THEME: THE WORLD OF LIVING THINGS

TOPIC: CLASSIFICATION OF PLANTS

- Flowering plants
- Division of flowering plants
- Division of flowering plants
- Root system in plants
- Stem propagation
- Types of leaves
- Transpiration in plants
- Pollination
- Tropism
- Fruits
- Dispersal of seed and fruits
- Non-flowering plants
- Plant propagation

THEME: THE SCIENCE IN HUMAN ACTIVITIES AND OCCUPATION

TOPIC: KEEPING CATTLE

- Animal husbandry:
- Importance of keeping cattle.
- Types of cattle
- Types of cattle breeds
- Types of breeding
- Reproduction in cattle
- Heat periods
- Service/insemination
- Systems of natural insemination
- Fertilization in cows
- Cattle management of a farm
- Housing cattle.
- Fencing cattle
- Types of cattle feeds
- Methods of grazing
- Farm structures
- Cattle management practices
- Deworming animals
- Milking
- Methods of preserving milk.
- Animal pests/animal parasites
- Cattle diseases.
- Groups of cattle diseases
- Viral cattle diseases
- Bacterial cattle diseases
- Starting a livestock farm

A Farm record

THEME: THE ENVIRONMENT

TOPIC: RESOURCES IN THE ENVIRONMENT

- Land.
- Water
- Animals and plants
- Air and wind.
- Types of resources
- Renewable resources:
- Non-renewable resources.
- Conservation of wild life;
- Importance of wild life

THEME: THE HUMAN HEALTH

TOPIC: THE RESPIRATORY SYSTEM

- Types of respiration
- Organs of respiration and their functions
- Diseases and disorders of the respiratory system
- Care for the respiratory system.
- Habits that improve the working of the respiratory system
- Advantage of regular body exercises

TOPIC 3: CLASSIFICATION OF PLANTS

Plants are living components of the environment that make their own food
plants are able to make foood because they have chlorophyll.
Chlorophyill helps the green plants to absorbs sunlight which help them to make their own food.

Classification of plants

It refers to grouping of different plant species according to their different characteristics.

Characteristics of plants used in grouping them

- Their germination mode
- Their reproduction mode
- Their mode of feeding

Plants are classified into two groups

- Seed bearing plants
- Spore bearing plants
- Algae

Seed bearing plants

These are plants that reproduce by means of seeds.
They are divided into two parts namely:

- Flowering plants
- Non flowering plants

Learner's activity

1) In **one** sentence state what you understand by the term classification of plants

_____
_____

2) Name the group of plants which do not bear flowers.

_____
_____

3) Apart from the group mentioned above, name any **two** other groups of plants.
(i) _____
(ii)_____

4) Apart from root system, mention any other system of a flowering plant.

_____
_____

5) State any **two** characteristics of plants used in grouping them.
(i) _____
(ii)_____

6) Write **one** way in which roots are useful to;
(a) People:_____
(b) Plants:_____

7) Mention any **two** similarities between plants and animals.
(i) _____
(ii)_____

8) Below is a diagram of an animal. Use it to answer questions below.

FLOWRING PLANTS

Flowering plants are plants that bear flowers and produced by means of seeds.

Flowering plants are made up of two systems

1. Shoot system
2. Root system

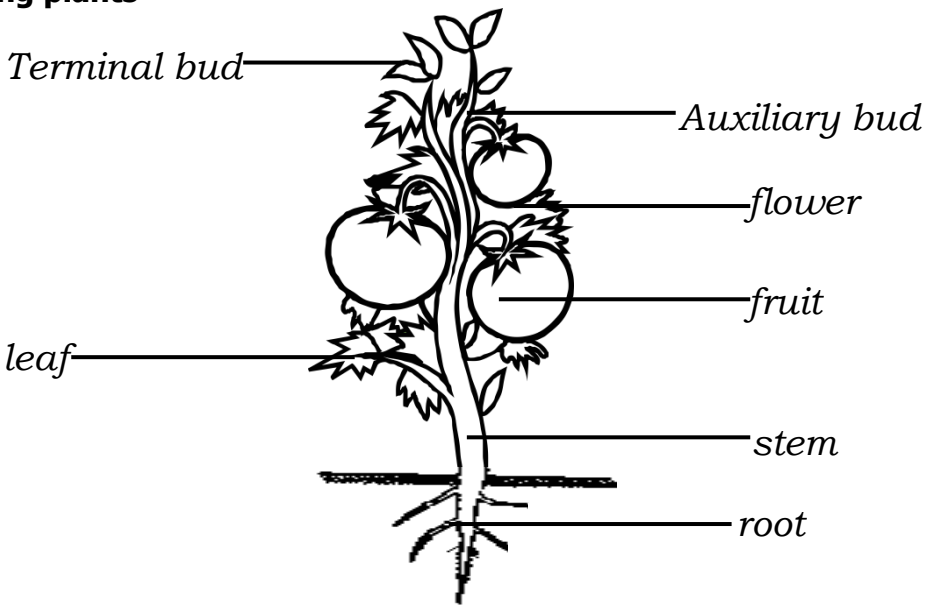
Shoot system

Shoot system is part of plant that develops from the plumule of the seed. It grows above the ground.

Parts of a shoot system

1. Stems
2. Flowers
3. Nodes
4. Internodes
5. Branches
6. Axillary bud
7. Fruits
8. Terminal buds
9. Leaves

Parts of flowering plants



Learner's activity

1. What are flowering plants?

   _____

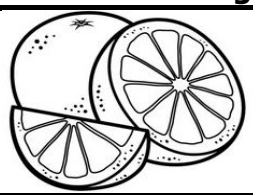
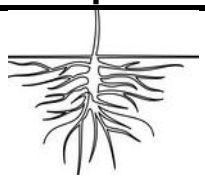
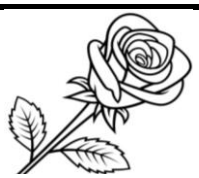
   _____

2. Mention any **two** systems of flowering plants.
   (i) _____
   (ii)_____
3. Name the system of a flowering plant which grows:
   a) above the ground:_____
   b) in the soil: _____
4. State any **two** examples of flowering plants found in the school compound.
   (i) _____
   (ii)_____
5. State the main reason why bean plants are referred to as flowering plants.

   _____
6. Mention any **two** similarities between plants and animals.
   (i) _____
   (ii)_____
7. Name the part of the plant that grows above the soil.

   _____
8. Which part of a flower develops in to the part of the plant shown above?

   _____
9. **Name the following parts of a plant**

10. Mention any **two** importance of plants to people.
    (i) _____
    (ii)_____

Division of flowering plants

Flowering plants are divided into two;

- Monocotyledonous plats
- Dicotyledonous plants

Monocotyledonous seeds

Monocotyledonous seeds are seeds which come out only one cotyledon.

Examples of monocotyledonous plants

Maize, sorghum, rice, millet, oats

Characteristics of monocotyledonous plants

- Seeds have one cotyledon
- Plants have parallel leaf venation
- They undergo hypogeal germination
- They mainly have fibrous root system

Dicotyledonous seeds

Dicotyledonous seeds are seeds that come out with two cotyledons.

Characteristics of dicotyledonous seeds

- Plants have network leaf venation
- They undergo epigeal germination
- They have a tap root system.
- Their seeds have two cotyledons.
- Their seeds undergo epigeal germination

Examples of dicotyledonous plants

Beans Ground nuts, Soya beans, Oranges, Simsim, Peas, Coffee, Cotton

Legumes

These are plants with root nodules on their roots and seeds in pods.

Examples of leguminous plants:

Beans, ground nuts, soya beans, peas, simsim

Learner's activity

1) In one sentence state what you understand by the term classification of plants.

_____

_____

2) State any **two** divisions of flowering plants.

(i) _____

(ii)_____

3) What are monocotyledonous seeds?

_____

_____

4) Mention any **two** examples of monocotyledonous plants.

(i) _____

(ii)_____

5) Sate any **two** characteristics of monocotyledonous plants.

(i) _____

(ii)_____

6) What are dicotyledonous seeds?

_____

_____

7) Give any **two** characteristics of dicotyledonous seeds.

(i) _____

(ii)_____

8) Mention any **two** examples of dicotyledonous plants.

(i) _____

(ii)_____

9) What are leguminous plants?

_____

_____

Root system in plants

- ✍ The root system is the part of the plant that grows in the soil.
- ✍ The root system involves main root, lateral roots, root hairs and the root cap.
- ✍ A true root system develops from the radicle of the embryo in dicotyledonous plants.
- ✍ Roots of plants which grow from a part of a plant other than radicle are called **adventitious roots**.

Types of root systems

There are basically two types of roots namely:

1. Primary roots
2. Secondary roots

Primary roots.

Primary roots are roots that grow directly from the radical of a seed.

Examples of primary roots

- ✍ Tap roots
- ✍ Fibrous roots

Tap root system.

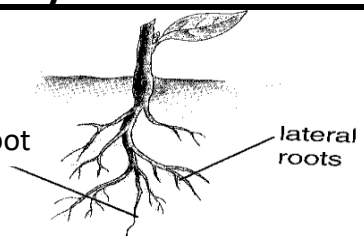
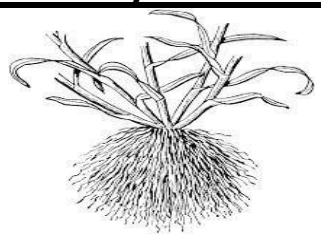
This type of root is formed when the radicle forms a large root with small lateral branches like:

- ✍ Roots of beans
- ✍ Roots or carrots

Fibrous root system

This is a type of root system where there are many roots growing randomly having the same size and length there is no main root.

Structures showing a tap root and fibrous root systems

Tap root system	Fibrous root system
	

Importance of roots to a plant

1. Roots hold the plant (shoot system) firmly in the soil
2. Root hairs absorb water and mineral salts from the soil
3. Some plants store their food in swollen roots.
4. Prop roots provide extra-support to plants
5. Breathing roots absorb oxygen especially in the mangroves.
6. Root nodules of legumes store nitrogen-fixing bacteria that improve soil fertility by fixing nitrogen into the soil.

NB: Mineral salts are absorbed by a process called **active transport.**

Importance of roots to people:

- ✍ Swollen roots with stored food are sources of food to people e.g. Cassava, Sweet potatoes, & Carrots.
- ✍ Some plant roots acts as herbs to cure some diseases e.g. Mangoes, Blackjack, Muringa plant
- ✍ Big dry roots acts as source of wood fuel to people
- ✍ Some big roots can be used in making craft items.

Learner's activity

1. How useful is a root system to a plant?

_____

_____

2. **In the space below, draw the structure of a tap root system**

3. Mention any **two** plants species which are herbal medicines
   (i) _____
   (ii)_____
4. Apart from making craft items, state **one** way in which roots are useful to people.
   _____
   _____
5. In **one** sentence, show the meaning of a flowering plant.
   _____
   _____
6. Give **two** examples of flowering plants
   (i) _____
   (ii)_____

Secondary roots

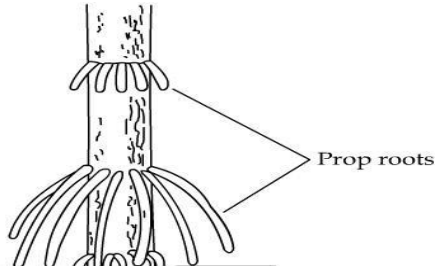
These are types of roots which grow from any other part of a plant like the stem and leaves.

Examples of secondary roots

- Prop roots
- Clasping roots
- Stilt roots
- Roots of bulbs
- Buttress roots
- Roots of corms
- Roots of rhizomes

Prop roots

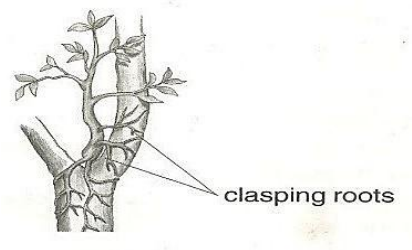
Prop roots are common in cereal crops such as, maize, millet, sorghum and wheat.
They mainly grow to provide extra-support to the plant during the flowering stage.



Clasping roots

These are also adventitious roots found on climbing plants.
Clasping roots enable plants with weak stems to climb other plants and trap sunlight energy
Stilt roots are found on plants which commonly grow in muddy or swampy areas.
They are also known as breathing roots

A structure showing clasping roots & Breathing roots

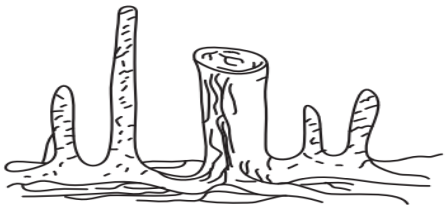


Note: some plants have swollen roots which store food for the plant.

Breathing roots

These are aerial roots which grow upwards and act as breathing organs. Such roots are found in many plants growing in water logged areas.
Examples of plants with breathing roots are: Mangroves,
Breathing roots act as breathing organ for the plant

Diagram showing breathing roots



A plant with breathing roots

a) **Stilt roots**

These are roots which grow in muddy areas in swamps and give extra support to the plant.
Examples include red mangrove tree.

Functions of stilt roots

They give extra support to the plant

b) **Storage roots**.

These are underground swollen roots which store food mainly starch.

Examples of storage roots

a) The swollen tap root of a carrot
b) The branch roots of cassava

The adventitious roots of sweet potatoes and carrots

A carrot is a plant with a swollen tap root and a very short stem at the top.

- ✓ The stem has a terminal bud surrounded by leaf bases
- ✓ It has a swollen tap root because it stores food.

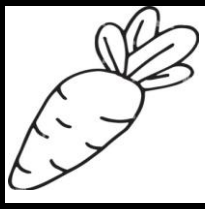
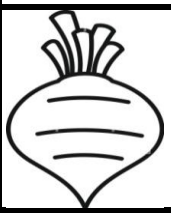
Root tubers:

These are swollen underground roots that store food for the plant.

Examples of root tubers:

1. Radish
2. Turnips
3. Parsnips

Structure of other root tubers:

Cassava	carrot	beetroot	Sweet potato
			

Food stored by root tubers:

Root tubers store starch. They are good source of carbohydrates.

Learner's activity

1. In **one** sentence explain the following terms
   (i) Primary roots.
   _____
   _____
   (ii) Secondary roots
   _____
   _____
2. Give **two** examples of secondary roots
   (i) _____
   (ii)_____
3. State the importance of prop roots to a plant
   _____
4. Name any **one** plant with prop roots.
   _____

Below is a diagram of a beetroot. Use it to answer the questions that follow.

5. Why is the plant above grouped under root tubers?

_____

_____

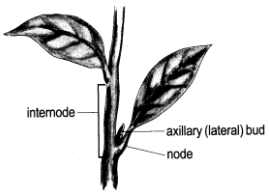
6. Apart from the beetroot, mention any one other plant under the same category.

_____

_____

Plant stems

- The stem is the biggest part of the shoot system of a plant. It holds leaves, flowers, fruits, branches and terminal bud.
- The growing tip of a plant is called a terminal bud
- The angle between each leaf and the stem is called the axil
- In the axils are the auxiliary or lateral bud
- The axillary bud can grow into a new branch or a flower
- A node is the part of a stem where a leaf is fixed
- An internode is the distance (region) between two nodes



Functions of stems to a plant

- They hold and space out leaves to receive the sunlight energy
- Stems transport water and mineral salts from the roots to the leaves
- Green stems help in the process of photosynthesis
- Stems conduct manufactured food in the leaves to all other parts of the plants.
- Stems hold flowers and fruits for easy pollination and dispersal
- Some plant stems have thorns for protection

Functions of stems to people

- Some plant stems act as a source of food to both people and animals
- Big stems provide people with timer and poles for construction
- Plant stems act as a local medicine to cure some animal diseases
- Some plants are harvested to provide wood fuel to people
- Some plant stems are used for propagation i.e. cassava, sugarcanes and some flowers.

Learner's activity

1) How are stems important to leaves of plants?

_____

_____

2) Mention any **two** plants that we eat their stems.
   (i) _____
   (ii)_____
3) Apart from being eaten, mention any **two** other uses of stems to people.
   (i) _____
   (ii)_____

Types of stems

1. Aerial stems – Upright/ erect, climbing, creeping
2. Underground stems
3. Climbing stems.

Upright/erect stems

These are stems found on either dicotyledonous or monocotyledonous plants
They grow straight in space

Examples of plants with upright stems include

- ✓ Woody plants, beans, peas, pineapples, maize, soya beans etc

Underground stems

These are stems which grow from underground

Examples of underground stems:

Stem tubers, bulbs, rhizomes, corms

Note: Examples of upright stems include paw-paws, mangoes, maize, beans etc.
Examples of underground stems are; stem tubers, bulbs and corms.

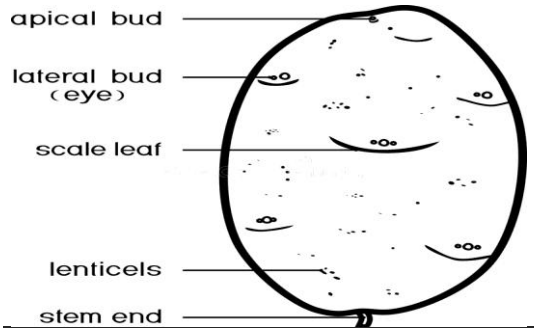
Characteristics of underground stems

1. They have scaly leaves at nodes
2. They have buds or eyes or side shoots in the axil with scaly leaves
3. They have terminal bud which grow into a shoot

Stem tubers

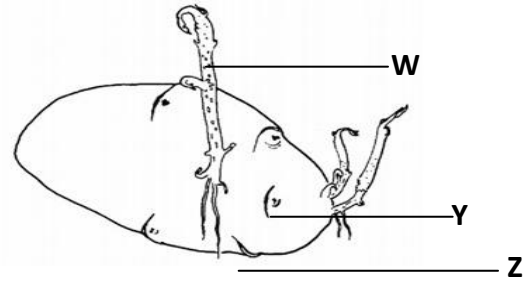
These are swollen underground stems which store food e.g. Irish potatoes and white yam, Coco yam and Irish potatoes

Parts of a stem tuber



Learner's activity

1. What name is given to the stems which grow underground and only leaves come out of the grounds?
   _____
2. Why are underground stems called storage stems?
   _____
   _____
3. Mention any **two** groups of underground stems.
   (i) _____
   (ii)_____
4. Mention any **two** examples of stem tubers.
   (i) _____
   (ii)_____
5. **The diagram below shows the external parts of the Irish potato. Study it carefully and answer the questions that follow.**



a) Name the type of stem shown above.
   _____
b) Name the part marked with letter W, Y and Z.
i) W

ii) Y _____

iii) X _____

6. Which part of Irish potatoes is eaten by people?

_____

_____

7. State the food value we get from eating Irish potatoes.

_____

_____

Bulbs:

A bulb is a condensed as a shoot with fleshy leaves.

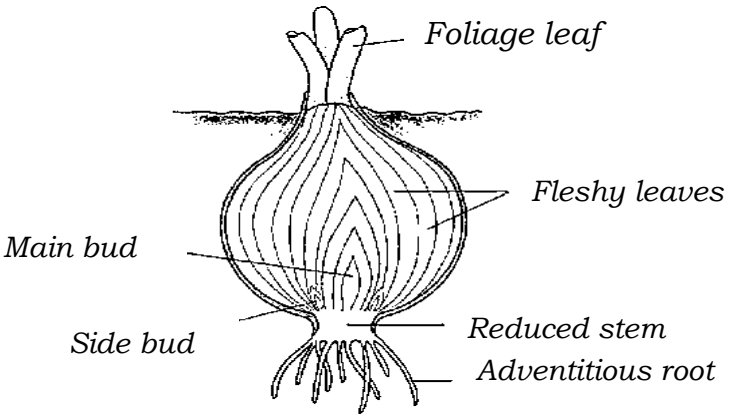
A bulb stores its food in the fleshy swollen leaves

Bulbs have small stems and have lateral or axillary buds

Examples include;

Onions, garlic, spider – lily, shallots

Internal structure of a bulb



Function of each part

1. **Foliage leaves** manufacture food for the plant
2. **Storage/fleshy** leaves store food for the plant
3. **Scaly leaves** protect the inside fleshy leaves
4. **Stem** provide attachment to the leaves
5. **Adventitious roots** the support onions in to soils.

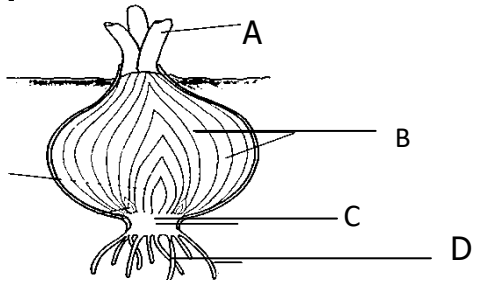
Learner's activity

1) What name is given to the swollen underground stems with stored food?

_____

_____

The diagram below shows the parts of the onion. Study it carefully and answer the questions that follow.



2) Name the type of stem shown above.

_____

_____

3) Name the part marked with letters A,B, C, D.

_____

_____

4) Which part of the above plant store food?

_____

_____

5) Name the type of root system found in the onion.

_____

6) Mention any **two** examples of stem tubers
   (i) _____
   (ii)_____

7) Apart from onion, mention any **one** other example of bulb.

