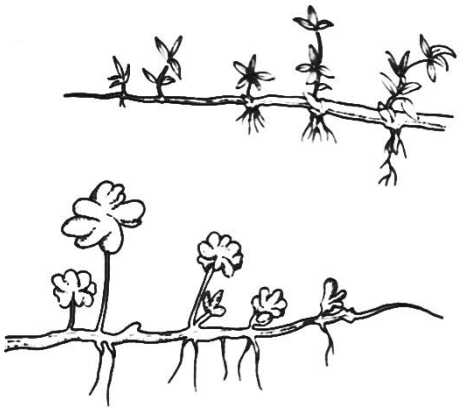
Examples of erect stems are those of maize, okra, bluegum, mango and pawpaw.

The illustration below shows examples of erect stems.

CREEPING STEMS

Creeping stems grow along the ground and produce roots as they grow on the ground, for example, kapinga grass, sweet potato and strawberry.

The following illustration below shows examples of creeping stem.



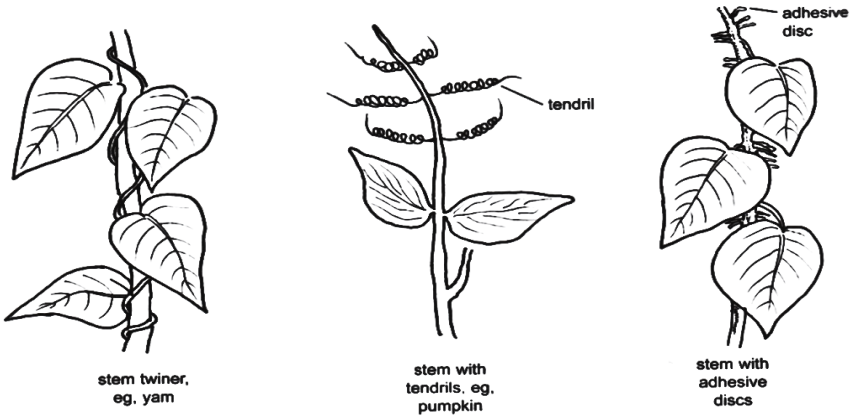
CLIMBING STEMS

Climbing stems have weak stems and they seek the support of standing objects to secure an upright position.

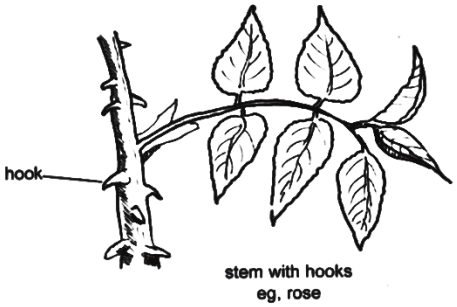
They do so by using tendrils and twisting around another plant.

Examples include pumpkins, Chitedze, kalongonda, granadilla and white haricot beans (kayera).

The following illustration shows examples of climbing stems



climbing stem
using tendrils



stem with hooks
eg, rose

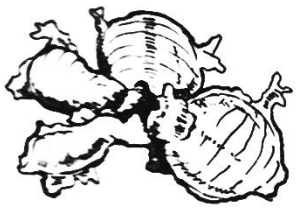
UNDERGROUND STEMS

Underground stems grow under the ground.

Some examples of underground stems are Irish potatoes, bananas, bamboos, and many grasses.

The following instruction show example underground stems.

banana sucker



ginger

Irish potato

An Irish potato has curved marks looking like eyebrows.

These are buds. An Irish potato is a stem because it has buds.

Note that a sweet potato is a root while an irish potato is a stem.

This is because sweet potato tubers are not normally used when planting sweet potatoes.

Stem cuttings are used when propagating sweet potatoes.

TYPES OF ROOTS

There are different types of roots.

These include:

- Tap roots
- Fibrous roots
- Adventitious roots
- Prop roots
- Aerial roots
- Tuberous roots

A TAP ROOT

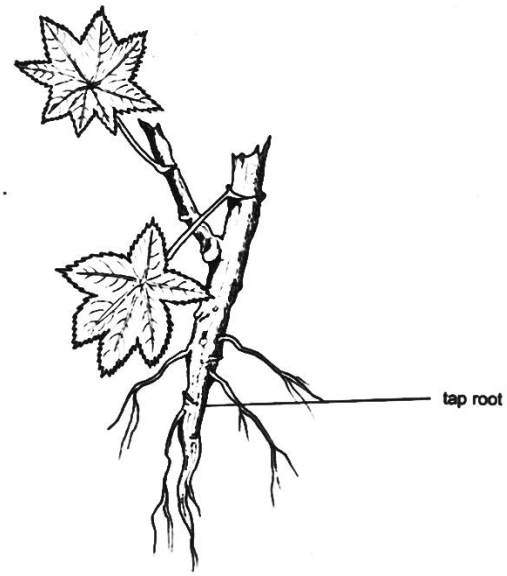
A tap root grows deeper and bigger as a plant grows.

In woody stems, other roots branch from the tap root.

Trees and shrubs have tap roots.

They keep the big trees fixed to the ground firmly to stop them from falling.

The following illustration below shows a tap root system



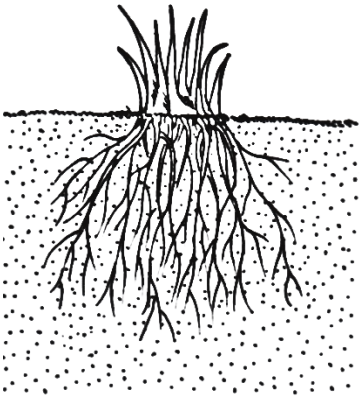
FIBROUS ROOTS

Fibrous roots grow spreading from the base of the stem.