_____

8) Mention any **two** importance of roots to the bulbs.
   (i) _____
   (ii)_____

Rhizomes

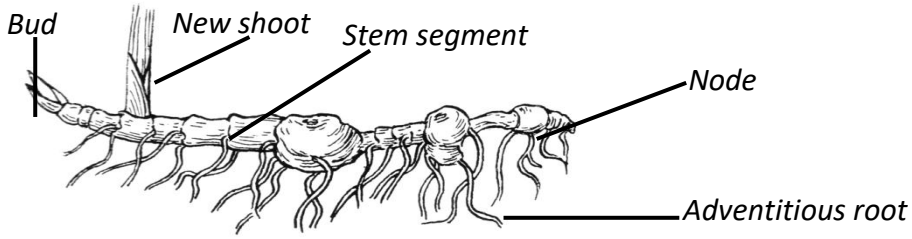
These are horizontal underground stems.

Examples of rhizomes

Ginger Turmeric
Cana lily Zoysia grass

Stalons of spear grass and couch grass Rhizome of a ginger

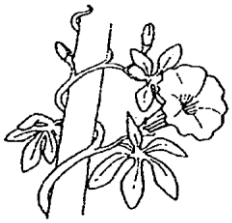
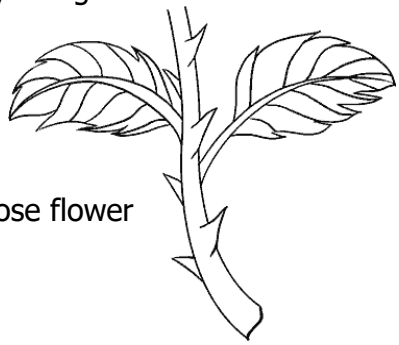
A diagram showing parts of a rhizome



Climbing or creeping stems (weak stems)

These are weak stems of plants that cannot support themselves upright.
Plants climb others for support in order to get sun light energy

How plants climb others

Methods of climbing	illustration	Example of plants
i) Using tendrils  passion fruits cucumber peas pumpkins	iii) By twinning (clasping)  morning glory sponge plants some beans, tomatoes	By using hooks  Rose flower

Corms

A corm is a short vertical underground stem swollen with stored food.

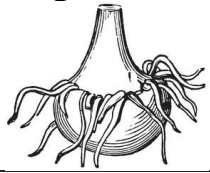
Characteristics

It has scaly leaves, buds and adventitious roots.

Examples of corms

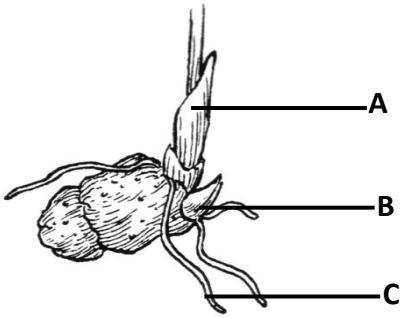
Coco yams, gladiolus, crocus

Diagram of a corm



Learner's activity

1. **Below is the diagram of a rhizome. Use it to answer the questions that follow.**



2.
3. Name the part of the rhizome marked with the letters **A** and **B**
   A: ..... B: .....
4. Apart from ginger and zoysia grass, mention any **one** other example of a rhizome.
   _____
   _____
5. In **one** sentence explain why plants climb others.
   _____
   _____
6. Explain the term stem tubers.
   _____
   _____
7. Write any **two** ways in which stems are useful to;
   (i) Plants
   (i) _____
   (ii)_____
   (ii) People
   (i) _____
   (ii)_____

Stem propagation.

This is the way how some plants can be grown using their stems.

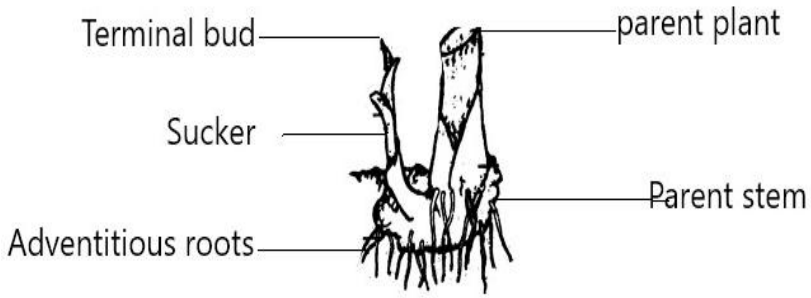
Examples of plants propagated from stems

- ✍ Onions from bulbs
- ✍ Ginger from rhizomes
- ✍ Coco yams from corms
- ✍ Irish potato from stem tuber
- ✍ Cassava from stem cutting
- ✍ Sugar canes

NOTE: suckers of a banana.

These are lateral branches with terminal buds which grow from the base of underground stems of certain plants.

Diagrams of sucker



Examples of plants propagated by suckers

Sisal, banana, pineapples, Aloe Vera

Uses of stems to animals/man

- ✍ Most stems from woody plants are used for timber and firewood
- ✍ Some stems are used as herbal medicines to treat some sicknesses

- Stems are used as food for wild animals
- Some stems are used as human foods especially stem tubers.

Learner's activity

1. What is stem propagation?

   _____

   _____

2. Mention **two** plants propagated from corms

   (i) _____

   (ii)_____

3. Give **two** examples of plants propagated by use of suckers.

   (i) _____

   (ii)_____

Below is a diagram of a plant. Use it to answer the questions that follow.

4. Name the crop grown above.

   _____

   _____

5. How is the crop above similar to sisal in the way they are propagated?

   _____

   _____

6. State **two** uses of stems to people

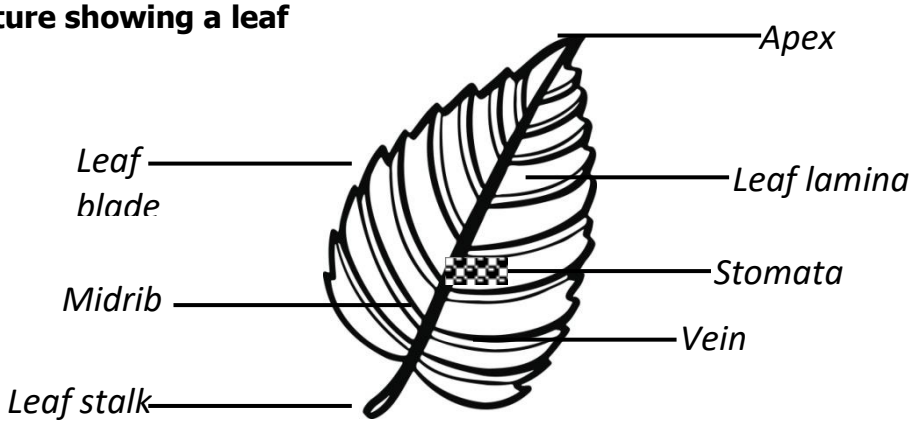
   (i) _____

   (ii)_____

Plant leaves

- Leaves are the green parts of a plant with stomata for gaseous exchange.
- Leaves have chlorophyll to trap sunlight energy and manufacture its starch.
- Leaves also form the shoot system of a plant.
- A leaf is fixed between two internodes on a plant stem or branch.

A drawn structure showing a leaf



Functions of the above parts

1. **Leaf lamina**

- It has a surface area for easy trapping of sunlight energy by the help of chlorophyll
- It's where the stomata are found.
- It helps in the manufacturing of starch

2. **Stomata are** called stoma for singular and stomata for plural.

   They are small holes on the leaf where gaseous exchange takes place.

3. **Leaf veins** are hollow to allow distribution of water and nutrients within the leaf

4. **Leaf apex is** the sharp tip part of a leaf to provide protection to the leaf
5. **Leaf stalk/ petiole** provide attachment of the leaf to stem or a branch.

Two processes that take place in plant leaves namely;

Photosynthesis and Breathing

Learner's activity

1. Identify **two** important processes that take place in plant leaves.
   (i) _____
   (ii)_____
2. Which part of the leaf provides protection?
   _____
   _____
3. State the functions of the following parts of a leaf;
   (i) Veins_____
   (ii) Chlorophyll _____
   (iii) Petiole_____
4. Draw and name parts of a leaf

5. How can plant leaves be useful to people?
   _____
   _____

TYPES OF LEAVES

Types of leaves

- Simple leaves
- Compound leaves

Simple leaves

A simple leaf is a type of leaf with one leaflet on one leaf stalk (Petiole)

Examples of simple leaves are;

- Simple serrated
- Simple palmate
- Simple divided entire
- Simple entire -Simple lanceolate

Simple entire	Simple lobbed	Simple serrated	Simple palmate

Compound leaves

A compound leaf is one with many other leaflets on the same leaf stalk.

The leaflets are divided at the original leaf stalk and each leaflet has its own small stalk called ranchis

Diagram showing compound leaves

Compound pinnate	Compound bipinnate	Compound trifoliate	Compound digitate

Types of compound leaves

1. Compound pinnate

2. Compound bi pinnate
3. Compound trifoliate
4. Compound digitates

Leaf venation

Plant leaf venation refers to the arrangement of veins in a leaf.
Veins in a plant leaf help in the distribution of water and mineral salts and translocation.

Types of leaf venation

There are two types of leaf venation and these are:

- ✍ Network leaf venation
- ✍ Parallel leaf venation

Network leaf venation

In network venation, the veins make something like a net.
Network leaf venation is a characteristic of dicotyledonous plants.

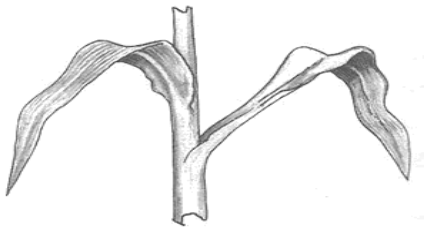
A drawn structure showing a network leaf venation of a plant

Note:
Network leaf venation is common in both simple and compound leaves.

Parallel leaf venation

In parallel leaf venation, there are many veins running parallel to one another.
Parallel leaf venation is a characteristic of monocotyledonous plants like maize, sugarcane, millet, wheat and grass.
Parallel leaf venation is a characteristic of monocotyledonous plants.

Drawn structure showing a leaf with parallel leaf venation



Functions of leaves to plants

- ✍ Leaves make food (starch) for the plant in the process called photosynthesis
- ✍ Leaves allow the plant to breathe through small holes called stomata.
- ✍ Leaves carry out transpiration.

Transpiration is the process by which plants lose water in form of water vapour to the atmosphere.

- ✍ Some leaves store food and water for the plant e.g. onions and bryophyllum
- ✍ Some leaves are used for propagation like in bryophyllum, aloe vera

Uses of leaves to man/animals

- ✍ Some leaves are a source of food to man e.g. cabbages
- ✍ Some leaves are used as herbal medicine
- ✍ Some leaves are used as feeds to animals i.e. pastures
- ✍ Some leaves are used for propagation by man
- ✍ Some leaves are used for thatching houses/shelter for man

Process that takes place in leaves

Photosynthesis in plants

Photosynthesis is the process by which plants manufacture their own food by the help of sunlight energy.
The word "photo" means light, "synthesis" means to make or "build-up"

Raw materials needed

There are two raw materials needed during the process of photosynthesis.

- ✍ Water

- Carbon dioxide gas

Water

This is a raw material absorbed by the plant root hairs during the process of osmosis

Carbon-dioxide

This air passes through the stomata during photosynthesis and then oxygen is given off, while during the process of respiration, oxygen is used and carbon-dioxide is given off.
This is synthesized to make carbon
Both water and carbon dioxide combine to build up glucose stored in the plant leaves as starch.

Conditions necessary for photosynthesis

1. Chlorophyll – to trap the sunlight energy
2. Sun light energy

- **Chlorophyll**
  This the green pigment (coloring matter) in plants
  Functions of chlorophyll
  It traps sunlight energy from the sun
  This energy is used during photosynthesis by leaves to make starch and store it as chemical energy
- **Sun light**
  This provides light energy for carrying out the process of photosynthesis

How leaves are adapted to photosynthesis

- They have a broad flat shape making a large surface area to allow the absorption of sunlight and carbon-dioxide
- They are thin to allow carbon-dioxide to reach the cells easily
- Most stomata are on the lower side of the leaf exchange of gasses
- The numerous networks of veins supply the cells with water, mineral salts and remove the bi – product of photosynthesis
- Leaves are arranged along the stem in a regular pattern to allow each leaf get sunlight energy

Note:

- Oxygen is a by-product of photosynthesis while starch is the main product.
- Animals get oxygen from the process of photosynthesis.
- Photosynthesis cannot take place at night due to the absence of the sunlight energy.
- Photosynthesis is a chemical change in plants.

Learner's activity

1. Write **one** word to refer to the process by which plants make their own food
   _____
   _____
2. State any **two** conditions necessary for plants to make their food.
   (i) _____
   (ii)_____
3. Write any **one** raw material for the process above
   _____
   _____
4. State **one** way in which the following can be useful during photosynthesis;
   (i) Sunlight_____
   (ii) Water_____
5. Apart from oxygen, mention any other product of photosynthesis
   (i) _____
   (ii)_____
6. Briefly explain why photosynthesis cannot take place at night.
   _____
   _____

TRANSPIRATION IN PLANTS

Transpiration is the process by which plants lose water as vapour into the atmosphere.

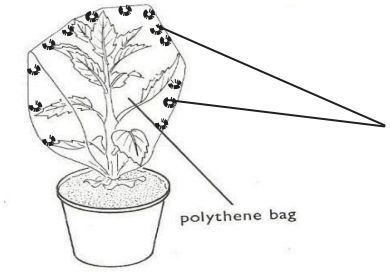
Transpiration takes place in plants through the stomata of leaves, lenticels and in the cuticle of stems.

How leaves are adapted to transpiration

- ✍ They have a broad flat shape making a large surface area to allow the absorption of sunlight and carbon-dioxide
- ✍ They are thin to allow carbon-dioxide to reach the cells easily
- ✍ Most stomata are fond on the lower side of the leaf for exchange of gasses
- ✍ The numerous networks of veins supply the cells with water, mineral salts and remove the bi – product of photosynthesis
- ✍ Leaves are arranged along the stem in a regular pattern to allow each leaf to get sunlight energy

Experiment to approve transpiration in plants

- ✓ Get a plant with healthy leaves
- ✓ Cover it with polythene bag
- ✓ Leave it there for about 2 hours



Results/observation

Droplets of water are found on the inside of the polythene bag

Conclusion

Plants give off water in form of water vapour

Factors that affect the rate of transpiration in plants

1. **Wind**
   - ✓ Wind blows off the water vapour on the plant leaf giving chance or space for more vapour to come out. This increases the rate of transpiration.
2. **Humidity:**
   - ✓ Humidity is the amount of water vapor in the atmosphere.
   - ✓ High rate of humidity lowers the rate of transpiration and vice versa.
3. **Temperature**:
   High temperature during hot days causes plant leaves to lose a lot of waterthan on cool days.
4. **Sunlight:**
   Heat from the sun causes the opening of the stomata, lenticels and cuticle hence creating more chances of losing water.
5. **Light**
   Light increases the rate of water loss, i.e. the stomata are open during day and closed at night
6. **Surface area of the leaf:**
   Plants with small surface area of their leaves lose water at a lower rate than those with larger leaf surface area.
7. **Number of stomata:**
   The more the stomata, the higher the rate of transpiration and vice versa

Types of transpiration:

1. Stomatal transpiration
2. Cuticular transpiration
3. Lenticular transpiration

Note:

In stomatal transpiration plants lose water through stomata.

In cuticular transpiration plants lose water through the cuticle of stems.
In lenticular transpiration plants lose water through lenticels.

Importance of transpiration to the plants

1. Transpiration promotes capillary attraction.
2. Transpiration helps in cooling the plant during a hot day.

Importance of transpiration to the environment

1. The transpired vapour from the plants helps in the formation of rain.

Dangers of transpiration

- ✍ Excessive transpiration makes plants to dry (wilt)
- ✍ It lowers the crop yields due to less water left in the plant.

Ways how plants reduce the rate of transpiration.

- ✍ Some plants reduce the rate of transpiration by shedding their leaves especially during dry season e.g. deciduous plants (Mvule, Oak& fig trees)
- ✍ Stems have tough cuticles and lenticels to guard against water loss.
- ✍ Some plants curl their leaves
- ✍ Some plant leaves have few stomata and distributed at the lower part of the leaf.
- ✍ Some plants have leaves with a small surface area to reduce transpiration.
- ✍ Leaves have a wax-like layer to cover their stomata to limit the water loss.

Learner's activity

1. Briefly explain the term transpiration
   _____
2. Cite out any **two** factors that affect the process of transpiration
   (i) _____
   (ii)_____
3. Give **two** ways in which transpiration can be useful to a plant
   (i) _____
   (ii)_____
4. Explain any **two** ways in which transpiration can be a disadvantage to a plant.
   (i) _____
   (ii)_____
5. Make an illustrative drawing to show that a plant shoot transpires

Buds

A bud is a small part on a plant that grows into flowers, branches and leaves

Types of buds

1. **Terminal buds** are the main growing tips of a plant shoot.
2. **Axillary buds** are buds which grow into branches and flowers.

Importance of buds to plants

Buds develop into branches and flowers.

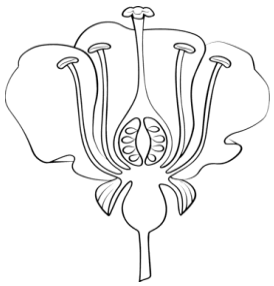
Flowers

A flower is a reproductive part of a plant.
It is a part of the shoot system of a plant in which reproductive cells (gametes) are produced.
The main function of a flower is to produce fruits and seeds

The external structure of a flower

The external structure of a flower is made up of;
Petals, sepals, receptacle, flower stalk
In some flowers we have the epicalyx below the calyx (sepals)

The structure of a flower



Functions of the parts of a flower

Petals;

The petals are brightly coloured to attract pollinating agents like insects, birds and animals

Pistil/carpel

The pistil is a female part of a flower. It is made up of:

Ovary, Style, Stigma

Ovary contains undeveloped seeds called ovules. An ovule is a female gamete.

Style is a tube running from the stigma to the ovary.

It holds the stigma upright to get pollen grains

Stigma is the part which receives the pollen grains during pollination.

Stamen is the male part of a flower. It`s made up of ;

The filament and anther

- ✓ Anther produces pollen grains
- ✓ Filament supports the anther

Sepals

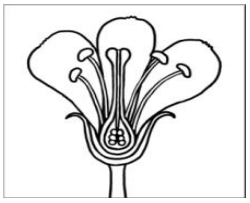
- ✍ Group of sepals is called calyx
- ✍ The main function of the calyx is to protect the young flower when it is in bud stage.
- ✍ The calyx is usually green, so it carries out photosynthesis
- ✍ The calyx also has veins and looks like a reduced leaf
- ✍ Epicalyx is found below the calyx.

Flower stalk

It holds the flower in an upright position for easy pollination

Learner's activity

1. What scientific name is give to a group of;
   (a) Petals :_____
   (b) Sepals : _____ `
2. Of what importance are brightly coloured petals to a plant
   _____
   _____
3. Give **two** uses of flowers to human beings
   (i) _____
   (ii)_____
4. State the main reason why petals of some flowers are brightly colored.
   _____
   _____
5. State the male part of a flower
   _____
   _____
6. What is the main function of the calyx?
   _____
   _____
7. Draw and name parts of a female part of a flower



Pollination in plants

Pollination is the transfer of pollen grains from the anther to the stigma of a flower on a plant.
Pollination helps to allow fertilization in plants
The pollen grains are the male gametes while the ovules are the female gametes in plants.

Types of pollination

1) Self pollination
2) Cross pollination

Self pollination

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

Adaptations of flowers to self pollination

- The anther heads and stigma mature at the same time e.g. tomato flowers
- The flower remains closed until self pollination has taken place
- The flower is hermaphrodite i.e. it has both male and female parts
- Some flowers are buried in the ground until self- pollination has taken place

Characteristics of self- pollinated flowers

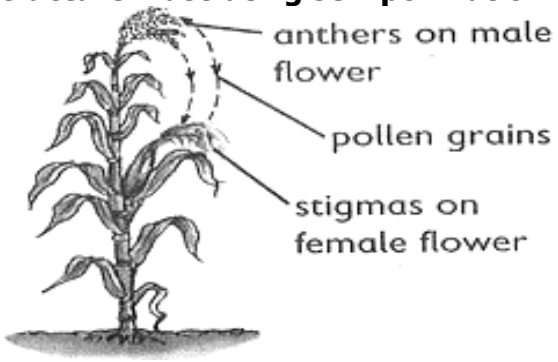
- ✓ Filaments are longer than the style making it easy for pollen grains to fall on the stigma
- ✓ The flowers do not produce nectar
- ✓ The flowers do not have scent.

A scent is a good smell

Examples of plants that undergo self-pollination

Beans, ground nuts, simsim, tomatoes

Structure illustrating self-pollination



Advantages of self pollination

It helps to maintain pure breeds

Disadvantages of self pollination

Flowers that undergo self -pollination are difficult to pollinate because stamen sometimes do not mature at the same time as the pistils

Learner's activity

1. Define pollination.
   _____
   _____
2. In which way is pollination helpful to plants?
   _____
   _____
3. Cite **two** types of pollination
   (i) _____
   (ii)_____
4. What is self pollination?

_____
_____

5. State **two** adaptations of flowers to self pollination.
   (i) _____
   (ii)_____
6. Mention **two** characteristics of self- pollinated flowers
   (i) _____
   (ii)_____
7. State **two** examples of plants that undergo self-pollination.
   (i) _____
   (ii)_____
8. Mention **two** advantages of self pollination
   (i) _____
   (ii)_____
9. Give **two** disadvantages of self pollination
   (i) _____
   (ii)_____

Adaptations of flowers for cross pollination

- ✓ The male and female flower occur on the same plant but mature at different times i.e. the stamen may mature earlier than the pistil e.g. maize plant and coconut plant
- ✓ The male and female flowers occur on separate plants e.g. pawpaw
- ✓ The pollen grains cannot germinate on the stigma of the same flowers and if they do, fertilization cannot occur e.g. passion fruit flower

Examples of plants that undergo cross pollination

Pawpaw
Passion fruits

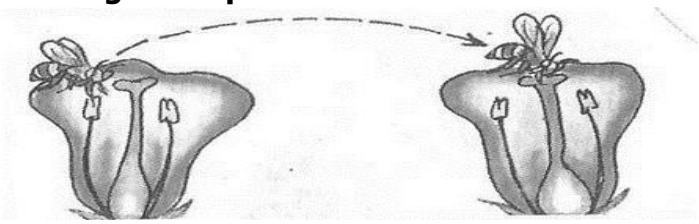
Advantages of cross pollination

- ✍ Cross pollination can result into new varieties of plants
- ✍ It can take place even if stamens do not mature at the same time as pistils
- ✍ seeds are produced in greater quantities

Disadvantages of cross pollination

- ✍ Plants waste a lot of pollen grains
- ✍ Only few flowers are pollinated
- ✍ Pollination may fail due to distance barrier
- ✍ Flowers depend on external agents of pollination

Illustration showing cross-pollination



Learner's activity

1) What is cross pollination?

   _____

   _____

2) State any **two** adaptations of cross pollinated flowers
   (i) _____
   (ii)_____
3) State any **two** examples of plants that undergo cross pollination
   (i) _____
   (ii)_____
4) Give any **two** advantages of cross pollination
   (i) _____
   (ii)_____
5) Name the type of pollination in pawpaw.

   _____

   _____

6) Apart from paw paws, mention any two other plants which undergo cross pollination.
   (i) _____
   (ii)_____
7) Mention any **two** disadvantages of cross pollination
   (i) _____
   (ii)_____

Agents of pollination:

An agent of pollination refers to the factors that are responsible or cause pollination to take place.

Agents of pollination

1) Wind
2) Insects
3) Flowing water
4) Animals

Wind pollinated flowers

When wind blows, pollen is transferred from the anther head of a flower to the stigma of a flower hence pollination takes place.

Characteristics of wind pollinated flowers

- The flowers are small and not easily seen
- The petals have dull colours
- The flowers do not produce nectar
- They produce a lot of pollen grains because a lot of it falls on wrong parts or areas
- They have small smooth and light pollen grains
- The pollen grains are light so that they can easily be blown by wind
- They have a long feathery stigma to increase chances of pollen sticking to them
- The flowers are not scented.

Learner's activity

1) Define the term agents of pollination.

   _____

   _____

2) Mention any **two** agents of pollination
   (i) _____
   (ii)_____
3) Why is wind referring to as agent of pollination?

_____

_____

4) What is wind pollinated flowers?

_____

_____

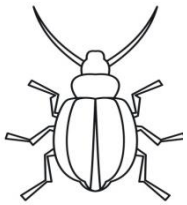
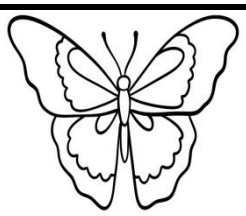
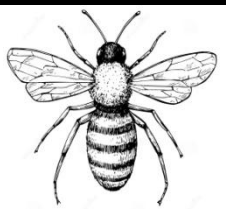
5) State any **two** characteristics of wind pollinated flowers

Insect pollinated flowers

Insects can pollinate flowers as they visit them to collect nectar

They rub themselves on the anthers so on visiting other flowers or coming out of the very flower, pollination takes place

Examples of insects which pollinate flowers

1. Beetles	2. Butterflies	Moths	**Honey bees**
			

Examples of insects which pollinate flowers during the night

Moths

Reason: It has ability to detect the scent of the flowers.

Characteristics of insect pollinated flowers

1. They are large and seen easily
2. They have brightly coloured petals
3. They are well scented
4. They have nectar which is produced by nectaries at the base of the petals
5. They have broad compact sticky stigma
6. They have large rough and heavy pollen grains
7. The anthers produce few pollen grains
8. The stamens have short stout filaments.

Learner's activity

1) Briefly explain the term pollination.

_____

_____

2) Name **two** agents of pollination

(i) _____

(ii)_____

3) Identify **two** factors that favour;

4) Self-pollination

(i) _____

(ii)_____

5) Cross-pollination

(i) _____

(ii)_____

6) In which way are bright colored petals responsible for pollination?

_____

_____

7) Apart from honey bees, mention any two insects which pollinate flowers during day time

(i) _____

(ii)_____

8) Mention **one** example of insects which pollinate flowers during the night

_____

_____

9) Mention **one** plant with brightly coloured petals.

_____

_____

10) Give any **one** difference between insects and wind pollinated flowers

_____

_____

Birds which pollinate flowers

Birds also visit flowers to get nectar which they feed on

Most of these flowers which are pollinated by birds have bright coloured petals

As birds come to get nectar, they rub their bodies on the anthers and the stigma in the way like insect

Examples of birds that pollinate flowers

Sun bird, humming bird

NOTE: the above birds have long slender beaks which are adapted to sucking nectar from the flower.

Water pollinated flowers

Some water plants (aquatic plants) are pollinated by running water

The pollen floats on the top of water until it finds the stigma of such flowers

Examples of water pollinated flowers

Water lily, Plankton, Water hyacinth

Animals

Some fruit eating bats help in pollinating flowers because they have hairy bodies on which pollen is attached.

Importance of pollination

1) Pollination allows fertilization to take place in crops

2) Pollination allows high yields in farmer's harvest

Learner's activity

1. Define agents of pollination.

   _____

   _____

2. Why are animals considered as the agents of pollination?

   _____

   _____

3. State **two** characteristics of wind pollinated flowers

   (i) _____

   (ii)_____

4. Besides sun bird, give **one** example of birds that pollinate flowers

   _____

   _____

5. Write down **two** importance of pollination

   (i) _____

   (ii)_____

Fertilization

This is the union or fusion of the nuclei of the male and female gametes or cells to form a zygote or embryo

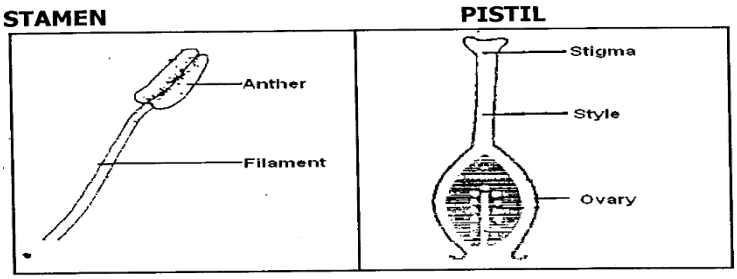
Fertilization takes place inside the ovary

In flowering plants the male reproductive cells are pollen grains while female are ovules. After pollination, fertilization takes place when the pollen tube and grows on the stigma down through the style. This meeting of the pollen grain with the ovule will lead to fertilization

After fertilization, ovules develop into seeds and ovary develops into fruit

Calyx, corolla, stamen and style wither slowly and fall off, but in some flowers the calyx may remain

Diagram of female and male parts of flowers before fertilization



Uses of flowers to man

- They are used for decorations on various functions
- They are used to make insecticides
- They are used to make perfumes
- They are used for making dyes
- They serve as a source of income when sold

Uses of flowers to plants

Flowers produce fruits and seeds

Learner's activity

1. Define fertilization as used in plant kingdom.

   _____

   _____

2. Where does fertilization take place in plant?

   _____

   _____

3. Which part of plant develops into fruit?

   _____

   _____

4. Mention **two** uses of flowers to man.

   (i) _____

   (ii)_____

5. State the main use of flowers to plants

   _____

   _____

SEEDS

A seed is a fertilized ovule.

A seed develops into a young plant or a seedling under favourable conditions.

Groups of seeds

Monocotyledonous seeds

Dicotyledonous seeds

Monocotyledonous seeds

These are seeds with only one cotyledon e.g. maize grain, rice, millet etc

These seeds are also called grains or cereals

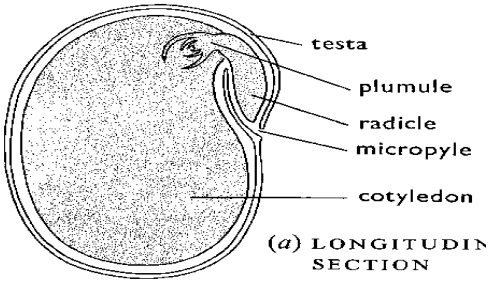
Dicotyledonous seeds

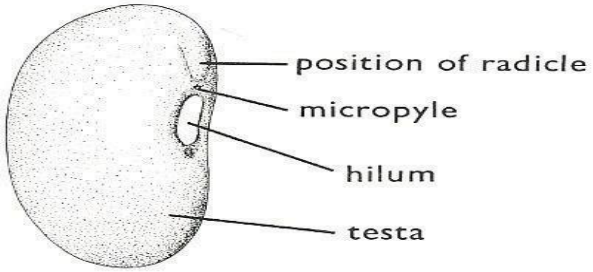
These are seeds with two cotyledons. E.g. beans, peas, groundnuts, Soya beans, mango etc

NB: All dicotyledonous seeds undergo epigeal germination.

A drawn structure showing parts of external and internal parts of a bean seed.

External Parts **Internal parts**





Functions of each part of a maize grain

Testa

It is the hard-outer covering of the fruit

It protects the inner delicate parts

Endosperm

It stores food for the embryo in dicotyledonous plants

Cotyledon

It absorbs food from the endosperm and supplies it to the embryo during germination

Style scar.

It is the part where the style was attached.

Embryo.

The embryo is the part that grows into a new plant.

It consists of two parts the plumule and the radicle

Plumule.

It is also called the embryo shoot which grows into the shoot system

Radicle.

It is also called the embryo root which grows into root system

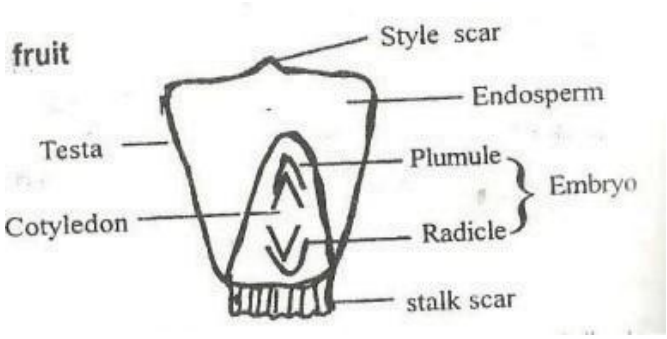
Monocotyledonous seeds:

Monocotyledonous seeds are seeds with only one cotyledon.

Examples include; Maize, Millet, Sorghum,

NB: Monocotyledonous seeds undergo hypogeal germination.

Drawn structures showing the parts of a maize grain



Functions of each part of a maize grain

- **Testa** is the hard-outer covering of the fruit. It protects the inner delicate parts
- **Endosperm** stores food for the embryo in monocotyledonous plants
- **Cotyledon** absorbs food from the endosperm and supplies it to the embryo during germination
- **Style scar** is the part where the style was attached.
- **Stalk scar** is the part where the fruit was attached to the cob
- **Embryo** is the part that grows into a new plant.
  It consists of two parts the plumule and the radicle
- **Plumule** is also called the embryo shoot which grows into the shoot system
- **Radicle** is also called the embryo root which grows into root system

Learner's activity

1. State **two** ways in which seeds are useful to people

   _____

   _____

2. Draw and name the following parts of a bean seed.
   (i) Micropyle(ii) Hilum / scar(iii) Testa

3. State the functions of the following parts of a maize grain.
   a) Endosperm :_____
   b) Cotyledon :_____
   c) Stalk scar : _____
4. Write any **two** differences between monocotyledonous and dicotyledonous seeds
   _____
   _____

Germination

This is the development of a seed embryo into a seedling.

Stages in seed germination (Epigeal germination)

- The seed first absorbs water through the micropyle and swell
- The radicle grows and pushes through the Testa in about three days
- The radicle grows downwards and is protected by a root cap
- The root hair appears as soon as the radicle is firmly attached into the soil.
- The root hairs appear quickly to begin absorbing water and mineral salts
- The plumule pushes itself out of the soil protected by cotyledons in dicotyledonous plants and coleoptiles in monocotyledonous plants

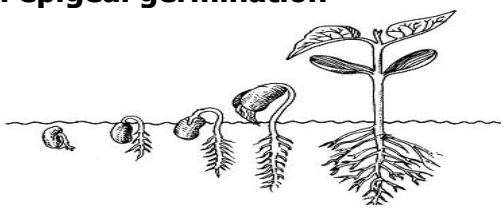
Types of germination

- Epigeal germination
- Hypogeal germination

Epigeal germination

This is the type of germination in which the cotyledons come out of the ground.

A diagram showing stages in epigeal germination



Stages of epigeal germination in dicotyledonous plant

Hypogeal germination

This is a type of germination in which the cotyledon remains under the ground

This type of germination is a common characteristic of monocotyledonous seeds e.g. maize, millet, rice, sorghum

Stages of hypogeal germination in monocotyledonous plant

Conditions necessary for seed germination

- Warmth
- Air
- Water/moisture

Differences between monocotyledonous plants and dicotyledonous plants

Monocotyledonous plants	**Dicotyledonous plants**
Have one cotyledon	Have two cotyledons
Have fibrous root system	Have tap root system
Have parallel veined leaves	Have net veined leaves
Grow with one leaf first	Grow with two leaves first
They never form true wood	Often make true wood

They undergo hypogeal germination	They undergo epigeal germination

Seed viability:
Seed viability is the ability of a seed to germinate under favourable conditions.
A viable seed should be;
- ✍ Whole without a hole / wrinkles
- ✍ Mature and dry
- ✍ Free from pest damages
- ✍ Healthy and of a good variety

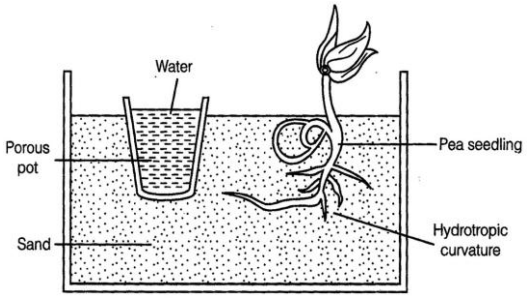
If a seed is not viable, it's said to be dormant. What does seed dormancy mean?

Learner's activity

1. State what you understand by germination of seeds
   _____
   _____
2. State any **two** differences between stages monocotyledonous plants and dicotyledonous plants.
   (i) _____
   (ii)_____
3. What type of germination is common in cereal crops?
   _____
   _____
4. Define epigeal germination.
   _____
   _____
5. What is seed viability?
   _____
   _____
6. List any **two** qualities of a viable seed.
   _____
   _____

Tropism
Tropism is the plants growth movement in response to stimulus (change in the environment.
A stimulus
Is defined as any change in the environment to which the plant is sensitive to the type of stimulus involved
There are five different kinds of tropisms, namely
1) Phototropism
2) Geotropism
3) Hydrotropism
4) Thigmotropism/ haptotropism
5) Chemotropism

Phototropism
This is the plant's growth movement towards the source of light
Hydrotropism
This is the plant's growth movement towards the source of water.



Geotropism
This is the plant's growth movement towards the direction force of gravity
Thigmotropism

This is the plant's growth movement in response to the direction of touch

Chemotropism

This is the plant's growth movement towards the source of chemical

Tropism	**Stimulus**
Phototropism	light
Geotropism	Force of gravity
Hydrotropism	Water and moisture
Thigmotropism	touch
Chemotropism	Chemicals other than water

Learner's activity

1. What term is used to mean the plants growth movement in response to stimulus?
   _____
   _____
2. What is a stimulus?
   _____
   _____
3. Mention **two** different kinds of tropisms in plants.
   (i) _____
   (ii)_____
4. State the stimulus for Phototropism.
   _____
   _____
5. Mention the scientific term to mean the plant's growth movement towards the source of water.
   _____
   _____

Fruits

A fruit is any structure in flowering plants that contains seeds

A fruit is a fertilized ovary

A fruit has two scars i.e. style scar and stalk scar

Difference between a fruit and a seed

Fruits	Seeds
A fruit has two scars i.e. style	A seed has one scar i.e. stalk scar and stalk scar

Functions of fruits

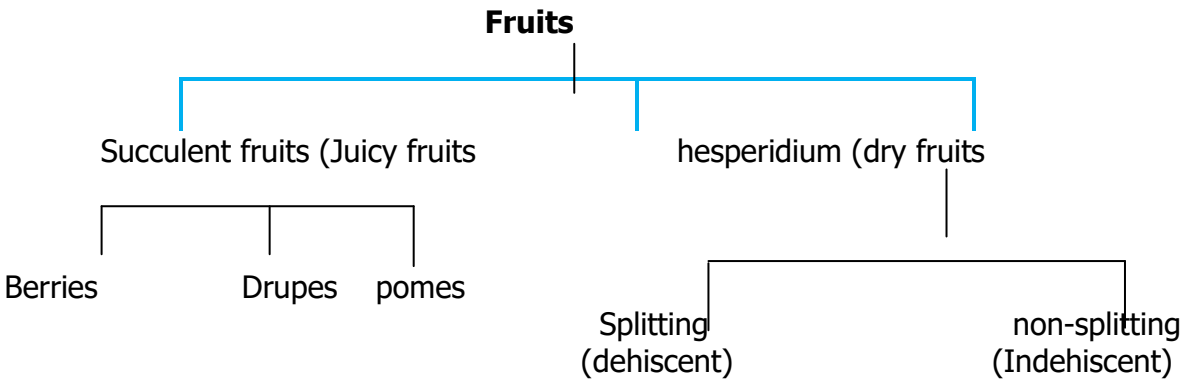
1. Fruits protect seeds
2. Fruits assist in scattering of seeds when ripe

Fruits are divided into two;

Succulent fruits (Juicy fruits)

Dry fruits (Non juicy fruit)

Classification of fruits

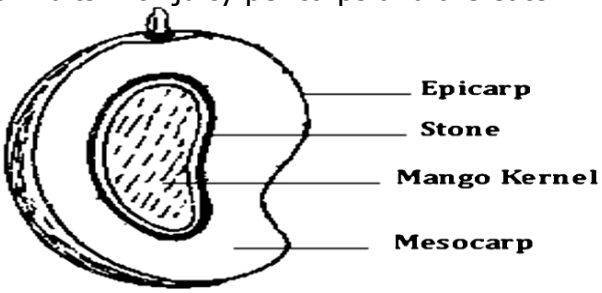


Succulent or juicy fruits

These are fruits whose pericarp becomes juicy and can be eaten.

They are divided into three groups as shown above.

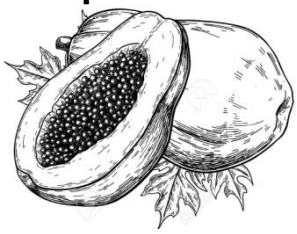
Succulent fruits
Succulent fruits are groups of fruits with juicy pericarps and are eaten.



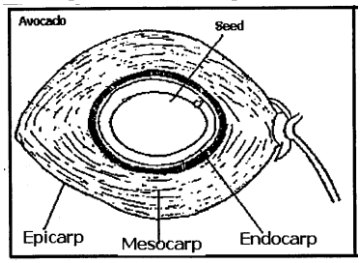
Berries
A berry is a fruit which has many seeds inside.
Its pericarp is divided into three layers
The pericarp is the outer covering of a fruit.

i).Epicarp
ii)Mesocarp
iii)Endocarp

Examples of berries include tomatoes, paw paws, guavas and water melons



Drupe.
A drupe has one seed inside.
Its pericarp is divided into three layers
i)Epicarp
ii)Juicy mesocarp
iii)Hard endocarp
Examples of drupes are; Mangoes, coconut, and oil palm



Pomes
The juicy part is the swollen receptacle while the inner core is the pericarp. An example is an apple.

Dry fruits
These are fruits whose pericarp is usually dry, hard and woody
They are divided into two

a) Splitting (dehiscent fruits
b) Nonsplitting (indehiscent fruits

Splitting (dehiscent fruits)

Splitting fruits have capsule or pods that split to disperse their seeds when dry. **Examples of splitting (dehiscent) seeds**

Beans, peas and castor oil

Non-splitting (indehiscent fruits)

Non-splitting fruits have one seed only.

Their pericarp does not split to disperse the seeds but have structures for their mode of dispersal.

E.g Black jack, maize, sunflower, tridax etc.

Note:

Some fruits develop from one flower. They are called simple fruits.

Sometimes all flowers on a stalk make one fruit. Such fruits are called compound or multiple fruits e.g. Pineapple.

Some fruits are not formed from the ovary of a flower but from some other parts of a flower. Such fruits are called **false fruits**. E.g. an apple which develops from a **receptacle**

Learner's activity

1) Briefly explain the following terms;

(i) A fruit

_____

_____

(ii) Dehiscent fruits

_____

_____

(iii) Multiple fruits

_____

_____

2) Cite out **one** example of a false fruit

_____

_____

3) Write **one** way in which black jack is different from castor oil.

_____

_____

4) List **two** functions of fruits to plants.

(i) _____

(ii)_____

5) Give **two** examples of juicy fruits.

(i) _____

(ii)_____

Dispersal of seed and fruits

Dispersal is the scattering of fruits or seeds away from the parent plant over a wide area.

In some plants, only seeds are dispersed while in others the fruits are dispersed with the seed.

Types or mechanisms of seed dispersal

These are the things that scatter fruits or seeds away from the parent plant over a wide area

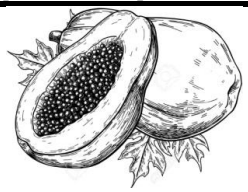
Agents of seed dispersal

- Wind dispersal
- Animal dispersal
- Water dispersal
- Explosive mechanism

Characteristics of seeds dispersed by animals

- Some have hooks which attached easily to the fur of animals
- Have brightly coloured epicarps
- Some plants have brightly coloured epicarps to attract people or animals
- They have scent
- Some fruits have juicy mesocarps
- Some have hook-like structures to attach them on the animals' bodies
- Some have hard seed coats to protect them from digestive juices of animals.