The roots are small, thin and normally similar in size.

Examples include maize plant and grass roots.

The following illustration shows fibrous roots

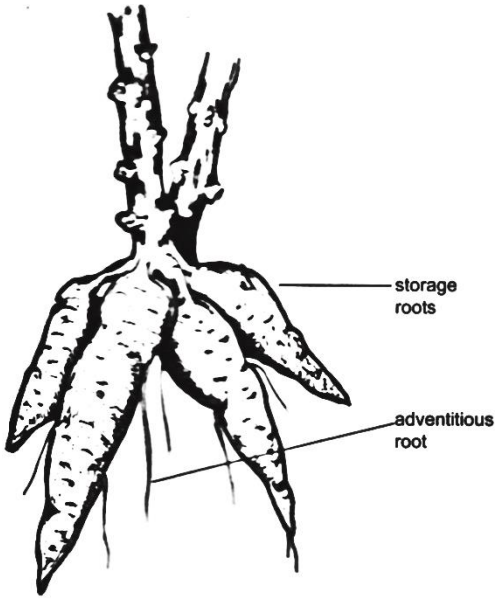


TUBEROUS ROOTS

Tuberous roots do not have buds.

Examples of tuberous roots are carrots, cassava, sweet potato and turnips.

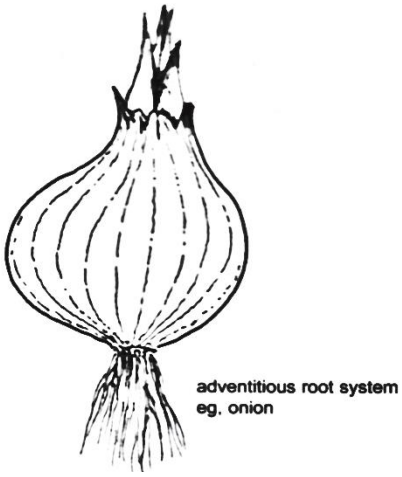
The following illustration below shows tuberous roots



ADVENTITOUS ROOTS

Adventitious roots grow from the base of underground stem, for example onions.

The following illustration shows adventitious roots.

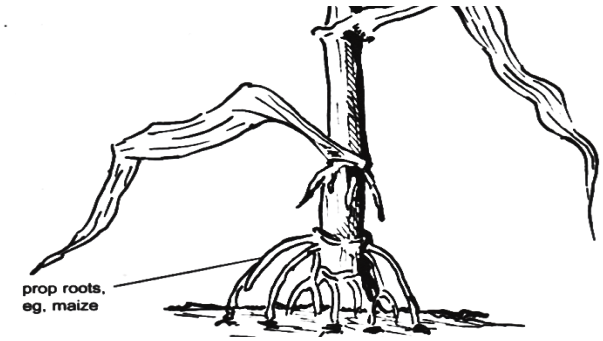


PROP ROOTS

Prop roots develop from the lower nodes of a plant and extend down into the soil.

Prop roots can be found growing on plants such as rice, wheat, oats, sorghum, maize, elephant grass and bamboo.

The following illustration below shows prop roots.

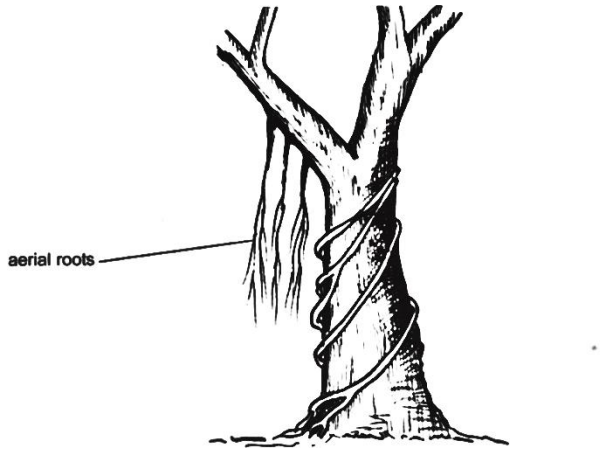


AERIAL ROOTS

Aerial roots grow on stems of plants such as kachere and mkundi.

These roots grow outside the soil.

The following illustration below show aerial roots.



UNIT 13 METHODS OF COOKING

STEWING AS A METHOD OF COOKING

Stewing is a method of cooking food in a liquid for a long time to soften it.

The food is cooked below the boiling point.

Stewing can be done on an open fire, on top of a stove or in an oven.

ADVANTAGES OF STEWING

- It does not need constant attention
- Tough pieces of meat are made tender.
- No loss of nutrients because the liquid is served with the food
- The food looks attractive and appetizing

DISADVANTAGES OF STEWING

- Very slow method of cooking
- Uses a lot of fuel

GUIDELINES FOR STEWING

- Cut the food into even small pieces to expose the maximum surface area to heat
- Keep the temperature just below boiling point
- Add just enough liquid to cover the food
- Use a fitting lid on a container
- Serve the food and liquid together.

SUITABLE FOODS FOR STEWING

Suitable foods for stewing include tough pieces of meat, fish, beans, peas, fresh and dried fruits.

The following is an example of a recipe using the stewing method

Stewed beef with vegetables

Ingredients

500g beef
2 onions
2 tomatoes
4 Irish potatoes
2 carrots
200g green peas
Salt and pepper
Oil for fry

Method

1. Clean the meat and cut it into pieces
2. Heat oil and brown the meat lightly
3. Peel vegetables. Cut potatoes in half and slice other vegetables
4. Add these to the meat and fry lightly. Add peas.
5. Cover with a liquid and season to taste.
6. Simmer till meat is tender then serve.