Examples of fruits dispersed by animals include.

			
✍ Mangoes	✍ Paw paws	✍ Tomatoes	✍ Passion fruits

Other examples of fruits dispersed by animals include.

✍ Guavas

✍ Black jack fruit

Examples of animals that disperse fruits

Man, birds, monkeys

Learner's activity

1. In which way can dispersal prevents overcrowding of plants?

   _____

   _____

2. Mention **two** mechanisms of seed dispersal.

   (i) _____

   (ii)_____

   Below is a diagram of tomato fruits. Use it to answer the questions that follow.

3. Name the crop shown above.

   _____

   _____

4. State the mechanism of seed dispersal in the crop shown above.

   _____

   _____

5. State **two** characteristics of seeds dispersed by animals

   (i) _____

   (ii)_____

6. In which way are brightly coloured epicarps responsible for fruit dispersal?

   _____

   _____

7. Mention **two** examples of common fruits dispersed by animals.

   (i) _____

   (ii)_____

Characteristics of seeds dispersed by wind

✍ Many are small and light to be easily carried by wind.

✍ Some seeds have wing-like structures for floating in air e.g. jacaranda

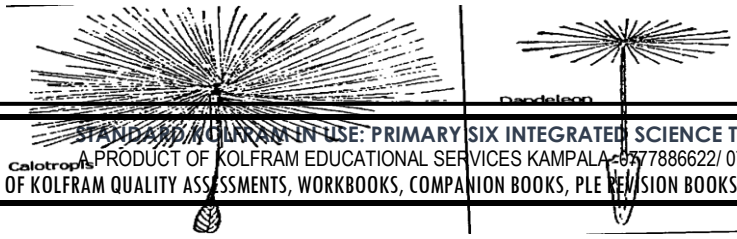
✍ Some have a parachute hair structure e.g. dandelion

✍ They can easily be carried by wind e.g. orchid

✍ Some seeds have a tuff or hair e.g. cotton plant seed

✍ Some seeds have a censer mechanism when wind blows the dry season are thrown out the capsule e.g. poppy

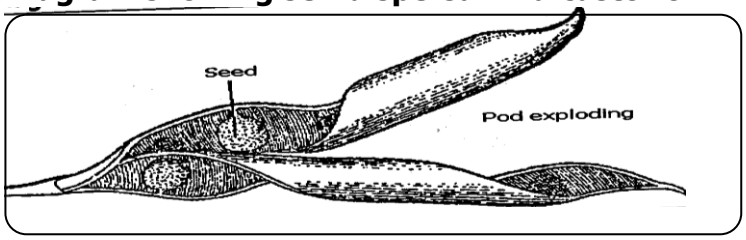
Calotropis **Dandelion**



Note:
Seeds dispersed by **explosive mechanisms** split their pods when ripe and disperse their seeds.

Explosive mechanism (self dispersal)
This method of dispersal of fruits and seeds is also called **mechanical dispersal**
Many fruits when ripe split open with force and throw out the seeds at the same distance.
These include; castor oil, peas and beans.

Diagram showing self dispersal in a castor oil



Water
Water is also an agent of seed dispersal.
Examples include; Water lilies and coconut fruits.
Characteristics of seeds and fruits dispersed by water
- These seeds have numerous air spaces with an air tight covering
- They are light
- They have air tight covering
- They have numerous air spaces in their mesocarp.

All the above make them able to float on water for a long period.
E.g. water lily, coconut fruit and mangrove

Importance of dispersal to the plants
- Dispersal prevents overcrowding of plants
- It reduces competition for light and nutrients
- It enables plants to colonize a new area
- Dispersal minimizes epidemic disease among crowded seedlings

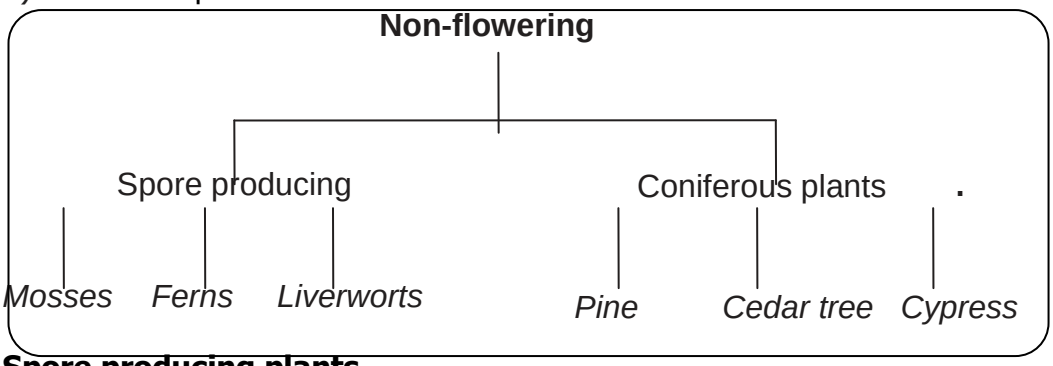
Importance of dispersal to the environment
- Dispersal increases chances of survival of species

Learner's activity

1. Write one word to mean the scattering of seeds from one mother plant to other areas.
   _____
   _____
2. Write any **two** methods of seed dispersal
   (i) _____
   (ii)_____
3. Give **two** ways in which seed dispersal can be useful to plants
   (i) _____
   (ii)_____
4. State any **one** importance of seed disposal to the environment.
   _____
   _____
5. List **two** differences between wind and animal dispersed seeds
   (i) _____
   (ii)_____

Non-flowering plants
Non-flowering plants are groups of plants that do not bear flowers.
Groups of Non-flowering plants

1) Spore producing plants
2) Coniferous plants**.**



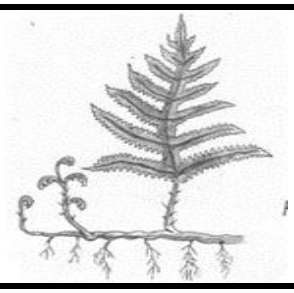
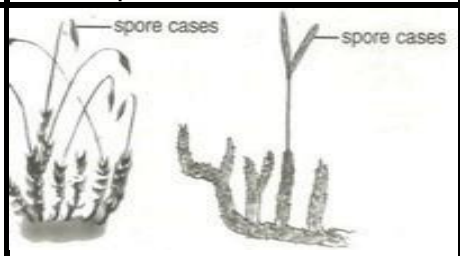
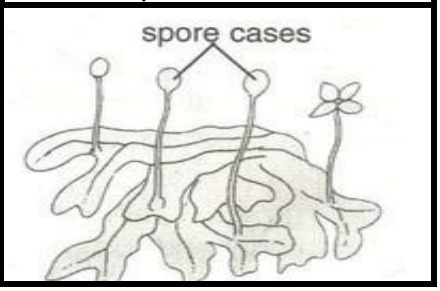
Spore producing plants

Spore producing plants are groups of non-flowering plants that reproduce by means of spores.
A spore is a single cell that can develop into a new plant under favourable conditions.

Examples of spore producing plants

- Liverworts, mosses and ferns
- Ferns are the most advanced group of spores producing plants with proper leaves, stems and roots.
- Mosses are small green cushion-like and grow commonly on house roofs, verandas, tree trunks, and in damp soils.
- Liverworts have leaf like structures and commonly grow in wet moist places.

Illustrations showing different examples of spore producing plants

Fern plant	Mosses plant	Liverwort plant
		

Note:
All spore producing plants are green and therefore able to make their own food.

Learner's activity

1) In **one** sentence show the meaning of non-flowering plants

_____
_____

2) State any **one** reason why ferns are grouped under plants.

_____
_____

3) Name the structure that helps the spore producing plants to absorb water and mineral salt.

_____
_____

4) Mention the **two** main groups of non-flowering plants
(i) _____
(ii)_____

5) A moss cannot bear flowers. How does it reproduce?

_____
_____

6) State **two** ways in which coniferous plants can be useful to people.
(i) _____
(ii)_____

7) Briefly explain why algae are not classified as plants.

_____

_____

8) How can algae be useful to an industrialist who deals in food processing?

_____

_____

Conifers or Coniferous plants:

Coniferous plants are non-flowering plants that reproduce by means of seeds produced in hard structures called cones.

Conifers have roots, stems and small needle shaped leaves

Examples of coniferous plants include

- ✍ Pines
- ✍ Junipers
- ✍ Cypress
- ✍ Cedar tree
- ✍ Fir tree
- ✍ Podo tree
- ✍ Sprouce
- ✍ Ginkgo

A staminate cone is a male cone while an ovulate corn is a female cone

Lichens

Lichens commonly grow on rocks, bark of trees, walls etc

Lichens are formed from a symbiotic relationship between a fungus and algae

Lichens reproduce by means of spores

Liverworts

These grow in water and commonly appear as floating leaves.

They reproduce by means of spores.

Characteristics of coniferous plants

1) Conifers have proper roots, upright stem and small needle like leaves
2) Conifers reproduce by special seeds found in cones.
3) Cones do not develop from flowers, examples include; pine, cedar, cypress, podo, firs
4) They have needle shaped leaves

Economic importance of conifers

- ✍ They provide people with soft wood for making soft boards and wood pulp
- ✍ Wood pulp is used to make paper
- ✍ Conifers are used as firewood
- ✍ Conifers are used as building materials
- ✍ Pine tree is used to make matches
- ✍ Cypress are used as fences in homes

Learner's activity

1. What are coniferous plants?

_____

2. Mention any **two** examples of coniferous plants.

(i) _____

(ii)_____

3. Why are lichens grouped under:

(a) Plants: _____

(b) Coniferous plants: _____

4. How is the reproduction in soya beans similar to that of the conifers?

_____

_____

5. Name the structure that store seeds for the conifers.

_____

6. Mention any **two** common places where lichens grow.

(i) _____

(ii)_____

7. By what means do lichens reproduce?

_____

_____

8. State any **one** importance of a needle shaped leaves to the cypress plants

_____

_____

9. Name the male and female cones of the conifers
   Male ……..(ii) female: ……..

10. Mention any **two** characteristics of coniferous plants
    (i) _____
    (ii)_____
11. State any two economic importance of coniferous plats to people.
    (i) _____
    (ii)_____

Algae

These are groups of plants which mostly grow on water.
They are grouped under plants because they have chlorophyll which helps them to make their own food.
Some algae reproduce by means of fermentation while others reproduce by means of spores.

Examples of algae

Diatoms, brown algae, green algae, stoneworts, spirogyra, seaweeds, giant kelp

Learner's activity

1. Where do algae mostly grow?

   _____

   _____
2. State any **one** reason why algae mostly grow in water instead of land.

   _____

   _____
3. State how most algae feed?

   _____

   _____
4. Mention any **two** importance of algae to the environment.
   (i) _____
   (ii)_____
5. Give any **one** way how algae reproduce.

   _____

   _____
6. How important is chlorophyll to the algae?

   _____

   _____

Plant propagation

Propagation is a way of obtaining a new plant from an existing plant.

Methods of plant propagation

1. Natural propagation (seed propagation)
2. Artificial propagation (vegetative propagation)

Natural propagation (seed/ sexual propagation)

This is the use of seeds for reproductive part of a plant.

Vegetative propagation (artificial propagation)

This is the reproduction of plants from plants part that are not associated with reproductive organs.
This is the asexual reproduction in which plant parts except seedsare used to grow a new plant.

Types of vegetative propagation

- ✍ Natural vegetative propagation
- ✍ Artificial vegetative propagation
- ✍ Natural vegetative propagation

Examples of natural vegetative propagation include use of suckers, bulbs, leaves and use of tubers.

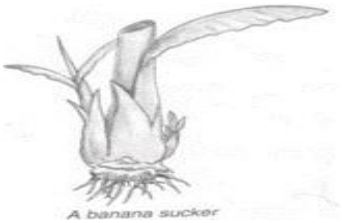
Learner's activity

1. What is plant propagation?
   _____
   _____
2. Mention any **two** methods of plant propagation
   (i) _____
   (ii)_____
3. Define the term natural propagation.
   _____
   _____
4. Give another name for natural propagation.
   _____
   _____
5. Why are vegetative propagation also referred to as artificial propagation?
   _____
   _____
6. Mention any **two** parts of a plant used in vegetative propagation.
   (i) _____
   (ii)_____
7. Give any **two** types of vegetative propagation
   (i) _____
   (ii)_____
8. Mention any **two** examples of natural vegetative propagation
   (i) _____
   (ii)_____

propagation from suckers

Suckers grow from the base of the stem of a parent plant with a terminal bud.
Each sucker is able to grow into a new plant.
Some plants are propagated using suckers such as; bananas, pineapple and sisal

A structure showing a banana and pineapple plant and their suckers



(b) Use of bulbs

A bulb is a short, thick underground stem with scaly leaves containing stored food.
Some plants are propagated using bulbs such as onions.
The scaly leaves protect the inner fleshy leaves
The thick fleshy leaves have fleshy leaves have stored food.

Propagation from tubers

A tuber is a swollen underground stem with stored food.
Some plants propagated by using tubers are; Irish potatoes, cocoyam

c. Use of corms

Some plants are propagated with the help of corms (kind of underground stems)
coco yams, gladiolus and crocus.

d. Use of rhizomes

Some plants are propagated using the rhizomes
Rhizomes are swollen underground stems with stored food and grow horizontally.
Example Include ginger, zoysia grass and turmeric.

Learner's activity

1) What is vegetative propagation?

_____

_____

2) Explain how the propagation of a banana plant is different from that of the bean plant.

_____

_____

3) How are pineapple and banana plants similar in the mode of their propagation?

_____

_____

Examples of artificial vegetative propagation

Artificial vegetative propagation by stem cutting

This involves use of stem cuttings to develop new plants.

Examples of plants propagated by using stem cutting

Sugar cane, Hibiscus plant, Cassava stems, Sweet potato

Artificial vegetative propagation by layering

Layering is when a shoot is pegged down to the soil but remaining on the parent plant.
When the adventitious roots grow out of the nodes, the stem is now cut off from the parent plants and planted in another place.

Marcotting

Marcotting is a way of propagating plants by making a shallow cut at the node, covered with soil, adventitious roots grow from the cut then it is cut from the parent plant and planted to another place.

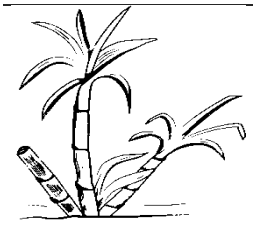
4. Artificial vegetative propagation by budding

Budding is type of vegetative propagation where the bud or scion is united with a seedling or a mature tree.

Types of budding

- T-budding
- Patch budding
- Top budding

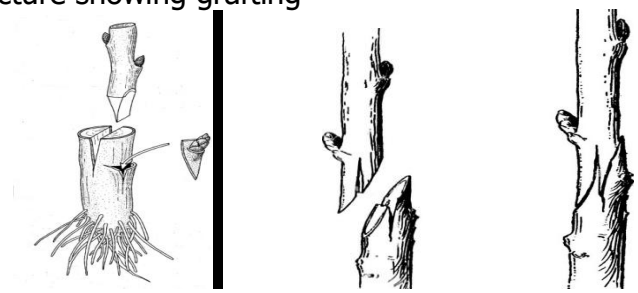
Learner's activity



5. By grafting

This is where two different stems are united in woody plants. The upper part of the union is called a **scion** while the lower part is called a **stock**.

Structure showing grafting



Reasons for grafting plants

1. It changes the tree top from being undesirable to desirable
2. It makes it possible to grow more than one fruit or flower in the same plant.
3. It helps to propagate clones that cannot be propagated by any means
4. Helps in change variety of plant species
5. Plants having viral infection with no signs will show signs when grafted.

Limitation of grafting

1. It is difficult for the plants to survive
2. Requires a lot of skills and experience for successful graft
3. Requires a lot of time for tangible results to be got.

Advantages of vegetative propagation

- In vegetative propagation plants mature in a short time.
- Off springs are strong and hardly compare with seedling obtain from seeds
- It is the best way for propagating plants with no viable seeds.
- Daughter plants obtain food from their parents
- Multiplication of the plant population is faster
- It overcomes the problem of prolonged dormancy in some seeds

Disadvantages of vegetative propagation

- It may cause overcrowding in the garden.
- It is difficult to handle and transport.
- Vegetative materials are difficult to store
- It needs a lot of skill to execute.
- A small hectare can be covered during planting

Learner's activity

1. State what you understand by the term plant propagation.
   _____
   _____
2. Give **two** methods of plant propagation
   (i) _____
   (ii)_____
3. State how the following plants can be propagated;
   i) Sweet potatoes : _____
   ii) Sisal : _____
4. Give **two** advantages of vegetative propagation over seed propagation.
   (i) _____
   (ii)_____
5. Name any **two** crops raised in a nursery bed.
   (i) _____
   (ii)_____
6. The upper part of the grafting union is called a **scion**. Name the lower part of the grafting union.
   _____
   _____
7. Mention **two** reasons for grafting plants
   (i) _____
   (ii)_____
8. State **two** ways in which grafting can be a problem to the farmers.
   (i) _____
   (ii)_____
9. Mention **two** examples of plants that can be grafted.
   (i) _____
   (ii)_____
10. Give **two** disadvantages of vegetative propagation
    (i) _____
    (ii)_____

THEME: SCIENCE IN HUMAN ACTIVITIES AND OCCUPATIONS

TOPIC 8: KEEPING CATTLE

Cattle refers to cows, calves, bulls, heifers and bullocks
Keeping cattle refers to the act of rearing bulls, bullocks, cows, calves and heifers.

- Bull is mature male cattle which can mate other female cows.
- Bullock is a growing male cattle which has not started mating others
- Heifer is growing female cow which has not yet given birth.
- Oxen are castrated bulls reared for doing work.
- Calves are young ones produced of a cow.

Animal husbandry:
This is the rearing and management of farm animals
Examples of farm animals
Pigs goats, sheep, cattle, rabbits
External parts of a cow
Importance of keeping cattle

- Cattle provide people with milk and meat which are sources of proteins
- Hooves and horns are used to make enamel items like plates and cups.
- Hides from cattle are used in making leather products
- Cow dung can be used in building local houses and making biogas
- Keeping cattle is a source of employment.

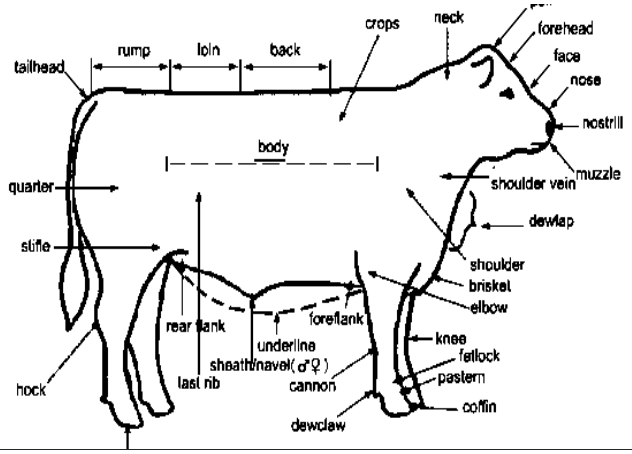
Problems faced by cattle keepers

- Pets and diseases
- Cattle rustling
- Shortage of pasture and water

Learner's activity

1. Write **one** sentence to show the meaning of the following terms;
   (a) Keeping cattle
   _____
   _____
   (b) Animal husbandry
   _____
   _____
2. What is the difference between a bull and a bullock?
   _____
   _____
3. State any **one** core importance of keeping oxen.
   _____
   _____
4. State **two** reasons why many Ugandans have taken up cattle keeping as a business.
   (i) _____
   (ii)_____
5. Name the food value we get from meat and milk.
   _____
   _____
6. Apart from cows, mention **one** domestic animal which provides us with milk.
   _____
   _____
7. What is the importance of horns and hides to an industrialist
   _____
   _____
8. Apart from cattle, mention any **two** examples of domestic animals.
   (i) _____
   (ii)_____

External parts of a bull



Learner's activity

1. Mention any **two** physical differences between cows and bulls.
   (i) _____
   (ii)_____
2. State any **one** importance of keeping:
   (a) Cows over bulls: _____
   (b) Bulls over cows: _____
3. How important are the muzzles to the cattle?
   _____
   _____
4. Name the place where cattle are kept.
   _____
   _____
5. Mention any **two** advantages of keeping cattle over other livestock.
   (i) _____
   (ii)_____

Types of cattle

A type of cattle is a class of cattle kept for a specific purpose.

Specific purpose may be;

- For milk production
- For meat (beef) production
- For provision of animal labour
- For both milk and meat production

Types of cattle

- Dairy cattle
- Beef cattle
- Dual purpose
- Draught cattle

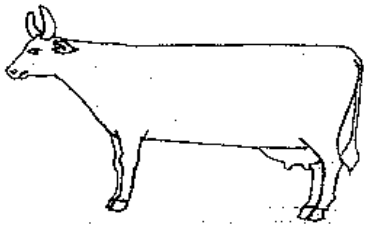
Dairy cattle

This is a type of cattle kept for milk production

Characteristics of dairy cattle

- Dairy cattle have big udder
- They have a triangular body shape
- Dairy cows have well set legs to support the body
- They have small necks
- They have wide and well hind quarters
- They have four medium teats
- They are usually docile and have a mild temperament
- They produce a lot of milk
- They have long legs
- They have plenty of space between their hind legs

A drawn illustration showing body shape of dairy cattle.



A dairy cow seen from the side

A dairy cow seen from above

Examples of dairy cattle include.

- Friesian
- Guernsey
- Jamaican hope
- Ayrshire
- Jersey
- Brown Swiss cattle

Learner's activity

1. What do you understand by the term type of cattle?

   _____

   _____
2. What are dairy cattle?

   _____

   _____
3. In which way are Friesian and Jersey cattle similar?

   _____

   _____
4. List any **two** types of cattle

   _____

   _____
5. Identify the type of cattle with a rectangular body shape.

   _____

   _____
6. Give **two** examples of dairy breeds of cattle

   (i) _____

   (ii)_____
7. Name the commonest exotic dairy breed of cattle reared in your locality.

   _____

   _____
8. State any **two** characteristics of Jersey cattle.

   (i) _____

   (ii)_____
9. In the space provided below, draw a body shape of dairy cattle.

10. Mention **two** products got from cattle with triangular body shapes.

    (i) _____

    (ii)_____

Beef cattle

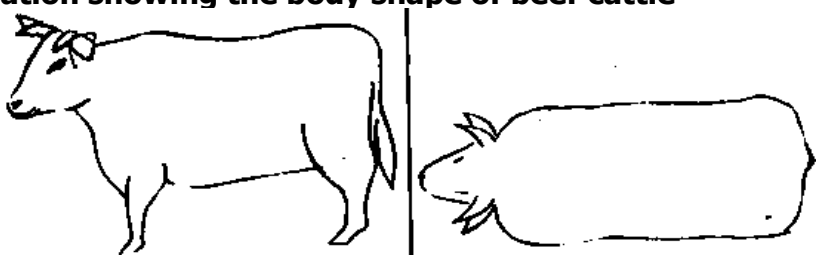
Beef cattle are type of cattle kept mainly for meat production

Characteristics of beef cattle

1. They have a rectangular body shape
2. They have small heads
3. They have small udder
4. They produce little milk
5. They mature quickly
6. They have short legs
7. They have large necks
8. Have short legs with long broad backs

9. They can survive drought without losing weight

An illustration showing the body shape of beef cattle



Examples of beef breeds of cattle

- Aberdeen angus
- Hereford
- Galloway
- Charolais
- Boran
- American Braham
- Short horn
- Santa Getrudas

Dual purpose cattle

This is the type of cattle kept for both meat and milk production

Characteristics of beef cattle

Dual purpose cattle have both the characteristics of dairy and beef cattle

Examples of dual-purpose breeds

- Ankole cow
- Zebu
- Sahiwal
- Red poll
- Milking short horn

Learner's activity

1. Name the type of cattle kept mainly for meat production.

   _____

   _____

2. What name is given to the:

   (a) Meat of a cow/ bull? _____

   (b) Meat of a calf? _____

3. State any **two** characteristics of beef cattle

   (i) _____

   (ii) _____

4. Give any **two** examples of beef breeds of cattle

   (i) _____

   (ii) _____

5. What are dual purpose cattle?

   _____

   _____

6. State any **two** characteristics of beef cattle

   (i) _____

   (ii) _____

7. Mention any **two** examples of dual-purpose breeds of cattle.

   (i) _____

   (ii) _____

Types of cattle breeds

A cattle breed is a family/group of cattle having specific characteristics.

Specific characteristics may include;

- Colour of cattle
- Size of the animals
- Productivity of the animals.

Breeds of cattle

- Exotic cattle breeds
- Indigenous/local cattle breeds
- Cross breeds:

Local breeds of cattle (indigenous)

◊Local breeds or indigenous cattle are breeds of cattle that have lived in East Africa for a long time. They are also called the native breeds kept for both milk and meat production.

Examples include;

1. Small east African zebu
2. Boran cattle
3. Nsagala or sanga cattle
4. Ankole cattle

Advantages of local breeds of cattle

- They are resistant to tropical diseases
- They have the ability to walk long distances
- They can withstand hash weather conditions
- They can survive on poor pasture and less water
- They need less care and management

Disadvantages of local breeds of cattle

- They produce less meat and milk
- They have a slow growth rate
- They are hard to market

Learner's activity

1) Give the difference between a breed of cattle and a type of cattle?

_____

_____

2) Mention any **two** breeds of cattle commonly kept in Uganda

(i) _____

(ii)_____

3) Identify a breed of cattle you would prefer keeping in your locality.

_____

_____

4) Give a reason for your answer in (3) above

_____

_____

5) Cite out the best way of improving on our local breeds of cattle

_____

_____

6) Mention any two specific characteristics of cattle breeds in the same group.

(i) _____

(ii)_____

7) State any **two** advantages of keeping native breeds of cattle.

(i) _____

(ii)_____

8) Mention any **two** disadvantages of local breeds of cattle.

(i) _____

(ii)_____

Exotic breeds of cattle

These are groups of cattle breeds imported into East Africa.
They are dairy, beef or dual-purpose cattle

Examples include;

Friesian, Ayrshire, Guernsey Jersey, Jamaican hope, brown Swiss, Aberdeen Angus, Hereford, Charolais, Shorthorn, Galloway and American beef master

Characteristics of exotic breeds of cattle

- They grow quickly with no horns
- They are not resistant to diseases.
- They need a lot of attention or care.
- They produce high quantities of milk and beef
- They need a lot of water and good pasture

Advantages of keeping exotic breeds of cattle

- They grow faster
- They produce a lot of milk and meat
- They are easy to market due to their sizes and qualities

Disadvantages of keeping exotic breeds of cattle

- They are easily attached by tropical diseases
- Need a lot of pastures and water to drink
- Need high management skills
- They can survive on poor pasture and less water

Difference between exotic and local breeds of cattle

Exotic breed	Local breed
They have specific colour	They have different colour
They grow faster	They grow slowly
They produce a lot of milk	They produce little milk
They are easily attached by tropical diseases	They are resistant to tropical diseases
They need a lot of pastures and water to drink	They can survive on poor pasture and little water
They need high management skills	They are easy to keep and care for

Cross breeds are obtained after mating a local breed with an exotic breed.
This is the best way of improving upon the poor local breeds of cattle.

Learner's activity

1. Mention any **two** examples of exotic breeds of cattle
   (i) _____
   (ii)_____
2. State any **two** characteristics of exotic breeds of cattle
   (i) _____
   (ii)_____
3. Mention any **two** advantages of keeping exotic breeds of cattle.
   (i) _____
   (ii)_____
4. Give any **two** disadvantages of keeping exotic breeds of cattle.
   (i) _____
   (ii)_____
5. Mention any **two** products got from the exotic breeds of cattle.
   (i) _____
   (ii)_____

Breeding of cattle

This is the mating of selected animals in a planned manner
It is the act of maintaining or improving the desired characteristics in cattle.

Desired characteristics in cattle may include

- Sizes of the animals.
- Resistance to diseases
- Animal's skin colours
- Productivity of the animals

Types of breeding

Inbreeding:
This is the mating of very closely related animals like brothers and sisters

Out breeding:
This is the mating of distantly related animals

Cross breeding:

This is the mating of unrelated breeds of animals like an exotic bull mating a local cow.

Line breeding:

This is the mating of animals such as cousins.

Upgrading:

This is the improving the existing breed by mating with a superior quality of breed several times

Reasons why farmers cross breed

1) To improve the quality of local breed
2) To increase on the milk or meat production
3) To improve on resistance to diseases
4) To improve on the rate of growth
5) To adopt to difficult conditions

Learner's activity

1) In **one** sentence show the meaning of breeding as used in cattle keeping

_____

_____

2) List down **two** types of breeding in cattle

(i) _____

(ii)_____

3) State why inbreeding is discouraged in the management of cattle breeding

_____

_____

4) How can a local farmer improve on his local breeds of cattle

_____

_____

5) Briefly describe how a hybrid is obtained.

_____

_____

6) Mention ant **two** reasons for supporting cross breeding.

(i) _____

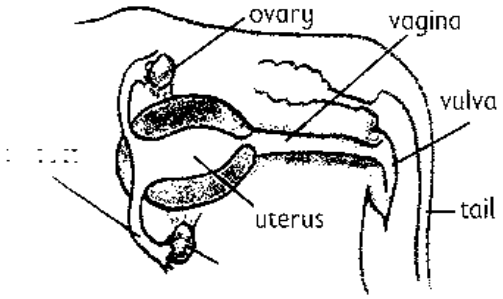
(ii)_____

Reproduction in cattle

Reproduction is the process by which living organisms produce other living organisms which resembles them

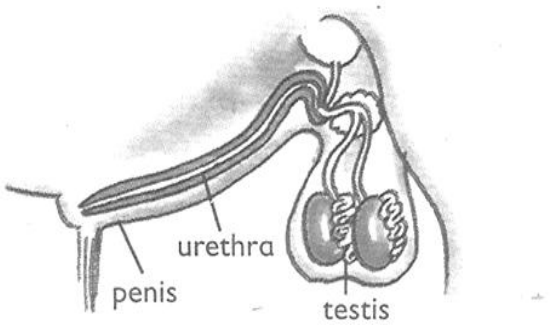
The reproductive system of a cow

Functions of different parts



1) **Vulva** receives and guides the penis
2) **Vagina** is where semen is deposited
3) **Cervix** closes the lower end of the uterus during pregnancy
4) **Ovary** produces the ova and hormones that help to control the sexual cycle
5) **Ova** are the reproductive cells produced by the ovary
6) **Oviduct/fallopian tube** are the place where fertilization takes place.
7) **Uterus** is where implantation takes place (development of the foetus

Reproductive system of a bull



Functions of parts
Testes produce sperms
Sperm ducts carry sperms
Urethra passes out urine and sperms
Penis delivers semen in the vagina of a cow

Heat periods in cattle
It is a period when a female animal is ready to mate with a male animal and result into pregnancy
Signs of heat in female animals
1. The cow allows other cows
2. The cow loses appetite to graze
3. The vulva swells and changes colours
4. There is mucus discharge from the vulva
5. The cow urinates frequently
6. The cow allows the bull to mount it without resisting
7. The cow makes a lot of noise
8. Lactating cows reduce milk production
9. The cow becomes restless

Learner's activity

1. Write the function of the following parts of the system;
   (a) Cervix : _____
   (b) Testis : _____
   (c) Ovary : _____
2. Name the part of a bull which produces sperms.
   _____
   _____
3. What is a heat period?
   _____
   _____
4. Mention any **two** signs of a cow on heat.
   (i) _____
   (ii)_____

Service/insemination
This is the act of depositing semen into the female reproductive organs
Types of service/insemination
Natural insemination
Artificial insemination

1. Natural insemination.
This is where a bull deposits semen into the vagina of a cow.
Systems of natural insemination
Hand mating
This is the system where a bull is kept separately from cows
Pasture mating.
This is the keeping of bulls together with cows so that the bull can easily identify cows on heat

Advantages of natural insemination

- ✍ It is cheap
- ✍ Natural insemination saves time
- ✍ It is easy for a bull to identify a cow on heat
- ✍ It does not need a farmer to look for qualified persons.
- ✍ It is easy for a bull in inseminate.

Disadvantages of natural insemination

- ✍ More sperms are wasted in one cow.
- ✍ It's very expensive to buy and maintain a bull
- ✍ Once the bull dies, sperms are also lost
- ✍ It encourages inbreeding
- ✍ Big bulls can injure small cows
- ✍ It can lead to a wide spread of venereal diseases

Learner's activity

1. Briefly explain the term insemination.
   _____
   _____
2. How does artificial insemination control unwanted pregnancies on a farm?
   _____
   _____
3. State any **two** advantages of natural insemination
   (i) _____
   (ii)_____
4. Give **two** ways in which natural insemination can be dangerous to a livestock farmer
   (i) _____
   (ii)_____
5. State **two** systems of natural insemination
   (i) _____
   (ii)_____

Artificial insemination

It is a method where a skilled person uses a syringe to deposit semen into the vagina of a cow.

Advantages of artificial insemination

1. It controls venereal diseases
2. It controls inbreeding
3. It controls injuries in small cows by big bulls
4. It is cheaper than keeping a bull
5. It improves on the quality of animals
6. It reduces the cost of keeping many bulls on the farm
7. Semen from a dead bull can be used

Disadvantages of artificial insemination

- ✍ Semen may not be available when needed
- ✍ It is only carried out by qualified inseminator
- ✍ Some farmers are not able to detect heat in cows
- ✍ Some animals have silent heat periods
- ✍ Storage of semen is difficult

Learner's activity

1. What is artificial insemination?
   _____
   _____
2. State the farm animal which reproduces by calving.
   _____
   _____
3. Mention **two** advantages of artificial insemination.
   (i) _____

(ii)_____

4. State **two** reasons why many farmers do not practice artificial insemination.
   (i) _____
   (ii)_____

Fertilization in cows

- Fertilization is the union (fusion) of the nuclei of male and female gametes to form a zygote.
- A gamete is a reproductive cell.
- The reproductive cell of a female animal is called an ovum.
- The reproductive cell of a male animal is called sperms/semen
- A zygote is a fertilized egg cell
- Fertilization takes place in the fallopian tube or oviduct
- **Conception** is the stage when a fertilized egg implants itself in the uterus.
- Implantation is the attachment of the embryo on the uterus wall
- Conception takes place in the uterus while implantation takes place on the walls of the uterus

Gestation period

This is the period between fertilization and birth. The gestation period of a cow is 9 months or 270 – 280 days

A cow which is pregnant is called in calf cow or in calf heifer

Note: when a cow is pregnant, it should be fed well so that it produces a healthy calf.
An in-calf cow should be isolated when it is about to calve down.

Signs of pregnancy in a cow

1) The udder increases in size
2) The cervix closes up
3) The uterus enlarges
4) The cow stops experiencing signs of heat
5) There is mucus around the cervix
6) Reduction in milk production

Learner's activity

1. Name the reproductive cell of a male animal.
   _____
   _____
2. Name the reproductive cell of a female animal.
   _____
   _____
3. State any **two** importance of feeding pregnant cows properly.
   _____
   _____
4. Where does fertilization take place in cow?
   _____
   _____
5. Mention **two** signs of pregnancy in a cow
   _____
   _____

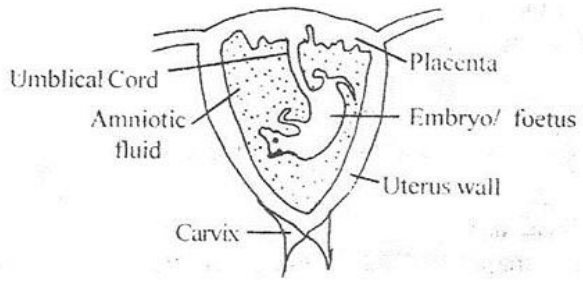
Steaming up the animal

This is the feeding of a pregnant cow on portentous feeds

Advantages of steaming up

- It encourages the foetus to grow healthy
- It prevents low birth weight of a calf
- Steaming up builds up the body of a pregnant cow in preparation for calving
- Steaming up increases milk production
- It increases persistence and lengthens the peak of lactation

The structure of a developing foetus



Note:
The placenta supplies oxygen and digested food to the foetus and also stores water from the foetus temporarily.
Umbilical cord is a passage of food and oxygen to the foetus
Umbilical cord also transports wastes from the fetus to the placenta.
Amniotic fluid acts as a shock absorber for any external pressure.

Learner's activity

1. What is steaming up in cattle management?
   _____
   _____
2. Give **two** advantages of steaming up.
   (i) _____
   (ii)_____
3. Which part of the foetus supply oxygen and digested food to the foetus?
   _____
   _____
4. State any one use of umbilical cords to the foetus.
   _____
   _____
5. Mention **two** signs of calving in a cow
   (i) _____
   (ii)_____

Dry period in cattle
This is the time when a lactating cow is left without milking it in preparation to giving birth.
A cow is dried six to seven weeks before calving.
During the dry period, the in-calf is fed on foods rich in proteins.

Calving or parturition
Calving is the act of giving birth in a cow.

Signs of calving in a cow
- The cow isolates itself
- The teats open
- The cow stops grazing
- The udder is filled with milk and swells
- The vulva enlarges
- Mucus comes out of the vulva
- The vulva looks red.

Colostrum
This is the first milk of a cow after calving. It is thick and yellow in colour

Importance of colostrums to a calf
- Colostrum opens the digestive tract of a calf
- Colostrum is rich in a balanced diet
- It contains high quality of Vitamin A

Learner's activity

1) What is calving in cattle management?

_____

_____

2) How is calving in cows similar to kidding in goats?

_____

_____

3) State any **two** changes which happen in the vulva of a calving cow.
   (i) _____
   (ii)_____
4) What is drying period in cattle management?

_____

_____

5) Why do farmers dry off their lactating cows?

_____

_____

6) Give **two** importance of colostrum to a calf
   (i) _____
   (ii)_____

Cattle management of a farm

Housing cattle

This is the construction of houses favouring good health of cattle

Qualities or characteristics of a good house of cattle (byre)

- Well ventilated for free air circulation.
- Has a strong floor made of concrete for easy cleaning
- Has a slanting side to enable urine drain out.
- It should have feeding trough for feeding the cattle

Materials used to build cattle houses include

Wood, concrete, metals, bricks, plastics, stones etc.

Types of cattle houses

- Permanent houses and
- semi- permanent

Different examples of cattle houses

- Calf pens are houses for calf
- Byre (cattle shed) are houses for mature cattle
- Milking shed
- Farm stores
- Cattle crush

Importance of housing cattle

1. Housing protects cattle from bad weather conditions
2. Housing protects cattle from predators
3. Housing protects animals from thieves
4. It is where farm animal produce are kept
5. It is where farm records are kept
6. It is where milking is done to ensure proper hygiene

Management of cattle houses

- Regular cleaning of the cattle house
- Scrubbing the floor to remove animal urine and dung
- Roofing the house to protect animals from bad weather conditions
- Providing feeding containers in cattle houses
- Cattle houses should be placed in well drained area for easy flow of animal urine and dung

Learner's activity

1. Give **two** reasons for housing cattle
   (i) _____

(ii)_____

2. Mention any **two** materials used for building cattle houses.
   (i) _____
   (ii)_____
3. In which way is a byre different from the calf pen?
   _____
   _____
4. State the reason why a cattle house should be:
   (a)Be well ventilated: .....
   (b)Have a slanting floor: .....
5. What name is given to the house for cattle?
   _____
   _____
6. Mention any **two** importance of housing cattle.
   (i) _____
   (ii)_____
7. What are predators?
   _____
   _____
8. State any **two** predators cattle are protected against.
   (i) _____
   (ii)_____
9. Mention any **two** bad weather conditions that affect the health of cattle.
   (i) _____
   (ii)_____
10. List any **two** qualities of a good house for cattle
   (i) _____
   (ii)_____

Fencing cattle

A fence is a barrier of live or dead material which divides an area of land.

Types of fences

Artificial/constructed fences
Natural/ planted fences

Artificial fences

This is the type of fencing where poles, bricks, barbed wire, chain links, wire nets, wire mesh and gates are used.

Natural fences

These are fences planted by man along the boundaries of the land.

Examples of plants used for fencing

Conifers, acacia, bamboo, thorn trees, sisal

Reasons for fencing animals

- Fencing prevents animals from spoiling peoples crops
- Fencing allows proper use of pastures
- Fencing protects animals from thieves and predators
- Fencing controls, the spread of pests and disease
- Fencing avoids wastage of manure
- Natural fences act as wind breaks thus controls soil erosion
- Natural fences maintain soil fertility by adding humus
- Fencing makes culling easy
- It is easy to separate animals according to their type, age, sex etc.

Learner's activity

1. What do you understand by the term "fence"?

_____

_____

2. What are artificial fences

_____

_____

3. Mention any **two** materials used for constructing artificial fences.

(i) _____

(ii)_____

4. How does a natural fence maintain soil fertility?

_____

_____

5. Which type of fences requires the use of barbed wires?

_____

_____

6. What type of fence is planted by man along the boundaries of the land?

_____

_____

7. Mention any **two** plants planted to provide live fences.

(i) _____

(ii)_____

8. Identify any **two** reasons for fencing farm animals

(i) _____

(ii)_____

Feeding cattle

Cattle feeding are giving enough nutritious food to the cattle.

Cattle mostly feed on pastures.

Pastures are the grass and other plant materials eaten by livestock.

Types of pastures

- Natural pastures:
- Prepared pastures

Natural pastures:

It is the grass which grows on its own and is eaten by animals in a raw form.

Examples of natural pastures

- Kikuyu grass
- Rhode's grass
- Guinea grass
- Nandi grass
- Elephant grass
- Guatemala grass
- Alfalfa grass

Prepared pasture

It is pasture made of fodder crops.

Fodder crops are crops grown for feeding animals

Examples of fodder crops

- Maize silage
- Hay
- Sorghum
- Millet
- Oats
- Napier grass
- Clovers

Importance of pastures

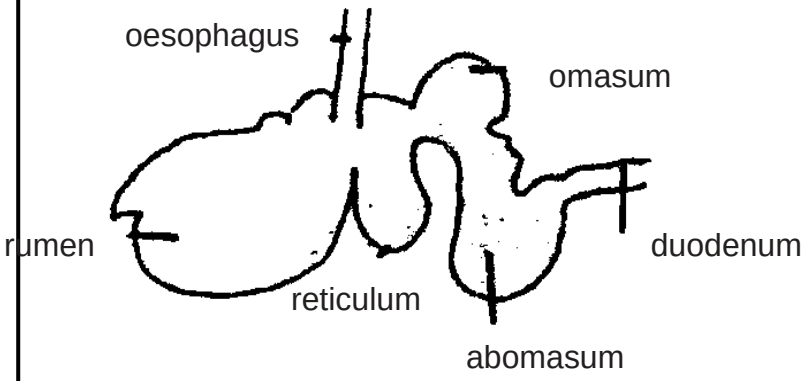
- It is food for animals
- Infertile land can be used as pasture land
- Pasture add humus to the soil
- Pasture provides beddings for animals
- Pasture can be used as thatching materials on a farm
- Some pasture add nitrogen in the soil like disodium
- Some pastures are used as local medicine for animals

Activity

- ✓ Cattle, sheep and goats are ruminant animals.