FRYING AS A METHOD OF COOKING

This is a method of cooking food in hot fat or oil.

There are three methods of frying food.

Namely: dry frying, shallow fat frying and deep fat frying.

a) Dry frying

No fat or oil is used in this method.

Food cooks in its own fat.

This method is suitable for very oily foods such as sausages, bwanoni, mafulufute, ngumbi and oily fish.

b) Shallow fat frying

This method uses just enough fat or oil to cover the bottom of the frying pan to prevent the food from sticking to it.

Food is turned over to cook on both sides.

Suitable foods for shallow fat frying include chicken, eggs, pancakes and fish.

c) Deep fat frying

This method requires plenty of fat or oil, about half of the deep frying pan.

The food is completely immersed or covered with fat or oil.

Suitable foods for deep fat frying include doughnuts, fritters, chicken, fish and chips.

ADVANTAGES OF FRYING

- No loss of soluble nutrients
- The food looks attractive and has good flavour
- A quick method of cooking
- Fuel is saved

DISADVANTAGES OF FRYING

- Plenty of fat or oil is needed and it is expensive
- Needs constant attention to prevent food from burning
- The food is not easily digested, if not well cooked and drained.

Guidelines for frying

- Coat the food if necessary, either in seasoned flour, eggs and bread crumbs or batter.
- Put the food into the pan carefully to avoid splashing, and add only a few pieces
- Heat clean fat or oil in a suitable pan at the correct temperature. This is about 180^0C but varies according to the food.
- When food is cooked, take it out and drain any excess oil.

The following is an example of recipe using frying method

Frying banana fritters

Ingredients

4 ripe bananas
15g of sugar
1 egg
125ml milk
Oil for frying
200g flour

Method

1. Peel and mash the bananas
2. Add sugar and one beaten egg
3. Add milk and flour
4. Drop a spoonful of batter in hot fat and fry on both sides
5. Sprinkle with sugar and serve.

UNIT 14 MEALS FOR SEDENTARY WORKERS AND MANUAL WORKERS

SEDENTARY AND MANUAL WORKERS

People doing various types of work should have their nutritional needs met properly.

These people may be employed elsewhere or may be doing different types of work at home.

Manual workers and sedentary workers are two basic categories of people doing work.

SEDENTARY WORKERS

These are people who are not involved in heavy work.

Their work is usually light and it is mostly done while sitting down in one place.

Sedentary workers are usually office workers such as secretaries, managers, television and radio presenters, reporters, lawyers, pilots, administrators, telephone operators and drivers.

Guidelines for planning meals for sedentary workers

- Be nutritionally balanced
- Not contain too much fat or oils as they do not need too much energy
- Contain foods from all the six food groups to provide variety in their diet

Below are some sample menus for sedentary workers

Sample breakfast	Sample lunch or supper
Orange juice Rice porridge Coffee with milk	Stewed fish Nsima Boiled nkhwani lemonade

Cooking and serving meals for sedentary workers

- Avoid frying food for sedentary workers because fried foods take a lot of time to digest
- Sedentary workers do not need a lot of energy. Therefore, cooking methods for their food should not require a lot of fat or oil

- Cook food using boiling, stewing, roasting, grilling, baking, and steaming methods
- Vegetables and fruit salads are ideal for sedentary workers
- Serve meals in small quantities attractively in clean plates
- Provide a variety of foods at each meal to avoid monotony
- If the food is to be taken away, pack it in clean containers

MANUAL WORKERS

Manual workers are people who do heavy work.

These people spend a lot of energy and lose a lot of water and salt through sweeting.

Examples of manual work include gardening, chopping wood, moulding bricks and carrying heavy things such as bags of maize or rice.

Guidelines for planning meals for manual workers

- Contain more energy giving foods
- Contain foods from all the six food groups
- Be nutritionally balanced
- Contain adequate protein, vegetables and plenty of fluids
- Provide a variety of foods at each meal to avoid monotony
- Be packed properly in clean containers if it is to be taken away

Below are sample menus for manual workers

Sample breakfast	Sample lunch or supper
Lemon juice Mgaiwa porridge Tea with milk	Stewed dried fish Mgaiwa nsima Boiled nkhwani with groundnut flour Pineapples

Cooking and serving for manual workers

Cooking promotes palatability and digestibility of foods.

Food for manual workers should be cooked using suitable methods of cooking.

Hence, meals for manual workers can be boiled, fried, stewed, roasted or baked.

Combining several foods in one pot helps to increase energy value of the foods especially if the foodstuffs used are of high energy value.

Such foods may include groundnut flour in vegetables or porridge, potatoes in meat, bean or chicken stew, fats such as margarine and butter in porridge or on bread and sugar in sweet dishes.

UNIT 15 LAUNDERING A SHIRT AND A BLOUSE

STAINS

Laundry involve a lot of processes.

One of such processes is removing stains from garments and articles.

A stain is a discoloured mark caused by spilling of foods and liquids on garments and articles.

These stains cannot be removed by the normal way of washing.

There are many different types of stains which can discolour our garments and articles.

These stains are classified according to their origins:

- *Animal stains*: egg, milk, blood and perspiration
- *Vegetable stains*: tea, coffee, cocoa and grass
- *Mineral stains*: rust, ink and dyes.
- *Other stains*: soot, grease, tar and wax.

How these stains are treated depends on the chemical nature of the stain, the age of the stain, texture and colour fastness of the fabric stained.

However it is important to remove the stains before the normal washing of clothes because the washing process tends to fix some stains.

For good results, it is advisable to identify the cause of the stains and remove them as soon as they occur.

STAIN REMOVAL

General principles of stain removal

1. When removing stains start with water and then use reagents. Begin with cold water, followed by hot water and later boiling water.
2. If water alone fails, use soap solution and washing powders.
3. If the stain is stubborn, repeat the steps 1 and 2. If it persists, use bleaches, absorbents such as salt, blotting paper and solvents such as paraffin and benzene and methylated spirits.

WAYS OF REMOVING COMMON STAINS

a) Tea, coffee and cocoa
   These are vegetable stains.

They usually contain acid.

To remove them, pour boiling water through the stain at once.

If it is not removed, use ammonia or borax and boiling water.

If it persists repeat the process

b) Fruit and wine
These are vegetable stains.

For fresh stains, cover with salt at once and pour boiling water.

If unsuccessful, use lemon juice and salt.

If the stain persists use bleach.

c) Egg and blood
These are animal stains.

They contain albumen and are set by hot water.

Therefore, soak in cold water and wash with soap.

If unsuccessful, steep in cold water and salt.

d) Paint and tar
If the stain is fresh, rub it gently with a softened pad moistened with ammonia and paraffin.

Remove all traces of grease and wash the article thoroughly with hot water and soap.

e) Grass
This is a vegetable stain.

Apply methylated sprits, rubbing the stain gently with a pad of soft cotton.

f) Ball point ink
Sponge with methylated spirits. If the stain is stubborn, use ammonia.

g) Chewing gum
Rub with ice-cube to set the chewing gum so it may be removed.

LAUNDERING A SHIRT AND A BLOUSE MADE FROM COTTON

Do the following when laundering a shirt and a blouse:

- Check for torn parts such as holes and split seams and mend accordingly
- Pre-soak the shirt or blouse in cold water
- Wash thoroughly in warm soapy water, particularly, around the neckline and armholes
- Rinse thoroughly in warm and then in cold water
- Hang out to dry
- Press if necessary then air and store

UNIT 16 TECHNOLOGIES FOR DOMESTIC USE

TECHNOLOGIES FOR DOMESTIC USE

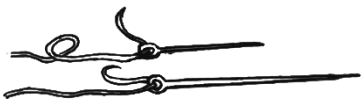
The technologies for domestic use are those that are used in the home.

These technologies include the following:

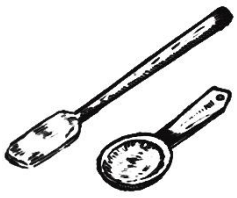
- A crotchet
- Sewing needles
- Mphero
- Wooden spoons
- A winnower
- A hoe
- and a mortal
- A flour sieve
- An axe
- Knitting needles
- A charcoal stove
- A clay pot
- A pestle

a crotchet

mphero

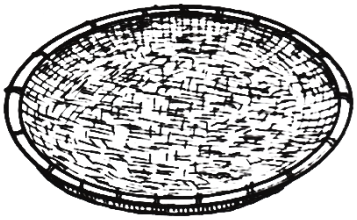


sewing needles

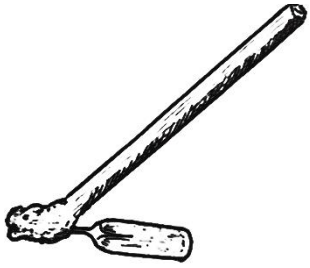


wooden spoons

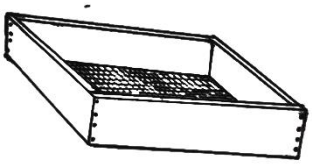
an axe



a winnower



a hoe

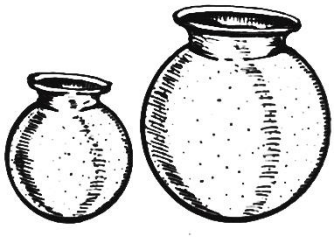


a flour sieve

a charcoal stove

knitting needles

a pestle and a mortar



clay pots

MAKING TECHNOLOGIES FOR DOMESTIC USE

Learners can make different types of technologies that can be used for domestic use.

Making such technologies involves a number of steps.

These are:

1. Identifying the problem

   The first step is to identify the problem to be solved.

2. Doing research

   The second step is to find out as much information as possible about the problem. This may involve research, for example, by asking other people or reading about the problem.

3. Planning

   The third step is to plan how you will solve the problem. This step involves brainstorming, considering different solutions and choosing an idea or solution that can be tried.

4. Outlining the technological processes

   When a solution has been decided upon, you need to outline the process to be followed when designing the technology.

   This would involve thinking about:

   - what exactly the technological device is expected to do
   - what materials are needed to make the device
   - the costs involved
   - the size and shape of the device
   - who will use my device
   - what the production process will involve
   - safety, health or environmental considerations

5. Making the technological device

   This step involve getting the necessary tools and other material to make the technological device

6. Testing the technological device
   Once the technological device has been made, it should be tested to see if it works according to expectations. If not, the whole process should be reviewed to identify and rectify any problem.

7. Evaluating the technological process
   Evaluation should take place at each step of the technological process in order to assess how the production is progressing.

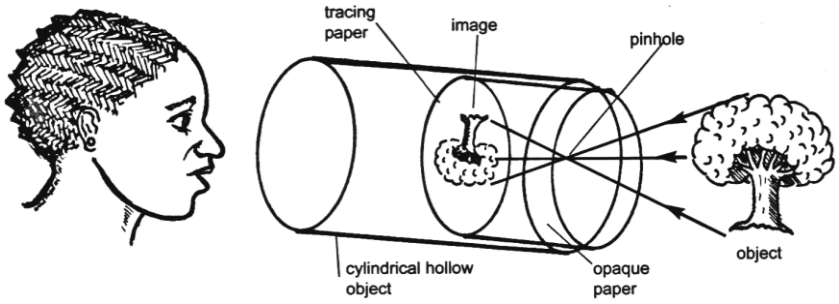
UNIT 17 PROPERTY OF LIGHT, HEAT AND SOUND

PROPERTY OF LIGHT
Light has several properties.