- ✓ They chew cud
- ✓ They have four chambered stomachs. I.e. Rumen(pouch), Reticulum (honey comb), Omasum and Abomasum

Illustration showing the stomach of a ruminant:



Functions of the parts:

1) **Oesophagus (gullet**
   This the passage through which food (roughage) moves from the mouth to the rumen
   Food (roughage) move by the process of wave like movement called peristalsis
2) **Rumen (pouch)**
   The rumen is the largest of the four stomachs
   It stores roughage temporarily before it is returned to the mouth for rumination (chewing cud)
3) **Reticulum (honey comb)**
   This is second stomach where bacterial action takes place.
   It separates chewed materials from coarse ones.
4) **Omasum**
   This is the third stomach. It is where absorption of water from food takes place
5) **Reticulum**
   This is the fourth stomach. It is called **true stomach**.
   This is where chemical digestion takes place.

Types of cattle feeds

- ✓ Animal feeds is the food given to livestock
- ✓ **Forages.**
  These include pasture or green grass, legumes, dry grass or hay, maize stalk preserved green fodder or silage.
- ✓ **Concentrates.**
  These are cattle feeds with a lot of nutrients and less moisture, e.g. cereals like maize brand, oil seeds, oil cakes, legume seeds, bone meal
- ✓ **Succulent feeds.**
- ✓ These are cattle feeds with high moisture content and low fibres, e.g. sweet potato vines, banana peelings, cassava peelings etc.
- ✓ **Supplement.**
  These are cattle feeds added to boast the nutritious value of ordinary feeds, examples are proteins, vitamins, mineral salts added to ordinary feeds.
- ✓ **Additives.**
  These are substances added to cattle feeds and water, e.g. medicine, flavours, hormones.
- ✓ **Roughages.**
  These are fibrous cattle feeds having low food values e.g. young grass, dry maize stalk, hay etc

Grazing

- This is the eating of fresh grass by animals.
- It is the proper use of grassland by live stock

Methods of grazing

There are three methods of grazing cattle namely:

- Rotational grazing
- Zero grazing
- Herding

Rotational grazing

Rotational grazing includes paddock grazing, herding and strip grazing

1. Paddock grazing/Paddocking

This is the method of grazing cattle where a livestock farmer divides up the pasture land into sections called paddocks.

Paddocking is also called rotational grazing.

Advantages of paddock grazing

- Paddocking controls pests and diseases
- It controls overgrazing
- Manure is distributed on a farm
- It protects animals from destroying peoples crops
- It requires less labour
- It protects animals from predators
- It helps grass get enough time to grow
- Ensures proper use of grass

Disadvantages of paddock grazing

- Barbed wires can injure the animals
- It is expensive to construct paddocks
- Paddocking requires a big piece of land
- Animals may not have enough land for exercise

2. Tethering

This is the method where animals are tied on pegs as they graze.

Water is provided to animals as they are transferred to another place.

Advantages of tethering

1. It is cheaper when handling a small number of livestock
2. The livestock farm can do other activities
3. Fencing is not required
4. The farmer selects the best pasture

Disadvantages of tethering

1. Tethering is expensive in terms of replacing ropes
2. Ropes can injure animals
3. It cannot be used when rearing many areas
4. It leads to over grazing
5. Animals lack enough exercise
6. Animals are restricted to one type of pasture

Learner's activity

1. One sentence, show the meaning of the phrase rotational grazing.
   _____
   _____
2. Give **two** advantages of rotational grazing
   (i) _____
   (ii)_____
3. Identify any **two** methods of rotational grazing
   (i) _____
   (ii)_____
4. Briefly explain how strip grazing can be a disadvantage to a livestock farmer
   _____
   _____
5. Give **two** advantages of paddock grazing to a farmer
   (i) _____
   (ii)_____

3. Strip grazing

This is the method where the pasture land is divided into smaller portions called strips with a temporally wire or movable fence to control the movement of animals.

Advantages of strip grazing

- Strip grazing controls pests and diseases
- Pasture is evenly used
- Ensures proper use of pasture
- Gives the farmer time to do other activities
- Grass is given time to grow
- Manure is evenly distributed on the farm

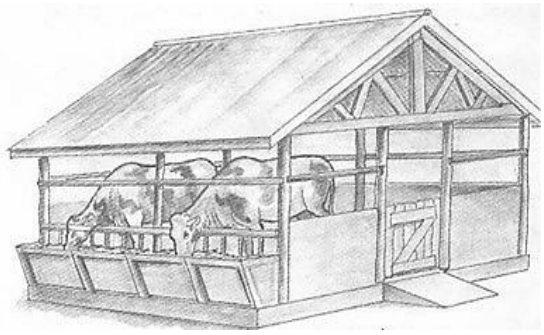
Disadvantages of strip grazing

- It is expensive to set up strips
- The animals may not get enough exercise
- Few animals are kept using strip grazing

4. Zero grazing.

This is the method where animals are kept in the constructed structure where feeds and water are brought to them.

In this method, animals do not move out of the constructed structure for grazing



Requirements for zero grazing

1. Water trough
2. Feeding trough
3. Fodder garden
4. Store
5. Labour
6. Well constructed shade
7. Drainage way to remove water and dung

Advantages of zero grazing

1. It enables easy collection of manure
2. Controls the spread of pests and disease
3. A sick animal can easily be identified
4. It protects animal from destroying crops
5. The feeds are not wasted
6. The animals do not move for a long distance and so they produce more meat and milk

Disadvantages of zero grazing

- ✓ It is expensive to start
- ✓ More labour is required to feed the animals
- ✓ Animal do not get enough exercise
- ✓ Diseases can easily be spread to other animals
- ✓ It requires a lot of cleaning

Learner's activity

1. Mention any **two** systems of rotational grazing.
   (i) _____
   (ii)_____
2. Which system of rotational grazing is mostly applicable in the
   (a) Urban areas of Uganda: ……
   (b) Rural areas of Uganda: ……
3. State the main reason why zero grazing is commonly used in urban areas of Uganda.

4.
5. How are the following important in zero grazing farms?
   (a) Fodder garden: _____
   (b) Labour: _____

6. State any **two** other requirements for zero grazing.
   (i) _____
   (ii)_____
7. Mention any **two** advantages of zero grazing.
   (i) _____
   (ii)_____
8. State any **two** disadvantages of zero grazing.
   (i) _____
   (ii)_____

Herding/ communal grazing/ free range grazing

This is a method where animals graze freely with the guidance of a herder.
It is the commonest method of grazing animals in most rural parts of Uganda.

Advantages of herding

- The herder closely watches animals
- Sick animals can easily be identified by the herder
- The herder directs animals to good pasture
- Animals get enough exercise
- Animals get a variety of pasture

Disadvantages of herding

- Animals can easily be attacked by diseases
- Animals can easily get lost
- Animals can destroy peoples' property.
- Herding leads to overgrazing
- It requires very large piece of land

Learner's activity

1. Explain the following terms;
   a) Herding :_____
   b) Zero grazing : _____
2. Name the method of grazing where animals are left to graze freely.
   _____
   _____
3. Mention any **one** factor to consider when using herding method of grazing animals.
   _____
   _____
4. Outline any **two** advantages of using herding
   (i) _____
   (ii)_____
5. Name the commonest method of grazing animals in most rural parts of Uganda.
   _____
   _____
6. How can zero grazing be a disadvantage to a farmer?
   _____
   _____

FARM STRUCTURES

A crush

It is a narrow structure on a farm made of timber or steel with an entrance and an exit

Advantages

1. It is used when carrying out vaccination
2. It is used when making identification mark like tattooing, branding

3. It is used when spraying and Deworming animals
4. It is used when carrying out insemination

Spray race

It is a confined place where animals are sprayed.

Dip tank

It is a tank where cattle are dipped. It consists of an entrance, swim bath and an exit

Uses of a dip tank

- It is appropriate when handling large numbers of animals
- Acaricides in a dip tank can be used again
- It requires less labour
- There is proper coverage of the animal with acaricide

Disadvantages

- It is expensive to construct
- It requires skilled personnel to apply correct quantity of acaricides

CATTLE MANAGEMENT PRACTICES

Animal identification marks.

The reason for identification marks is to enable farmers locate his / her animals from a big herd.

Ways of putting animals' identification marks

Branding

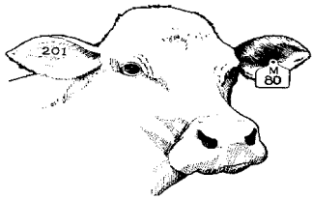
This is where a hot iron is used to make a mark or symbol on the animals' skin. Branding lowers the quality of the skin

Ear notching

This is where marks are cut on the edge of the ear

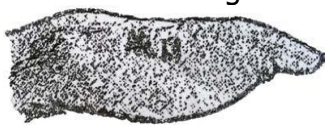
Ear tagging

This is where a tag with a number is fixed on the animals' ears.



Ear tattooing

This is the cutting of the edge of the ears of animals with marks



Number tag (laces)

This is where a wooden, metallic, rubber or plastic plate is put in the animal's neck

Tail bobbing. This is where the tail hair (switch) is trimmed.

Uses of animal identification marks

Enables a farmer to identify his animals

Dehorning (Disbudding)

This is the practice of removing horn buds from the animal's head

Learner's activity

1. Briefly e dandelion explain the following terms

i) Steaming up

_____

_____

ii) Drying off

_____

_____

iii) Calving

_____

_____

7. How is colostrum important to a calf?

_____

_____

8. Why do you think a cow should be separated from the herd before calving?

_____

_____

9. List down any **two** signs of a cow on heat
   (i) _____
   (ii)_____

Below is an identification mark put on an animal. Use it to answer the questions that follow.

(a) Name the method of animal identification shown above.

_____

_____

(b) State any **two** importance of putting the identification mark above.

_____

_____

Dehorning

Dehorning is the shortening of grown horns from an animal.

Disbudding is the removal of horn buds to prevent them from growing.

Methods of dehorning

1. **Using chemicals.**
   Chemicals used are sodium or potassium hydroxide. In this method a caustic stick is used to put chemicals on the horn bud.

This method is carried out when the calf is three to four days old.

2. **Using a hot iron.**
   This is where a hot iron is pressed outside on the horn bud for a short time. This method is carried out when the calf is 7 – 14 days.
3. **Using spoon dehorner.**
   This is a tool used to scoop out the horn bud from an animal's head. It is carried out when the calf is 2 months

Reasons for dehorning animals

- It prevents animals from injuring each other
- It increases the spaces in the byre
- It enables easy handling of animals
- Many animals can be kept in a small space

Disadvantages for dehorning animals

- It is painful to animals
- It can cause damage to the animal's brain
- It can lead to cause of disease
- Animals are denied chances of defending against enemies
- Poor operation can lead to death of animals

Activity

1. Define the term dehorning.

_____

_____

2. How is dehorning different from disbudding?
   _____
   _____
3. Mention any **two** methods of dehorning farm animals.
   (i) _____
   (ii)_____
4. Give **two** reasons for dehorning animals.
   (i) _____
   (ii)_____
5. State any **two** chemicals used for dehorning.
   (i) _____
   (ii)_____
6. How is a caustic stick important during the process of dehorning?
   _____
   _____
7. State any **one** importance of a dehorning spoon to the cattle farmers.
   (i) _____
   (ii)_____
8. Give **two** disadvantages for dehorning animals.
   (i) _____
   (ii)_____

Castration

This is the removal of testis from male animals

Methods of castration

- Using a burdizzo (closed operation)
- Open operation (surgical operation)
- Using a loop/rubbering

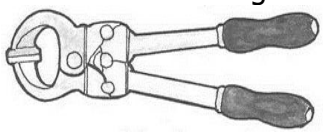
Open operation.

This is where a sharp knife is used to make a slit by cutting the scrotum vertically to remove the testis

Note: a hot iron is used to burn and seal the wound.

Using a burdizzo (closed operation)

This is where an instrument called burdizzo is used with great pressure to crush the sperm duct.



Using a loop/rubbering

This is where an elastic rubber band is used to squeeze the testis

Note: When the spermatic cords and blood vessels are broken, the testis shrivels and dies.

Reasons for castration

- Castration prevents in-breeding
- Castrated bulls are easy to handle
- It prevents venereal diseases
- Castrated animals grow very fast
- It makes animals more suitable for work
- Castrated animals grow fatter and produce good meat
- Castration prevent mating which can cause unwanted pregnancies

Disadvantages of castration

- Animals are denied a chance to enjoy natural mating.
- There is loss of blood from the animal
- The wounds may become septic and attract germs
- It is painful to animals
- It may lead to death of animals if poorly done

Learner's activity

1. What is castration?

   _____

   _____
2. State **two** farm animals that can be castrated.
   (i) _____
   (ii)_____
3. Name the method of castration where a sharp knife is used to castrate animals.

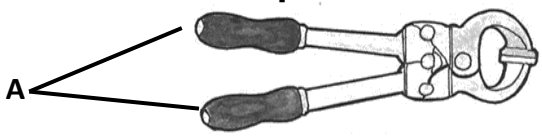
   _____

   _____
4. Write down any **two** methods of castrating male farm animals.
   (i) _____
   (ii)_____
5. Mention the tool used in closed castration method.

   _____

   _____
6. Give **two** reasons for castration in a farm.
   (i) _____
   (ii)_____

Below is a farm tool. Use it to answer questions that follow.



7. Name the farm tool shown above.

   _____

   _____
8. How is the above tool important to the cattle farmers?

   _____

   _____
9. How important is the part marked with letter A important to the tool above?

   _____

   _____
10. Matayo castrated his bulls using open castration method, after two days, the animals fell sick and died. What caused in Matayo's bulls?

    _____

    _____
11. State **two** disadvantages of castration to animals.
    (i) _____
    (ii)_____

Deworming animals

This is the practice of giving drugs in the mouth to control internal parasites.

Methods of deworming

Drenching is the giving of liquid drugs to an animal using a drenching gun or bottle.

Dosing is the giving solid drugs to an animal using a dozing gun.

Hoof trimming.

It is the practice of shaping hooves of calves. A hoof trimmer is used.

Reasons for hoof trimming

- To avoid early infections that occur around hooves
- To enable balanced moved of the animals hence avoiding lameness.
- It avoid diseases in animals
- It facilities easy mating by males

Removal of teats

This is the act of removing extra teats that grow on the udder.

Learner's activity

1. What is deworming as used in animal management?
   _____
   _____
2. Mention any **two** methods of deworming animals.
   (i) _____
   (ii)_____
3. What is hoof trimming?
   _____
   _____
4. Apart from cattle, mention any **two** farm animals which can be hoof trimmed.
   (i) _____
   (ii)_____
5. State any **two** reasons for hoof trimming
   (i) _____
   (ii)_____
6. Of what importance is a hoof trimmer to the cattle farmers?
   _____
   _____
7. What term is used to mean the act of removing extra teats that grow on the udder
   _____
   _____

Milking

It is the act of squeezing the teats of the lactating cow to get milk.

- Milk is a white liquid got from the cow's udder.
- Milk is the white liquid secreted from the mammary glands of a female animal.

A cow can let down milk or hold up her milk when disturbed.

Milk letdown is when the cow has released the milk from the udder.

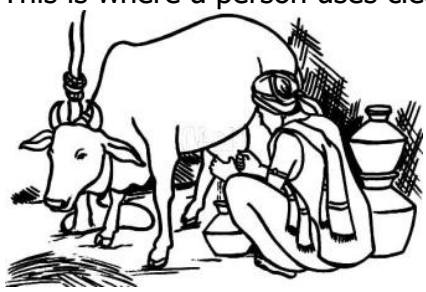
Milk holdup is the condition in which a cow fails to release her milk.

Methods of milking

- Hand milking.
- Machine milking.

Hand milking

This is where a person uses clean hands to get milk from the udder of a cow.



Advantages of hand milking

- It is very cheap
- It does not cause any problem in the udder and the teats
- It does not require skills to operate
- It creates relationship between the animals and the milkman

Disadvantages of hand milking

- It takes a lot of time
- It is risky to milk tough cows
- It is not suitable for large scale

Machine milking

This is where a machine is used to milk an animal.

Advantages of machine milking

- It is time saving
- It helps in milking tough cows
- It is suitable for large scale

Disadvantages of machine milking

- Needs a trained person to operate machine.
- The machines are expensive to buy.
- The udder may be injured in case of a machine fault
- There is high risk of mastitis infection
- Power challenge can affect milking time.

Learner's activity

1. What is milking?
   _____
   _____
2. Define the term milk letdown.
   _____
   _____
3. What term is used to mean the condition in which a cow fails to release her milk?
   _____
   _____
4. State any **two** factors that cause milk holdup.
   (i) _____
   (ii)_____
5. Mention any **two** methods of milking
   (i) _____
   (ii)_____
6. What is the main tool used in hand milking
   _____
   _____
7. State any **two** advantages of hand milking
   (i) _____
   (ii)_____
8. Mention any two disadvantages of hand milking
   (i) _____
   (ii)_____
9. What is machine milking?
   _____
   _____
10. Mention any **two** advantages of using milking machine instead of hands to milk cattle
    (i) _____
    (ii)_____
11. State any **two** disadvantages of machine milking
    (i) _____
    (ii)_____

Preparation for milking

Assemble the milking equipment

1. Put the cow in a milking place and tie the hind legs with a rope
2. Wash the udder with warm water to stimulate milk production
3. Wash the milking containers using hot water to kill germs
4. Apply the milking cream on the teats to prevent cracking on the teats
5. Clean the milking parlour
6. Draw some milk into the strip cup to test for mastitis
7. Milk must be filtered to remove foreign bodies like grass, hair, small insects
8. After milking, the milking parlour and milking equipment should be washed.
9. Give the cow some feeds to keep it busy during milking.

A strip cup is farm equipment used to test for mastitis
Lactometer is a machine used to detect the amount of water in milk. A lactometer also detects whether fats has been removed from milk

NOTE:
Dry off periods. This is the stopping of milking a pregnant cow.

Types of milk

1. Processed milk. It is milk processed to kill germs and improve on its quality
2. Sterilized milk. It is the milk produced by boiling and cooling to make it free from germs.
3. Pasteurized milk. This is milk which is cooled and packed in materials that can provide protection against micro-organisms.
4. Skimmed milk. This is milk from which fats have been removed.
5. Condensed milk. This is milk from which most of the water content has been removed
6. Evaporated milk. This is milk that has been homogenized and all the water is removed to make it powder.
7. Fortified milk. This is the milk which has minerals, vitamins and other food nutrients added to it.
8. Cultured milk. This is prepared from pasteurized milk by adding bacteria to make it thick and sour.
9. Dried or powdered milk. This is milk prepared by removing fats and water

Methods of preserving milk

- **Pasteurization**
  It is the process of killing germs from the milk by heating under controlled temperature that does not change the natural characteristics of milk.
- **Refrigeration**
  This is the method where milk is kept under very low temperatures below 0^0cc
  Note: freezing does not kill germs but reduces the rate at which germs multiply.
- **Sterilization**
  This is the process of making milk free from germs by boiling.

Learner's activity

1) State what you understand by the term milk preservation.
   _____
   _____
2) How is fortified milk different from skimmed milk?
   _____
   _____
3) Give **two** ways of preserving milk.
   (i) _____
   (ii)_____
4) Describe how yoghurt is made from milk.
   _____
   _____
5) Name the disease got from drinking unboiled milk.
   _____
   _____
6) Name the type of milk which most of the water content has been removed.
   _____
   _____
7) Name the farm equipment used to test for mastitis
   _____
   _____
8) Give **two** reasons for preserving milk.
   (i) _____
   (ii)_____
9) State the importance of carrying out these activities before milking

(a) Washing hands : _____

(b) Washing the teats: _____

10) State any **two** causes of milk contamination.

(i) _____

(ii)_____

11) State the importance of the following milk products to people

a. Cream _____

b. Ghee : _____

c. Butter _____

Milk products and how they are made

Milk product	**How it is made**	**uses**
Butter	It is made by churning cream	It is used for frying food
Cheese	Made by sour milk, thickening it by salt	It is eaten directly or mixed in to food
Yoghurt	It is made by churning milk from which fats has been removed	It is drunk directly It is mixed with the dry food
Ice cream	It is made by flavouring milk fats	It is refrigerated and eaten or mixed with grain foods like rice
Skimmed milk	Removing fats from the milk	It is directly drunk by people
Fresh milk	Boiling or refrigeration	It is drunk or directly added on food
Ghee	It is made by boiling butter	For frying food

Other animal products

- Hides
- Beef
- Horns and bones
- Hooves

Preservation of hides

- Wet salting
- Drying suspension

Practices that harm cattle and other domestic animals in a home, the field, transit and abattoir:

At home:

- Overcrowding of animals
- Beating animals
- Castration and dehorning
- Neglecting sick animals
- Tying the legs of a cow tightly when milking
- Poor feeding of animals

In the field

- Beating animals severely
- Making the rope too tight when tethering animals
- Over stocking
- Giving animals insufficient food
- Piercing animals to get blood from them

In transit:

- Beating animals
- Making animals walk very long distances without food or water.
- Tying the legs and neck of animals when transporting them.

In the abattoir:

- Slaughtering in-calf cows
- Starving animals before slaughtering
- Cruel methods of slaughtering animals

Learner's activity

1. In which way can beating animals cause pain in them?

   _____

   _____

2. Mention any **two** practices that can harm cattle in the field.

   (i) _____

   (ii)_____

3. Mention any **two** practices that can harm cattle in the abattoir

   _____

   _____

4. State any **two** effects of harmful practices to animals.

   (i) _____

   (ii)_____

Animal pests/animal parasites

A pest is an organism which cause harm to another organisms.

A parasite is a living organism which depends on another organism (host) for food and shelter.

Ways how pests are harmful

- They transmit diseases
- They suck blood from animals causing anaemia
- They cause damage to the skin

Types of animal pests/parasites

- Internal parasites or pest (endo parasites)
- External parasites (Ecto parasites).

Internal parasites or pest (endo parasite)

These are the parasite that live and feed from inside the body of animals.

Examples of internal parasites/pests

Tape worms, Round worms, Liver fluke

Control of internal pests/parasite

Deworming animals

Keep feeding containers clean

External parasites (Ecto parasites)

These are parasites found on the body of animals (host)

Examples of external parasites

Fleas, mites, Tsetse flies, Lice

Control of external parasites/pests

- Spraying animals with acaricides
- Dipping animals
- Deticking (hand picking)
- Clearing bushes around the cattle farm.

Learner's activity

1. What do you understand by the term parasites?

   _____

   _____

2. Name the **two** types of parasites

   _____

   _____

3. State any one reason why hand picking is not a best way of controlling ticks in animals.

   _____

   _____

4. How do parasites gain entry into the animal's body?

   _____

   _____

5. Name the type of parasite which causes Nagana in cattle.

_____

_____

6. Give **two** examples of external cattle parasites.
   (i) _____
   (ii)_____
7. State any **two** effects of parasites on animals.
   (i) _____
   (ii)_____
8. Mention any **one** impact of parasites to the animal farmers.
   (i) _____
   (ii)_____
9. Briefly mention any **two** ways of controlling parasites on a farm
   (i) _____
   (ii)_____

Cattle diseases

Diseases are particular abnormal condition that affects the body of an organism.
Diseases cause sicknesses and death in animals.

Cattle diseases are grouped according to their causative agents

Signs of sickness in animals

- Abnormal body temperature and pulse rate
- Difficult in passing out urine/dung
- Loss of appetite
- Prolonged cough
- Rough fur
- Animals become restless
- Animals appear gloomy
- Diarrhoea
- Abnormal salivation

Conditions that may lead an animal to acquire diseases

- Lack of essential nutrients in the feeds
- Overcrowding of animals
- Physical injuries
- Feeding animals on contaminated feeds

Ways how diseases are spread from one animal to another

- Direct contact between sick and healthy animals
- Through food, water, feeding trough
- Through dead animals
- Shoes and clothing of visitors who deal with animals
- Through pests and parasites

Learner's activity

1) Define the term diseases

2) State any **two** effects of diseases in animals.
   (i) _____
   (ii)_____
3) State any **two** ways in which diseases are spread from one animal to another.
   (i) _____
   (ii)_____
4) What causes sickness in animals?

   _____

   _____
5) State any **two** signs of sickness in animals.
   (i) _____
   (ii)_____
6) Mention any **two** conditions that may lead an animal to acquire diseases
   (i) _____
   (ii)_____

Groups of cattle diseases

Viral cattle diseases

These are cattle diseases caused by virus and they include:

- Rinder pest
- Foot and mouth disease
- Nairobi sheep disease

Rinder pest

It is spread through body contact with infected animals

Signs and symptoms

- Bloody diarrhoea
- Difficulty in breathing
- High temperature
- Nasal and eye discharge
- Loss of appetite
- Flow of tears.
- The nose, mouth and muzzle become hot with fast breathing

Prevention and control of rinder pests

- Regular vaccination
- Apply quarantine
- Isolate and slaughter infected animals

Foot and mouth disease

- It is caused by a virus
- It is spread through sharing feeding and water troughs
- It is also spread through body contact

Signs and symptoms

- Lameness due to blisters between the hooves
- Fever and dullness
- Loss of appetite
- Excessive salivation
- Blisters/wounds on the tongue, gum and palates
- High temperatures

Prevention and control of foot and mouth disease

- Let animals bathe their feet in antiseptic
- Apply quarantine
- Regular vaccination
- Isolate and slaughter infected animals Nairobi sheep disease

Learner's activity

What are viral diseases

_____

_____

1) State **two** ways in which viral infection in cattle are spread.
   (i) _____
   (ii)_____
2) Mention any **two** cattle diseases caused by virus.
   (i) _____
   (ii)_____
3) State any **two** signs and symptoms of rinder pest infection in cattle
   (i) _____
   (ii)_____
4) State **two** ways of preventing rinder pests
   (i) _____
   (ii)_____
5) What causes foot and mouth disease

   _____

   _____
6) State any **two** signs and symptoms of foot and mouth diseases
   (i) _____
   (ii)_____
7) Mention any **two** ways of controlling of foot and mouth disease in a cattle farm.
   (i) _____

(ii)_____

Bacterial cattle diseases

These are cattle diseases caused by bacteria, e.g.

- Anthrax
- Mastitis
- Calf scour
- Black bovine pleuropneumonia
- Foot rot
- Brucellosis
- Tuberculosis
- Pneumonia

Anthrax

This is caused by bacteria called bacillus anthracis.
It is spread through close body contacts.

Signs and symptoms of anthrax

- High fever of over 40^0C
- Shivering
- Loss of appetite
- Dullness of an animal
- Blood-stained dung (dysentery)
- Sudden death in cattle within 24 hours
- Watery blood flows from the anus, nose, mouth, vulva of a dead animal.

Prevention and control of anthrax

- Treat early cases with antibiotics
- Vaccinate animals every year
- Never open carcass that show signs and symptoms of anthrax
- Dispose of the carcass by completely burning or burying 3 metres deep.
- Report suspected anthrax cases to the veterinary authorities as soon as possible

Learner's activity

1) Name the bacteria which cause anthrax.
   _____
   _____
2) State any **two** signs and symptoms of anthrax
   (i) _____
   (ii)_____
3) Mention any **two** ways of preventing anthrax
   (i) _____
   (ii)_____
4) Give any **two** farm animals affected by anthrax infection.
   (i) _____
   (ii)_____
5) State **one** way in which anthrax is spread from one animal to another.

Mastitis

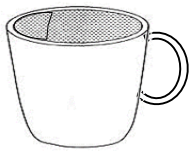
It is an infectious disease caused by bacteria.
It affects the mammary glands of mammals like cattle buffaloes, sheep, goats, bitch, woman

Signs and symptoms

- Swollen udder and teats
- Milk contains pus, blood and turns watery or clots
- Death may result if not treated
- The affected udder quarter dies and gives no milk

Note: mastitis can be detected using a strip cup

Diagram of a strip cup



Prevention and control of mastitis

- Treat early cases with antibiotics
- Milk out teats and massage with hot water
- Use disinfectants during milking
- Observe cleanliness in the milking parlour
- Regular vaccination of animals
- Use of strip cup to detect the presence of mastitis
- Strict quarantine

Learner's activity

1) Name the bacterial infection which affects the mammary glands in cattle.
   _____
   _____
2) How is the disease named above spread from one animal to anot gns and symptoms of mastitis
   (i) _____
   (ii)_____
3) State the tool used for detecting mastitis in cattle.
   _____
   _____
4) Of what use is a strip cut to the cattle farmers?
   _____
   _____
5) Mention **two** ways in which Morgan can control mastitis in his cattle.
   (i) _____
   (ii)_____

Tuberculosis in cattle

It is a chronic infectious disease caused by bacteria.
It is spread through air

Signs and symptoms of tuberculosis

- Loss of appetite
- Coughing
- Decrease in milk production

Prevention and control of tuberculosis

- Isolate infected animals and slaughter them
- Observe goof hygiene
- Regular vaccination of animals.

Brucellosis

It is a contagious infectious disease caused by brucella abortus bacteria
It affects animals like cattle, sheep, goats and man

How brucellosis is spread

It is spread when an animal eats infected materials contaminated by discharge from another infected animals.
Brucellosis can be spread through sexual intercourse from an infected bull.

Signs and symptoms

- Abortion occurs
- Brownish vaginal discharge
- The placenta remains inside the womb
- In rams, the testes swell
- In sows, piglets are born dead

Prevention and control

- Cull and slaughter the infected animals
- Regular vaccination of female animals below 12 months especially cattle
- Do not touch aborted fetuses or do not remove placenta without hand gloves
- Boil milk from infected animals before drinking

Learner's activity

1) Name the most chronic infectious disease caused by bacteria in cattle.
   _____
   _____
2) State any **two** signs and symptoms of tuberculosis.
   (i) _____
   (ii)_____
3) Give two ways in which Tom can control the spread of tuberculosis in his animal farm
   (i) _____
   (ii)_____
4) What causes Brucellosis?
   _____
   _____
5) How is brucellosis spread from one animal to another?
   _____
   _____
6) Name any **two** domestic animals which are affected by Brucellosis.
   (i) _____
   (ii)_____
7) State any **two** signs and symptoms of Brucellosis
   (i) _____
   (ii)_____

Contagious bovine pleuropneumonia

It is spread by breathing discharged bacteria from the nose of other infected cattle

Signs and symptoms

- Discharge of thick mucus from the nose and mouth
- Rise in temperature
- Coughing
- Hard painful coughing
- Difficulty in breathing
- Loss of appetite

Prevention and control

- Isolate and slaughter all infected animals
- Regular vaccination of animals
- Treat early cases with antibiotics
- Imposing quarantine

Foot rot

This is caused by bacteria and attacks hooves of all animals

Foot rot is common in wet areas.

Signs and symptoms

- The hooves may contain pus with smell
- Swollen painful hooves
- Animals become lame

Prevention and control

- Treat cases of foot rot with antibiotics
- Trim the hooves properly and remove the affected parts properly and then isolate the animal
- Provide animals with a foot bath of copper sulphate solution
- Routine trimming

Pneumonia

It is an infectious disease of the lungs caused by bacteria or virus. Pneumonia affects all animals

Signs and symptoms

- Difficult breathing
- Coughing
- Rise in temperature
- Nasal discharge
- Animal become reluctant to move
- Loss of appetite

Prevention and control

- Treat early cases with antibiotics
- Keep animal houses well ventilated

- Keep animal houses clean and warm
- Provide animals with soft feeds and water

Learner's activity

1) What causes pneumonia in cattle?

   _____

   _____

2) State any **two** signs and symptoms of pneumonia.
   (i) _____
   (ii)_____
3) Mention any **two** ways of preventing pneumonia in cattle.
   (i) _____
   (ii)_____
4) What causes foot rot?

   _____

   _____

5) Which part of a cow is mostly affected by foot rot?

   _____

   _____

6) State any **two** signs and symptoms of foot rot
   (i) _____
   (ii)_____

Protozoan cattle diseases

These are cattle diseases caused by protozoa, e.g.

- East coast fever
- Red water
- Coccidiosis
- Nagana
- Heart water
- Gall sickness

Nagana

It is an infectious protozoan disease of domestic animals. It is spread by tsetse flies and caused by trypanosome

Signs and symptoms

- Fever
- Loss of appetite
- Anaemia in an animal
- The animal licks soil
- The animal loses weight
- Swollen lymph nodes
- Running eyes which leads to blindness
- Death may occur after several weeks

Prevention and control

- Treat animals with readily available cures like berenil, antride and samon
- Spraying animals using insecticides to kill adult tsetse flies
- Clear bushes around homes
- Using tsetse fly traps to kill adult tsetse flies

Heart water

It is a protozoan disease spread by ticks; therefore, it is a tick-borne disease

Signs and symptoms

- High fever
- Loss of appetite
- Animals move in circles and become restless pressing the head against hard objects.

When the animal falls down the legs keep paddling in the air.

Prevention and control of heart water

- Treat early cases with tetracycline antibiotics and sulphur dilimidine
- Spraying and dipping animals

Learner's activity

1) State any **two** cattle diseases caused by protozoa

   _____

   _____

2) Which vector transmits Nagana to cattle?

_____

_____

3) State any **two** signs and symptoms of Nagana
   (i) _____
   (ii)_____
4) State **two** ways of preventing Nagana diseases.
   (i) _____
   (ii)_____
5) What spreads Heart water in cattle?

   _____

   _____
6) State any **one** cattle disease caused by the vector shown below.

   _____
7) State any **two** signs and symptoms of heart water.
   (i) _____
   (ii)_____
8) Mention any **two** ways of preventing and controlling heart water
   (i) _____
   (ii)_____

East coast fever (ECF)

It is a protozoan disease spread by both the brown ear ticks and red legged ticks.
It attacks cattle only

Signs and symptoms

- ✍ High temperature
- ✍ Constant salivation
- ✍ Animal gets thin quickly and dies in 2 – 3 days

Prevention and control

- ✍ Spraying and dipping animals to control ticks
- ✍ Fencing of land to prevent animals from getting ticks

Red water

It is a protozoan disease transmitted by brown ear ticks and red legged ticks to cattle only.

Signs and symptoms

- ✍ Fever
- ✍ Constipation
- ✍ Dullness
- ✍ Red urine
- ✍ Anaemia
- ✍ Animal kicks the soil
- ✍ Swollen lymph glands

Prevention and control

Treat with tetracycline antibiotics
Control ticks by spraying and dipping

Learner's activity

1) Give **two** ways of controlling cattle diseases
   (i) _____
   (ii)_____
2) State any **two** diseases in cow controlled by spraying ticks.
   (i) _____
   (ii)_____
3) Give **two** examples of viral and bacterial diseases of cattle
   (i) _____
   (ii)_____
4) Point out any **one** cause of sickness in cattle.

   _____

   _____

5) Identify the infection of cattle that attacks udder.

_____

_____

STARTING A LIVESTOCK FARM

Livestock refers to the animals kept on a farm. These may include;

Poultry Goats Sheep Pigs and Cattle

Livestock farming is the rearing of farm animals.

It's important to people in the following ways;

- It's a source of income when animals and their products are sold
- It's a source of food
- It provides employment opportunities to people

Requirements for starting a livestock farm

For one to start a livestock farm the following requirements should be in place.

- Land
- Capital
- Transport
- Market
- Labour
- Management

Land

This is a place on which the farm is started.

It may be obtained in the following ways;

- By buying
- Through inheritance
- From donation
- Through hiring

Capital,

This is the money used to buy things needed to start a farm.

Some of the things the money may be used for include;

- Buying land if it is to be bought
- Constructing animal houses, stores, office and stationery.
- Preparation of pasture
- Bringing water on the farm
- Paying workers and experts for the treatment and vaccination of the farm animals before the farm starts producing.
- Buying drugs, acaricides and necessary equipment for the farm.

c. Labour

- This includes people who do activities on a farm both skilled and unskilled workers.
- Market, in livestock farming, marketing refers to the demand for cattle or their products.
- Demand for cattle products means the desire and ability to pay for the products. Therefore, it's important to know whether people are ready to buy the products from the farm.

Learner's activity

1. Give a difference between livestock and livestock farming

   _____
2. Today in Uganda, many people prefer livestock farming to crop growing. Give **two** reasons for this.
   (i) _____
   (ii)_____
3. Identify any **two** ways of obtaining land for starting a livestock farm.
   (i) _____
   (ii)_____
4. List any **two** activities done by skilled workers on a farm.
   (i) _____
   (ii)_____
5. Give **two** ways in which capital can be used in starting a livestock farm
   (i) _____
   (ii)_____

6. How are livestock economically important to people.
   (i) _____
   (ii)_____
7. State any **two** requirements for starting a livestock farm.
   (i) _____
   (ii)_____
8. How are the following requirements important in a livestock farm?
   (a) Capital: _____
   (b) Labour: _____

A Farm record

A farm record is written information on various activities carried out on a farm

Types of farm records

- Production records
- Breeding records
- Health records
- Labour records
- Marketing records
- Field records

Types of farm records

- **Feeding records:**
  These show the amount of feeds bought, consumed and methods of feeding.
- **Breeding records**:
  These include reproduction, birth or death rates.
- **Production records:**
  These show yields of various farm produce e.g. eggs, milk, meat
- **Health records:**
  These are when and which animals were sick, what treatment they got or which ones to cull.
- **Labour records:**
  These include the number of farm labourers, type of work they do and their wages.
- **Marketing records:**
  These include where, when and what prices various products were sold.
- **Income and expenditures**:
  These are records of all the sales and purchases of the farm business.

Importance of farm records

- Help farmers to know the profits and losses
- Farm records help farmers to make decisions on the farm
- Farm records enable the government to tax the farm fairly
- It helps to acquire loans from the bank

Learner's activity

1) What are farm records?
   (i) _____
   (ii)_____
2) State any **two** types of farm records.
   (i) _____
   (ii)_____
3) Mention any **two** reasons why a cattle keeper should have records on his farm.
   (i) _____
   (ii)_____
4) Which type of farm record shows:
   (a) all the sales and purchases of the farm business: _____
   (b) yields of various farm produce: _____
   (c) the amount of feeds bought, consumed and methods of feeding: _____
5) Mention any **two** components of a farm budget.
   (i) _____
   (ii)_____
6) Mention any **two** dangers of not keeping farm records.
   (i) _____

(ii)_____

7) State the main reason why cattle farms should have a water source.
(i) _____
(ii)_____

TOPIC 4: RESOURCES IN THE ENVIRONMENT

Environment means all things that surround man.

Components of environment

- Land/soil
- Animals
- Plants
- Water
- Air

Resources are materials in the environment used to satisfy people's needs.

Types of resources

- Renewable resources
- Non- renewable resources

Renewable resources:

Renewable resources are resources that can be naturally replaced.

Renewable resources include;

(i) Water (ii) Plant (iii) Animals (iv) Air (v) Soil (vi) Sunshine

Characteristics of renewable resources

- They can naturally be replaced
- They can get exhausted
- They take millions of years to be formed
- They exist in limited quantity

Harvesting of resources is acquiring or getting resources from the environment.

Types of resources

- Renewable resources
- Non- renewable resources

Importance of plants as resources

How are plants used as resources?

1. Some plants are a source of food to people.
2. Some plants give us natural plant fibres like cotton, sisal, jute and linen.
3. Some plants are a source of herbal medicine to cure certain diseases.
4. Plants provide timber

Learner's activity

1. What are resources?
   (i) _____
   (ii)_____
2. State any **two** types of resources
   (i) _____
   (ii)_____
3. What term is used to mean a man and his surrounding?
   (i) _____
   (ii)_____
4. State any **two** biological components of environment.
   (i) _____
   (ii)_____
5. State any **two** edible parts of a plant.
   (i) _____
   (ii)_____
6. What are renewable resources?
   (i) _____
   (ii)_____
7. Mention any **two** resources that can be naturally replaced once used up.
   (i) _____
   (ii)_____

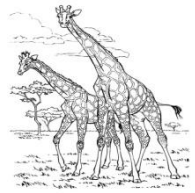
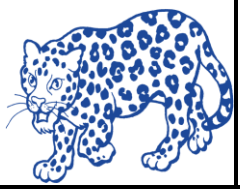
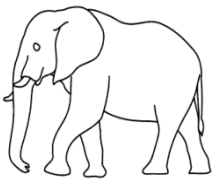
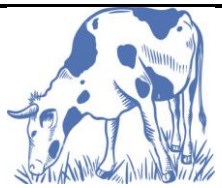
8. State any **two** characteristics of renewable resources
   (i) _____
   (ii)_____
9. Mention any **two** importance of plants as resources
   (i) _____
   (ii)_____

Animals

Animals can be found on land and in water. They include

Domestic and wild animals

- Domestic animals are animals kept and cared for at home.
- Wild animals are animals which live on their own in the bush

Wild animals			**Domestic animals**		
Giraffes	leopard	Elephant	Cow	Dog	Donkey
					

How are animals used as resources?

- Some animals like merino sheep provide wool, used to make cloths, suits, blankets, carpets, curtains, bed sheets
- Animas provide food to people
- Silk worms provide silk used to make different types of cloths.
- Some domestic animals provide skins and hides used to make bags, shoes, belts,
- Cattle provide horns and hooves used to make glue.
- Bees help to pollinate farmers' crops, provide honey and bee wax.
- Some animals help to guard our homes.
- Some animals like oxen and donkeys provide labour.

Ways of harvesting resources from animals

- Wool from sheep is got by shearing
- Milk from cow is got by milking
- Some wild animals are caught by hunting
- Meat are harvested by slaughtering animals
- Fish are caught by using fishing nets or hooks.

Learner's activity

1. Name the group of industries which use:
   (a) Skins from animals as raw materials: _____
   (b) Plant materials as raw materials:_____
2. Mention any **two** products got from animal skins.
   (i) _____
   (ii)_____
3. What is shearing?
   (i) _____
   (ii)_____
4. Name the way in which the following animal resources are harvested.
   (a) Wool: _____
   (b) Meat: _____
5. State any **two** ways in which animals are used as resources.
   (i) _____
   (ii)_____

Below is a diagram of an insect. Use it to answer the questions that follow.

6. (a)How are bees important to?
   (a) People: ……
   (b) Plants: ……
7. State any **one** way in which the insect above is dangerous to people.

   (i) _____
   (ii)_____

Wild life:

Wild life refers to plants and animals that live and grow on their own.
Some of these animals and plants have been extinct or are endangered because of increasing demand for their products e.g. Crocodiles for their skins Elephant for their tusks, Rhinos for their horns

Importance of wild life

- Some mammals and birds are a source of food
- Some animals and birds are used for cultural heritage by some countries and tribes
- Plants provide wood for fuel and timber
- Forests help in the formation of rain
- Earn foreign exchange for the government through tourist attraction.