The list below shows some of the properties of light:
- light travels in a straight line
- light has speed
- light can be reflected
- light can be refracted
- light rays form shadows when blocked
- light rays can be converged or diverged
- light that is white consists of different colours

LIGHT TRAVELS IN A STRAIGHT LINE
This property of light can be proved through experiments. The action of a pinhole camera and three identical rectangular cards with tiny holes at their centres arranged in a straight line proves that light travels in a straight line.

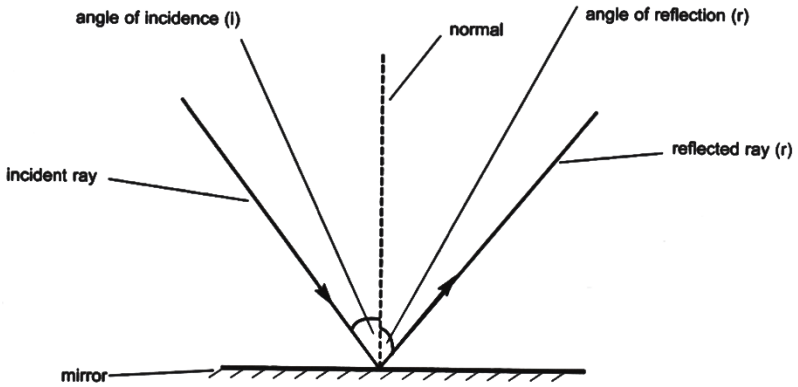
The following diagram shows what happens when light enters a pinhole camera and when light is shone on one rectangular card that is aligned with other two cards**.**



REFLECTION OF LIGHT

Light can travel through a vacuum and some media that are transparent. Light is reflected (bounced off) by certain media. Mirrors are good examples of objects that reflect light. Reflection of light from smooth surfaces is done in a special way. A ray that is incident on a mirror surface is reflected following the laws of reflection.

The diagram that follows shows reflection based on the law that states that the angle of incidence (angle between the incidence ray and normal) is equal to the angle of reflection (which is the angle between the normal and the reflected ray). The light that strikes the mirror surface at 90^0 is reflected along the same path.

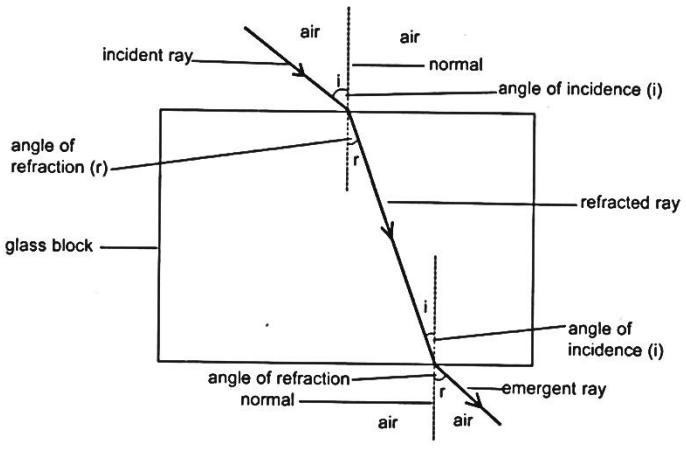


reflection of light

REFRACTION OF LIGHT

Refraction is the sudden change of direction of light as it travels from one medium to another of different optical density. When an incident ray goes from a less dense medium like air to a denser medium like a glass block, the refracted ray is always refracted towards the normal. As the refracted ray travels from the glass to air, once again, it is refracted away from the normal.

The diagram that follows shows light travelling from a less dense medium to a more dense medium, and then to a less dense medium, once again.



TECHNOLOGIES THAT USE PROPERTIES OF LIGHT

Technologies	**Property of light**	**Uses**
Microscope	Refraction	To magnify objects
Periscope	Reflection	To see things above the observer or over an obstacle
Mirror glass	Reflection	To see an image of oneself
Telescope	Refraction	To make distant objects to look bigger
Car mirror	Reflection	To see what is behind vehicles
Reflector	Reflection	To make something visible
Projector	Reflection and refraction	To project images on a screen
Pair of binoculars	Refraction	To see distance objects clearly

PROPERTIES OF HEAT

Heat energy can be absorbed or lost by a substance. The heat energy lost by one substance is transferred to another substance even if there is no contact between them. Heat travels through various substances at different speeds.

The speed of heat in a substance may depend upon the nature of the substance and closeness of the particles in the substance.

As heat flows through substances it can:

- cause expansion of matter
- cause changes of state of matter
- be transferred through a medium
- make things move

TECHNOLOGIES BASED ON THE HEAT

Substances normally expand as heat passes through them. Thermometers are constructed based on the expansion and contraction of the liquid that is used. Some joints are made based on the principle of expansion and contraction.

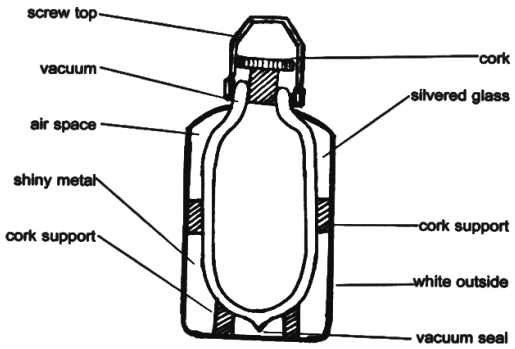
There are technologies that have been made to cool a device so that it contracts for it to fit into the hole of another device. On expansion, the material firmly fits into the hole thereby making an extremely strong joint.

Such joints exist in bicycles, cars and other heavy machinery. Automatic switches (thermostats) in electric pressing irons and geysers work on the principle of expansion and contraction.

Vacuum flasks have been designed to employ some of the properties of heat. The vacuum flasks have a glass that has the inner part and its outer surface silvered.

The silvered surface radiates (emits) very little amount of heat and absorbs very little heat from its outer surface since polished (shiny) surfaces are bad radiators or emitters of heat.

The diagram below shows a vacuum flask.



A vacuum flask

Thermometers, cooling systems in cars and industries, electric pressing irons and geysers are some of the technologies that use properties of heat.

PROPERTIES OF SOUND

Sound is produced by anything that is vibrating. Just like heat, sound can be absorbed, transmitted through substances, reflected and refracted.

An echo is a good example of reflected sound. Sound travels at different speeds in different materials.

Sound requires a medium for its transfer. Sound spreads out in all directions from the source of production.

TECHNOLOGIES THAT USE THE PROPERTIES OF SOUND

There are a number of technologies that use properties of sound.

These include musical instruments such as a xylophone, mabatcha/badza, guitar, drum, flute, piano, trombone and trumpet.

UNIT 18 FORCES

TYPES OF FORCES

A force can be a pull or a push that can change the state of rest of an object.

The diagram that follows shows the illustrations of a pull and a push.

a pull a push

Different bodies can exert a pull or a push on objects. The earth exerts a force of attraction on objects. The force the earth exerts on objects is called the force of gravity or the gravitational force.

Gravity is defined as the pull of the earth. When one object moves or tries to slide over another object, a force to oppose the motion arises.

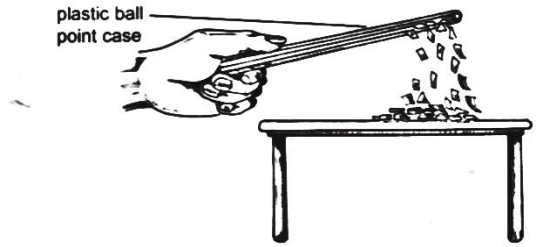
The force that is produced as a result of sliding or rubbing two bodies together is known as the frictional force or friction.

One can also produce an electrostatic force. This type of force can be produced by rubbing the plastic case of a ball point against the hair or fur. When the case is brought close to small pieces of paper it attracts them.

This happens because of the force of attraction that exists between the pen and the pieces of paper.

This attractive force is called an electrostatic force.

The diagram that follows shows a ball point case picking small pieces of paper.

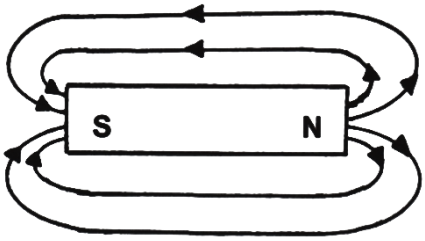


a charged ball point case attracting small pieces of paper

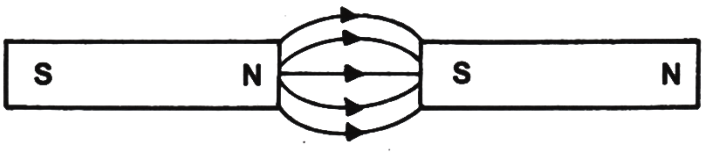
Magnets also exert forces on each other as well as on materials that are magnetic. The force which a magnet exerts is called magnetic force.

The magnets will attract each other if unlike poles of the magnets face each other. Otherwise, a force of repulsion will exist when like poles of magnets face each other.

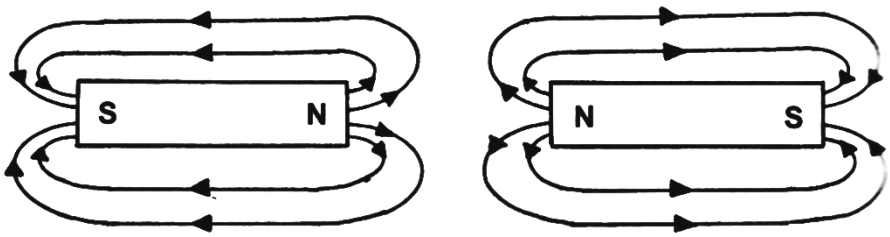
The following diagrams show attractive and repulsive forces between unlike and like poles of magnets.



lines of force around a magnet



lines of force between unlike poles
of magnets resulting in
a force of attraction



lines of force between like poles
of magnets resulting in a force of repulsion

A stretched elastic band possesses strain energy. The band can exert a force on other objects. The force that the elastic band exerts is called an elastic force. The forces that have been discussed so far are just a few examples of the many different types of forces that exist.

USES OF FORCES

- forces can change the shape of objects
- forces can make objects at rest start moving
- forces can make objects move faster or slower
- forces can make things spin round
- forces can change the direction of moving objects
- forces can stop moving objects
- forces can produce heat

TECHNOLOGIES THAT USE THE PRINCIPLES OF FORCE

- Sewing machines
- Cars
- Bicycles
- Aeroplanes
- Musical instruments
- Electric fans
- Boats
- Traps
- Bows and arrows
- Balances
- Mortars and pestles
- Catapults

UNIT 19 NUTRITIONAL DEFICIENCY DISEASES

Nutritional deficiency diseases are due to lack or shortage of a particular nutrient in the diet.