Conservation of wild life;

1. Banning of poaching
2. Control over fishing
3. Take care of animals in national game parks and game reserves
4. Some rare animals should be caught and let to breed in the wild life centre
5. Soil erosion should be controlled.
6. Soil should be kept fertile by using manure and fertilizers.
7. Plastic wastes like broken Jerrycans, polythene papers should be recycled.
8. Vehicles in dangerous mechanical conditions should be repaired to conserve fuel.
9. Petroleum products should be used wisely to prevent further exploitation of oil

Learner's activity

1. What do you understand by the term conservation of resources?
   (i) _____
   (ii)_____
2. Give **two** ways of conserving the these resources in our environment
   Wild life
   (i) _____
   (ii)_____
   Soil
   (i) _____
   (ii)_____
   Minerals
   (i) _____
   (ii)_____
3. Explain the term fibre
   (i) _____
   (ii)_____
4. Give any **two** examples of plant fibres
   (i) _____
   (ii)_____
5. Name the water resource conserved by controlling over fishing.

(i) _____
(ii)_____

6. State **two** materials that can be recycled.
(i) _____
(ii)_____

Resources from non-living things

A non-living thing is one without life.

(i) Soil
(ii) Water
(iii) Air and wind
(iv) Rocks and minerals

Water

Water is a renewable resource when used carefully.
Water is made of two hydrogen atoms and one oxygen atoms (H2O
The main source of water is rain
Wetlands, lakes, rivers, swamps springs, underground water are also sources of water

How water is used as a resource

1. Running water can be used in the generation of hydro electricity
2. Water bodies are used for transport
3. Water is used to mix soft drinks
4. Water is used for irrigation of crops
5. Water sources are a source of fish
6. Water is used by plants in the process of photosynthesis
7. Water is used domestically for cooking and washing.

How water can be polluted.

- By silting.
  Silting is the deposition of eroded soil particles into water sources.
  This leads to death of aquatic life
- Dumping of industrial wastes in water.
  These wastes contain chemicals that contaminate the water bodies.
- Building of latrines near water bodies that can cause water contamination
- Dumping of house refuse in water sources.

Harvesting of water

- Underground water is harvested using boreholes
- Rain water is harvested using gutters and stored in the tanks
- Underground water is harvested using a windlass
- Underground water is fetched using jerry cans

Learner's activity

1. Why is water called a renewable resource?
(i) _____
(ii)_____
2. Name the main natural source of water
(i) _____
(ii)_____
3. Mention any **two** ways in which water are used as a resource.
(i) _____
(ii)_____
4. Give **one** soft drink mixed using water.
(i) _____
(ii)_____
5. What is Silting?
_____
_____
6. How does silting afferst:
7. Water bodies: _____

8. Aquatic animals: _____
9. State any two ways of harvesting underground water
   (i) _____
   (ii)_____
10. In which way is dumping of industrial wastes a problem to water?
   (i) _____
   (ii)_____
11. State **one** way in which water can be used as a resource.

   _____
   _____

Sun

- It is the single natural source of energy
- It produces light and heat energy

Importance of heat energy

- It is used by plants to carry out photosynthesis. The food made by plants is called starch.
- Sun light helps to dry crops after harvesting
- Heat from the sun is used for preserving food e.g. fish meat etc Heat from the sun is used to generate solar electricity.

Solar energy

This is energy radiated by the sun
Solar energy can be trapped and converted into electricity

Devices used to trap solar energy

- Solar cookers
- Solar driers
- Solar cells (solar panels)

Solar water heater

It is used for heating water in homes

How it works:

- It reflects sun rays towards a black hot plate
- The reflector is kept at an angle to receive the sun rays
- The sun rays are reflected toward a blackened plate that absorbs and radiates the heat out of it.
- When water in a container is placed on this plate it begins to boil.

Solar drier

It helps to dry crops e.g. maize, beans etc
Heat from the sun goes in through the top glass but it is not radiated out.
Ventilator pumps are used to blow air over the crops.

Solar panels

These are special types of plates made of solar cells that convert some light energy into electricity.
Solar cells are used in sate lights, space stations and other places where electricity is not available.
Solar cells provide power for running calculators, watches, lighting rooms and running radios.

Learner's activity

1) Name the natural source of energy.

   _____
   _____

2) What term is used to mean the light and heat we get from the sun?

   _____
   _____

3) Define the term **photosynthesis**.

   _____
   _____

4) State the element of weather needed for photosynthesis to take place.

   _____
   _____

5) Name the food made by plants.

_____

_____

6) What is heat energy?

_____

_____

7) Mention any **two** importance of heat energy

(i) _____

(ii)_____

8) What form of energy is got from the sun?

_____

_____

9) State any **one** device used to trap solar energy

_____

_____

Air and wind resources

Air is a mixture of gases

Wind is moving air

Uses of air

1. Oxygen is used during germination
2. Oxygen is used for respiration
3. Carbon dioxide is used in photosynthesis by green plants to make starch.
4. Carbon dioxide is a raw material in industries used to make liquefied carbon dioxide used to extinguish fire.
5. Carbon dioxide is used to preserve bottled drinks e.g. soda.
6. Nitrogen is used in the formation of proteins in plants
7. Nitrogen helps to make the soil fertile in form of nitrates
8. Rare gases (neon, argon, krypton, xenon, helium) are used in the making of electric bulbs

How man's activities affect air

- Burning produces smoke and carbon dioxide that cause air pollution
- Heavy industrialization causes air pollution
- Spraying dangerous chemicals causes air pollution.

Uses of wind

- It dries clothes
- It is used in winnowing seeds
- For running dhows and other boats which sail on water
- Wind energy runs mills to generate energy
- Wind is used for flying of kites
- Wind is used for driving windmill

Learner's activity

1. What is air?

_____

_____

2. What is the difference between wind and air?

_____

_____

3. How can air be useful to people? (Give **one** way)

_____

_____

4. Briefly explain the term wind.

_____

_____

5. Mention **two** uses of air to plants

(i) _____

(ii)_____

6. Mention **two** activities of human beings which are done on land.
   (i) _____
   (ii)_____
7. Air is a mixture of gases. In which way is wind different from air?
   _____
   _____
8. Oxygen is used during germination; mention **one** other use of oxygen.
   _____
   _____
9. Carbon dioxide is used to preserve bottled drinks. Cite **one** example of bottled drinks
   _____
   _____
10. How does heavy industrialization causes pollution?
   _____
   _____
11. Mention any **two** component of environment affected by industrialization.
   (i) _____
   (ii)_____
12. Name the element of weather which dries clothes at night.
   _____
   _____

Non renewable resources

Non renewable resources are materials that cannot be replaced by natural means when used

Characteristics of non renewable resources

- They cannot be replaced when they get used up.
- They can be exhausted in case they are not properly handled and preserved.

Examples include;

Examples of **Non renewable resources**

(i) Fossil fuels	(ii) Rocks	(iii) Clay
(iv) Sand	(v) Petroleum	(vi) Minerals

Rocks and minerals as resources

- Rocks provide raw materials for building
- Rock contains minerals
- Rocks are weathered to form soils
- Rocks are habitats for wild animals

Minerals

Minerals are valuable solid substances that exist naturally under the ground.

Examples of mineral include: copper, gold, diamond, cobalt, silicon, phosphates, aluminum, uranium.

Importance of minerals

- Irons are used for making axes, hoes and nails
- Copper is used for making electric wires
- Mercury is used in the thermometers
- Gold is used in making jewellery

Alloys

An alloy is a mixture of two or more metal minerals

Importance of alloys

- To make the metal harder
- To lower the melting point of the metal.
- To make the metal more resistant to corrosion i.e. wear and tear
- To increase the electrical resistivity of metals.

Examples of alloys

Alloy	Combination	Uses

Brass	Copper and Zinc	Decorating ornaments Making wires, tubing cases for bullets.
Dentist Amalgam	Gold and Copper	Making coins.
Solder	Lead and Tin	Joining metals

Learner's activity

1) Differentiate between renewable and non-renewable resources

   _____

   _____

2) Give **two** examples of non renewable resources in your environment

   (i) _____

   (ii)_____

3) Briefly explain the term alloy

   _____

   _____

4) Mention any **two** characteristics of noon renewable resources.

   (i) _____

   (ii)_____

5) State any **two** ways how rocks are used as a resource.

   (i) _____

   (ii)_____

6) Give **two** examples of alloys

   (i) _____

   (ii)_____

7) State the importance of the following alloys;

   (i) Brass: _____

   (ii) Manganese steel : _____

   (iii) Cupronickel :_____

8) Point out any **two** uses of alloys in our society

   _____

   _____

Fossil fuels

Fossil fuels are remains of plants and animals that got buried in the ground a million years ago
Examples of fossil fuels are coal and crude oil
Coal was formed from the remains of the plants which got buried under the ground million years ago.

Uses of coal

- Coal is burnt to produce thermal energy
- Coal is used for making tars to surface tarmac roads
- It is burnt to produce heat for warming houses
- It is used for making inks and dyes

Petroleum or Crude oil

Petroleum or Crude oil was formed from the remains of the animals which got buried under the ground million years ago.

Products obtained from crude oil/ petroleum

Kerosene, petrol, diesel, jet fuel, lubricating fluids

Uses of crude oil/ petroleum

- Petroleum products are used to run car engines
- Petroleum products are used for making paints, dyes and ink
- Petroleum products are used for producing thermal energy

Fossil as a resource

- Fossils help geologists to determine the age of a place or rock.
- Fossils help geologists to know how different plants and animals have existed and changed.
- Fossils help to tell how land looked before.
- Fossils show us how and where the different sedimentary rocks were formed.

- Fossils help to tell what the animal or plant looked like, what it ate, where it lived etc.

Learner's activity

1. What are fossil fuels?
   _____
   _____
2. In which way is coal different from the petroleum?
   _____
   _____
3. State any **two** examples of fossil fuels
   (i) _____
   (ii)_____
4. State any **two** uses of coal
   (i) _____
   (ii)_____
5. Mention any **two** products obtained from crude oil/ petroleum
   (i) _____
   (ii)_____
6. Mention any **two** uses of crude oil/ petroleum
   (i) _____
   (ii)_____
7. State any **one** example of a liquid metal.
   _____
   _____

Conservation of resources

Conservation of resources is the use of resources while leaving some for future generation.
Conservation of resources is the sustainable use of resources.

Ways of conserving plants

- By controlling deforestation
- By controlling plant harvesting
- Using energy saving equipment for cooking and heating
- Using electricity for cooking instead of firewood

Ways of conserving soil

- By bush fallowing
- By adding manure
- By mulching
- By adding manure in the soil
- By controlling soil erosion

Ways of conserving animals

- By treating sick animals
- By providing clean water and food
- Controlling poaching
- Using good methods of fishing
- Gazetting game parks
- Spraying animals
- Deworming animals regularly
- Cleaning animals' shelter

Ways of conserving minerals and fossil fuel

- Painting metals to prevent rusting
- Repairing vehicles under DMCs
- Recycling metal scraps and synthetic materials
- Using another alternative source of energy for cooking

Learner's activity

1. Define the term conservation of resources.
   _____
   _____
2. State any **two** activities carried out to care for plants in the garden
   (i) _____
   (ii)_____
3. State any **two** reasons for conserving resources.

(i) _____
(ii)_____

4. Mention any **two** ways of conserving soil as a resource.
   (i) _____
   (ii)_____
5. How is bush burning a problem to the environment?
   _____
   _____
6. Mention any **one** way in which the following resources can be conserved.
   (a) Plants: _____
   (b) Minerals: _____
   (c) Soil: _____
7. How is energy saving stove important in the protection of environment?
   _____
   _____

THEME: HUMAN BODY

THE RESPIRATORY SYSTEM

- Respiration is the breakdown of digested food in the body to produce energy.
- Respiration is the process by which the body uses oxygen to burn down food to produce energy, carbon dioxide and water vapours.
  Respiration takes place in the body cells.

Types of respiration

There are two types of respiration i.e.

- Aerobic respiration – One which uses oxygen.
- Anaerobic respiration –One which does not use oxygen.

Difference between breathing and respiration

Breathing is the taking in of air rich in oxygen and taking out of air with more carbon dioxide.

Waste products of respiration

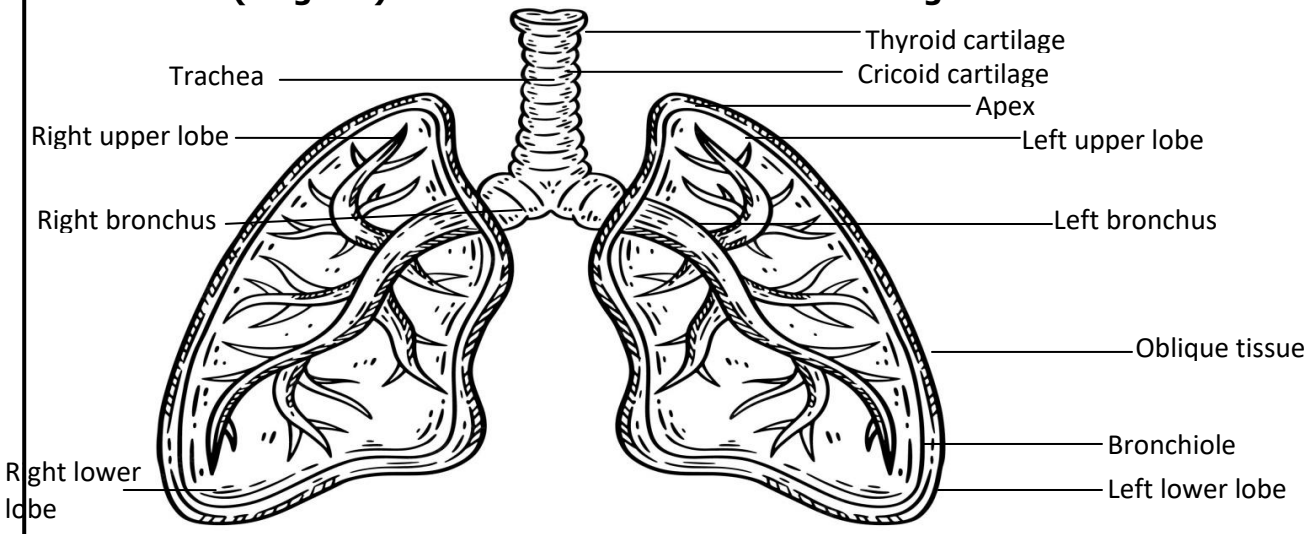
1. Water vapour
2. Carbon dioxide

Major breathing organs

- Nose
- Trachea
- Lungs

Energy is the main product required by the body.

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

✍ It is also called the wind pipe.
✍ It is a passage of air down the lungs.
✍ The trachea contains 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 continue to divide into bronchioles and end up into the air sacs / alveoli.

Learner's activity

1. What is respiration?
   _____
   _____
2. Suggest any **two** types of respiration
   (i) _____
   (ii)_____
3. What is breathing?
   _____
   _____
4. Name the breathing organs for the following organisms
   (a) Insects: _____
   (b) Mammals: _____
5. State the component of air used by animals for respiration.
   _____
   _____
6. State the main difference between breathing and respiration.
   _____
   _____
7. Why is it not advisable to breathe through the mouth?
   _____
   _____
8. Name the body organ which acts as excretory and respiratory organs.
   _____
   _____
9. Suggest the reason why trachea is made up of cartilage rings?
   _____
   _____
10. Name the waste product excreted by the lungs from the body.
    _____
    _____

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 carbon dioxide 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.

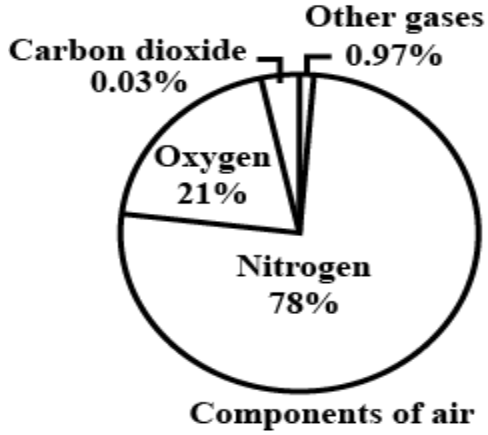
Adaptations of air sacs / Alveoli to their function

- 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%
Carbon dioxide 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 carbon dioxide is breathed in and 4% is expired because more of it is produced by various reactions like respiration.
- 78% of Nitrogen is inspired and 78% expired because nobody reaction needs nitrogen to occur.
- Less water is inspired but more is expired because more water vapour is produced by different body organs.
- 0.97% rare gases is inspired 0.97% expired because nobody reactions required it to occur.

Learner's activity

1. Suggest any **two** adaptations of air sacs / alveoli to their function.
   (i) _____
   (ii)_____
2. State the reason why:

a) The amount of oxygen breathed in is greater than the amount of oxygen breathed out
_____
_____

b) The amount of carbon dioxide breathed in is less than the amount of breathed in.
_____
_____

3. Name the body organ where exchange of gases takes place.
_____
_____
4. State the process by which gaseous exchange take place.
_____
_____
5. State any **two** components of air which don not change in air we breathe in and out.
   (i) _____
   (ii)_____
6. State any **two** adaptations of alveoli to their function.
   (i) _____
   (ii)_____
7. What is diffusion?
_____
_____
8. Which form of energy is produced during respiration?

_____

_____

9. How is oxygen important during respiration?

_____

_____

10. State the main reason for the equal amount of nitrogen inspired and expired.

_____

_____

BREATHING

Breathing is the act of taking in and out of air from the lungs.

Types/ Process of breathing

- Breathing in (Inspiration / inhalation)
- Breathing out (Expiration / exhalation)

Mechanism of breathing (expiration and inspiration)

Inspiration:

- Inspiration is the taking in of air by an organism.
- We breathe in to get oxygen for respiration in the body.

During inspiration, the following actions take place.

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

Expiration:

Expiration is the giving out of air by an organism.

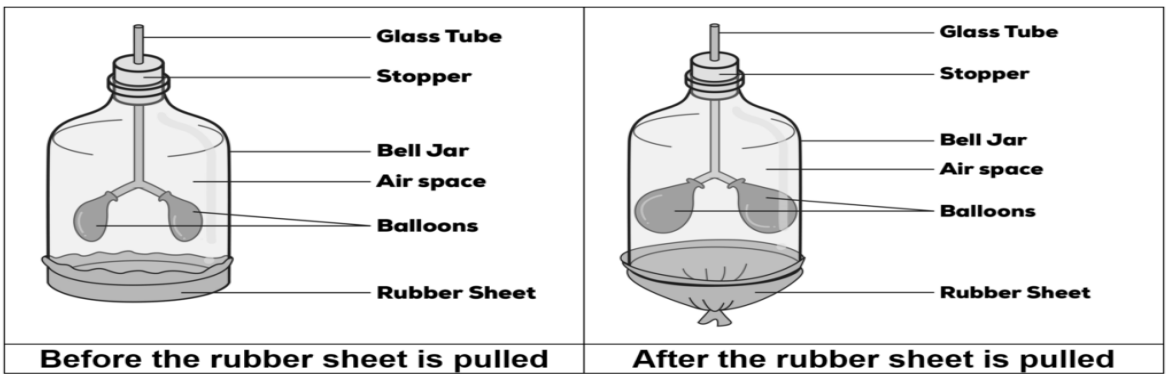
During expiration, the following actions take place.

- The volume of the chest and the lungs decrease.
- The ribs go down wards and in wards.
- The diaphragm and intercostal 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.

Illustration of a breathing mechanism in human being



Before the rubber sheet is pulled | After the rubber sheet is pulled

Learner's activity

1. How is inspiration different from expiration?

_____

_____

2. Name the muscles that hold the lungs together in a fixed position.

_____

_____

3. Why are we supposed to breathe through nose instead of mouth?

_____

_____

4. Name the skeletal structure which protects the lungs.

_____

5. Name the fluid which is secreted by the pleural membranes.

_____

6. How important is the fluid mention above to the lungs and the ribs?

_____

_____

7. State what happens to the following parts during breathing in

a) Diaphragm : _____

b) Lungs : _____

c) Intercostal muscles:_____

8. Name the fluid which lubricates and reduces friction between the lungs and the ribs.

_____

_____

9. State the reason why animals breathe

(a) In:_____

(b) Out: _____

10. By what process does oxygen enter into blood?

_____

Diseases and disorders of the respiratory system

Disorders of the respiratory system

- Hiccups

  Hiccups are a repeated sound made in the throat as a result of sudden movement of diaphragm.
- Sneezing.
- Choking is the blocking of air passage to the lungs
- Yawning.
- Coughing is caused by irritation of the trachea or bronchioles.

Diseases.

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

Ways of caring for the respiratory system.

- Eat a balanced diet.
- Perform regular exercise.
- Eat meals containing low animals' fats.
- Avoid smoking.

Practices that help to keep the respiratory system in a good working condition

- Avoid smoking
- By having regular physical exercises.
- Feeding on a balanced diet meal.
- Keep away from dusty places etc.
- Stay in well ventilated houses/places

Advantage of regular body exercises

1. The heart muscles grow stronger and larger.
2. The heat delivers more blood to the body muscles.
3. They reduce the level of fats in the body.
4. The risk of high blood pressure and heart diseases is reduced.
5. Ligaments and tendons become stronger and reduce chances of injury.
6. Joints become flexible.
7. Weight is lost.

Learner's activity

1. What is respiratory system?

   _____

   _____

2. State any one organ of the respiratory system.

   _____

   _____

3. What cause hiccups?

   _____

   _____

4. Mention any **two** disorders of the respiratory system.
   (i) _____
   (ii)_____
5. Mention any **two** examples of:
   a) Communicable diseases which affect the respiratory system.
   (i) _____
   (ii)_____
   b) Non-communicable diseases which affect the respiratory system.
   (i) _____
   (ii)_____
6. Mention any **two** importance of regular body exercise.
   (i) _____
   (ii)_____
7. State any **two** ways of caring for the respiratory system.
   (i) _____
   (ii)_____