When the body cannot cope with the little amounts supplied, specific signs and symptoms appear. Various nutritional deficiency diseases show different signs and symptoms.

Some of the deficiency diseases which affect people especially children are night blindness, scurvy, rickets, anaemia and goiter. These deficiency diseases can be prevented and treated.

NIGHT BLINDNESS

Night blindness is caused by lack of vitamin A in the diet. This deficiency disease is characterized by inability to see in dim light, dry and rough skin, and skin infections.

SCURVY

Scurvy is caused by lack of vitamin C in the diet and it is characterized by bleeding of gums, slow healing wounds, slow growth in children and loose teeth.

The illustration below shows a person with scurvy

a mouth of a person with scurvy

ANAEMIA

Anaemia is caused by lack of iron in the diet and it is characterized by tiredness, pale hands, pale mouth, pale skin, pale mucus membranes and pale eyes and heart palpitations

GOITRE

Goitre is caused by lack of iodine in the diet. It is characterized by slow growth in children and an enlarged gland at the front of the neck.

The illustration below shows a person with goitre

a person with goitre

RICKETS

Rickets are caused by lack of vitamin D in the diet and are characterized by soft bones. The teeth are also affected.

Due to the weight of the body, the soft bones of the legs bend outwards.

Rickets mostly occur in children.

The illustration below shows a child with rickets

a child with rickets

PREVENTIVE MEASURES AND TREATMENT OF DEFICIENCY

Nutritional deficiency diseases can be prevented by ensuring that the nutritional needs of various members of the family, especially children, are met through a proper diet. As such, families are to eat a variety of foods in the right amounts. Once affected by this nutritional deficiency diseases they can be treated the first step in treating deficiency diseases is diagnosis. There after the treated can be corrected supplying the missing nutrients in the diet. Nutrients supplements are used where the condition is severe.

Preventive measures and treatment of deficiency disease

Deficiency disease	**Preventive measures sources**	**Treatment**	**Suitable foods**
Night blindness	Eating a variety of foods (balanced diet) including foods rich in vitamin A	➢ Provision of foods rich in vitamin A	Yellow sweet potatoes, carrots, milk, oily fish, cheese, eggs, liver, oils, dark green vegetables and fruits
Scurvy	Eating a variety of foods (balanced diet) including foods rich in vitamin C	➢ Provision of foods rich in vitamin C	Citrus fruits, potatoes, dark green vegetables
Anaemia	Eating a variety of foods (balanced diet) including foods rich in vitamin C	➢ Provision of foods rich in iron and vitamin C ➢ Use of iron tablets or folic acid	Meat, liver, kidney , peas, beans, dark green vegetables
Goitre	Eating a variety of foods (balanced diet) including foods rich in iodine	➢ Provision of foods rich in iodine ➢ Use of iodised salt in foods	Iodised salt, sea foods, sea fish and shell fish
Rickets	Eating a variety of foods (balanced diet) including foods rich in vitamin D	• Provision of foods rich in vitamin D	Sunshine, oily fish, margarine, butter, eggs, milk, cheese

UNIT 20 DYEING MATERIALS

DYEING FABRICS AND OTHER MATERIALS

The process of dyeing fabrics and other materials can be done in different ways depending on the type of dye to be used.

Dyes come in different names such as dylon, dryad and reeves. These are suitable for dyeing natural fibres and good for commercial purposes.

These can be bought from shops. Dyes can also be made locally. These include boiled concentrated solution of tea leaves, inks, maroon coloured leaves of maize, onion skins, red cabbage, mushrooms, carrot tops, spinach and roots of some trees, for example n`joka in Yao.

It is essential to know the reaction of different types of dyes to fabrics and other materials. Different fabrics and other materials absorb dyes differently.

Fabrics made from natural fibres, for example, cotton, linen, and woollen materials dye more readily than fabrics made from artificial fibres, for example, nylon and terelyne.

Materials made from natural fibres give best results for dyeing because they readily absorb dyes.

Cotton fabrics and garments are the best for dyeing purposes. Cotton fabrics can easily be identified by burning a piece of fabric. Cotton fabrics will burn like wood, producing ash.

If the fabric shrinks, it is not cotton.

Other ways of identifying fabrics and other materials that are good for dyeing include:

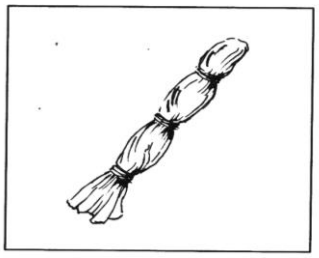
- Dipping a piece of material in a dye solution and observing for 5 to 10 minutes. If the fabric gives a deeper shade, it is good for dyeing. If it is pale, it is not good for dyeing
- Putting drops of water on a piece of material. If the material readily absorbs water, then it is good for dyeing**.**

PREPARATION OF FABRICS AND OTHER MATERIALS FOR DYEING

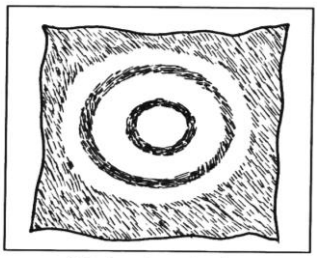
The process of dyeing materials

- Wash the material and remove dirt and soften it
- Decide and prepare the design you want your material to be.

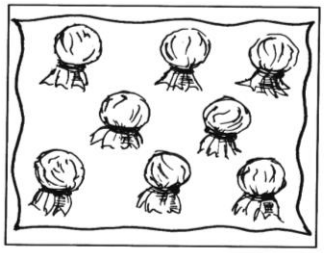
Here are examples of illustrations of pieces of fabric that have been prepared for dyeing and how the fabric looks like after dyeing.



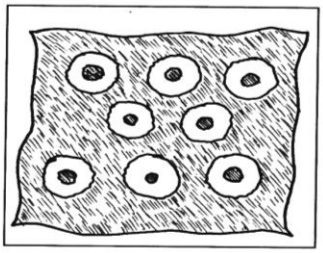
fabric before dyeing



fabric after dyeing



fabric before dyeing



fabric after dyeing

USING ARTIFICIAL DYES

1. Dilute 40g of dylon in 1 litre of hot water
2. Stir well until the dye is dissolved
3. Add 1 tablespoon of kitchen salt to the solution and 1 packet dylon cold fix (about 50g) or soda
4. Stir well until the salt and dylon cold fix or soda are dissolved.
5. Add enough water just to cover the material
6. Immerse the material in the solution for 1 hour, keep on turning the material for the first 10 minutes. This allows the dye to penetrate deeper into the material.
7. Rinse thoroughly in cold wate**r.**

Note

- 1 tin (about 40g) of dylon is enough for a 250g piece of fabric. Therefore, use only what is needed.
- Salt, dylon cold fix or soda are added to fix the colour

USING NATURE DYES

1. Allow some coloured sheaths of maize cob or tea leaves or roots to boil for about 10 minutes
2. Immerse the material into the boiling solution
3. Keep on stirring at intervals for 30 minutes
4. Add at least a tablespoon full of salt
5. Stir until the salt dissolves
6. Allow the contents to cool down.
7. Rinse the material thoroughly in cold water

Note

The water should be just enough to cover the fabric to the dyed. Sometimes chemicals are added to the natural dyes to facilitate the absorption of the dyes.

UNIT 21 MACHINES

MACHINES THAT USE OF PRINCIPLES OF LEVERS

Levers have a number of functions.

The following table shows some of the machines that use the principle of levers and their functions.

Lever	**Function**
Wheelbarrow	Carrying loads
Battle opener	Opening bottles
Balance	Weighing masses
Pliers, spinners	Tightening bolts or unscrewing bolts
Jack	Lifting heavy bodies
Pair of scissors	Cutting things
Knife	Cutting things
Crowbar	Lifting things
Nail cutter	Cutting fingernails
Pair of tongs, tweezers	For holding small objects, hot objects or dangerous materials
Bicycle brakes	For stopping a bicycle
Bole holes	For drawing underground water

PULLEY SYSTEMS

Pulley are used to:

- change direction of a force
- reduce the force needed to raise a given load

Pulley systems can be found in garages, curtain rails, bicycles, cranes, elevators and toys.

UNIT 22 GROWING UP

PHYSICAL AND EMOTIONAL CHANGES IN ADOLESCENTS

Girls and boys may reach adolescence stage between the ages of 11 and 15.

Adolescence is the period when boys and girls are changing from childhood to adulthood.

There are several changes which boys and girls undergo during this stage.

These include physical, emotional, mental and social changes.

The following table shows physical and emotional changes that boys and girls undergo as they grow up.

Changes in boys

Physical changes	Emotional changes
➢ Grow taller and heavier. Their hands and shoulders become bigger and stronger. ➢ The skin becomes oily and the face develops pimples ➢ Grow hairs in the armpits, around the genitals and on the face ➢ Produce sperm ➢ Develop deep voice ➢ Experience wet dreams	➢ Begin to develop sexual feelings and start getting excited when they see a girl ➢ Interest in girls increases and start taking extra care on how they look ➢ Develop more self confidence and do not like to be forced to do things they do not want to do ➢ Experience frequent changes in their mood ➢ Become more sensitive to failure ➢ Become more sensitive to remarks from adults and peers about the changes they are going through.

Changes in girls

Physical changes	**Emotional changes**
➢ Grow faster, their hips get wider and their breasts start to grow bigger. ➢ The skin becomes oily and the face develops pimples ➢ Hair grows in the armpits and around genitals ➢ Experience menstrual period ➢ Their voice becomes softer	➢ Begin to develop sexual feelings and get excited when they see a boy ➢ Interest in boys increases and they start taking extra care about how they look ➢ Develop more self confidence and do not like to be forced to do things they do not want to do. They want to be treated like adults ➢ Become more sensitive to remarks from adults and peers about the changes they are going through ➢ Experience frequent changes in their mood ➢ Become increasingly sensitive to failure

THE MENSTRUAL CYCLE

At puberty, girls will start producing egg cells. An egg is produced every month by one or both ovaries. This is called ovulation. Ovulation has a reproductive function. When the egg cell is fertilized, the results is pregnancy.

When ovulation is happening, the wall of the uterus becomes thick as it prepares to receive an embryo after fertilization. When the egg is not fertilized, it dies. The wall of the uterus then breaks down leading to a discharge of bloody material. This discharge of bloody material is called menstruation. Menstruation happens every month, hence it is called menstrual cycle.

Menstruation lasts about 7 days. Menstruation is a normal thing for girls. It may start at the age of 11 in some girls is as late as the age of 18 in others. A women menstruates up to the age of 45 to 50.

During menstruation, girls need to take extra care of themselves.

They can do this by:

- taking a bath regularly
- changing absorbent materials such as cotton wool regularly
- using clean and dry sanitary towels
- washing hands after handling sanitary towels
- wearing clean clothes

EFFECTS OF PREMARITAL SEX

- Unplanned pregnancies
- Contracting HIV and other sexually transmitted infections
- Early marriages
- Poor performance at school
- Dropping out of school

Typed by Zikomo Masese Banda and Shadrach Bowa Chabwera (Brother-in-law)

Edited by Zikomo Masese Banda

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