TEACHER.AC
P.6 SCIENCE LESSON NOTES

THEME: WORLD OF LIVING THINGS

TOPIC: CLASSIFICATION OF ANIMALS:

CLASSIFICATION OF VERTEBRATES.

Classification of living things (basic characteristics)

- Classification means grouping of organisms according to their characteristics.
- **Basic characteristics of living things are:**
  1. They reproduce.
  2. They respond to stimuli
  3. They respire
  4. They feed
  5. They grow
  6. The excrete
  7. They move/locomote

Groups of animals

- Animals in the environment are grouped into **vertebrates** and **invertebrates.**
- Vertebrates are animals with a back bone/vertebral column/spine.

Characteristics of vertebrates.

1. Vertebrates have a back bone
2. Vertebrates have endo skeleton.
3. They have a water proof skin.

Classification of vertebrates.

Vertebrates are classified or grouped into two groups namely;

1. Warm blooded vertebrates
   - Birds
   - Mammals
2. Cold blooded vertebrates
   - Reptiles
   - Fish
   - Amphibians

Warm blooded animals are vertebrates that keep their body temperatures constant or slightly change.

Examples

All birds and mammals

- **Cold blooded animals** are vertebrates that change their body temperatures according to the environment.

  Examples

  Lizards, snakes, crocodiles, frogs, toads and fish

  Learners' Activity

1. List any four characteristics of living things
2. In one sentence explain the term vertebrates
3. Identify any one characteristic common to all vertebrates.
4. Write one sentence to explain the following terms;
   a) Warm blooded animals
   b) Cold blooded animals
5. Give two examples of cold blooded animals
6. In one sentence give a reason why animals move.

SUB TOPIC: WARM BLOODED VERTERBRATES

LESSON 2 : BIRDS (CHARATERISTICS OF BIRDS)

A bird is warm blooded vertebrate covered with feathers, two wings, two legs and a beak.

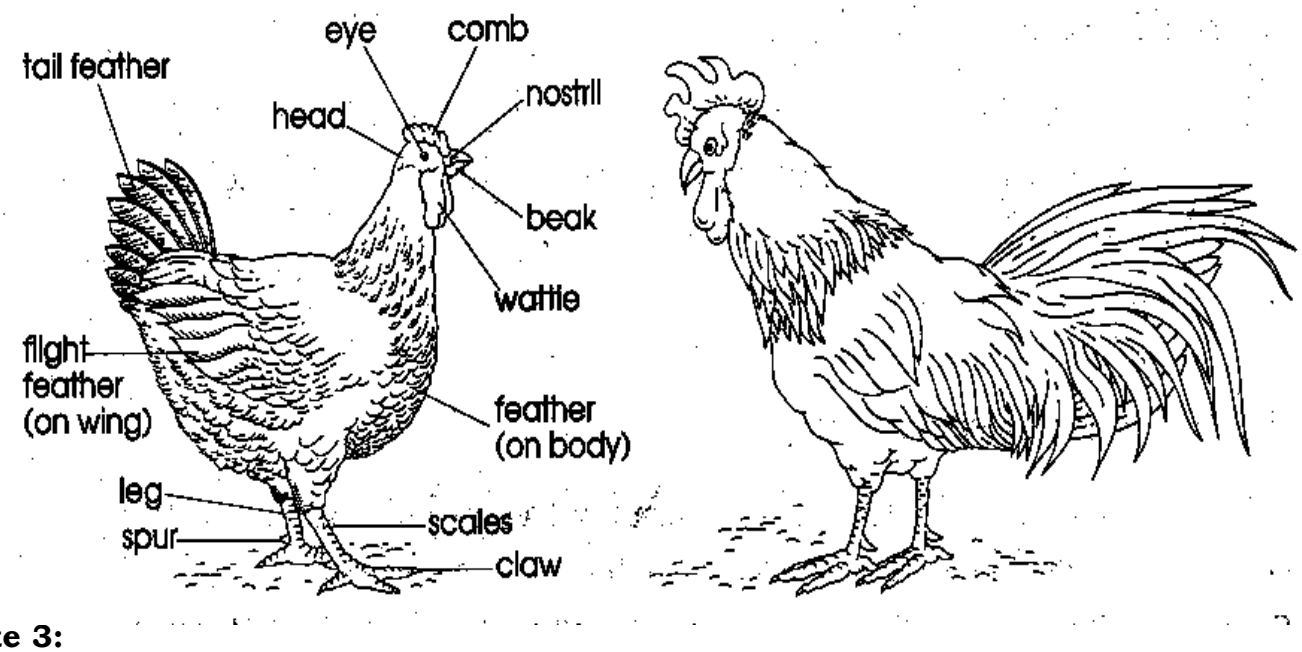
Characteristics of birds

- They are warm blooded vertebrates.
- Their legs are covered with scales and the body with feathers.
- They reproduce by means of laying eggs which are fertilized internally
- They breathe using lungs.
- They are stream lined/pointed at the front and the back to overcome friction (viscosity)
- They have a four chambered heart.
- Birds use beaks for pecking food.
- Birds care for their young ones
- They have endo skeleton.
- Birds have back bones

NOTE 1: Birds use their front limbs modified as wings for flying and the hind limbs for walking.

An illustration showing the external parts of a bird.

NOTE 2: Their skin is dry, loose and has no sweat glands so cooling is effected by panting.



Note 3:

A bird has spurs on the legs for protection/defence.

- Birds use feathers for protection of the inner body parts from external damage.
- Feathers of birds provide warmth to the body of the bird.
- Feathers help the bird to fly especially those of the wings and tail.

Learners' Activity

1. Give any four characteristics of birds
2. In one sentence give the functions of the following parts of the bird
   a) Talons c) feathers
   b) Beak
3. State how birds reproduce
4. Draw and name the following parts of a hen
   i) Spur
   ii) Wattle
   iii) Eye
5. In one sentence give two differences between a hen and a cock

TOPIC C: WARM BLOODED VERTEBRATES

LESSON 3: BIRDS (BIRD FEATHERS)

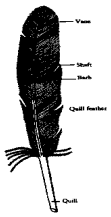
Types of bird feathers;

- There are basically four types namely;

1. Quill or flight feathers
2. Body or covert feathers
3. Down feathers
4. Filoplume feathers.

NOTE; Quill feathers are divided into primary and secondary feathers.

- Quill feathers have a strong central part called the shaft, the hollow portion. They are found on the tail and wings.
- Covert feathers help to cover the body of the bird
- Covert feathers are slightly smaller compared to Quill feathers.
- Filoplume feathers are the smallest and found nearest the skin of the bird.
- Down feathers help to trap a layer of air close to the body therefore keeping the bird's body warm.

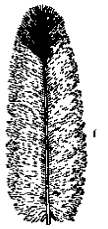
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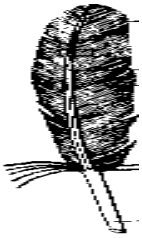
Quill feather **A covert feather** **Filoplume feather**

1. **Learners' activity 3.** State the importance of feathers to a bird
2. Identify the four types of feathers



Covert feather

3. <u>Below is a diagram of a bird's feather. Use it to answer the questions that follow.</u>



a) Identify the type of feather shown in the diagram
b) Name parts marked with letters A, B, C
c) In which way is the quill feather useful to a bird?

SUBTOPIC: VERTERBRATES

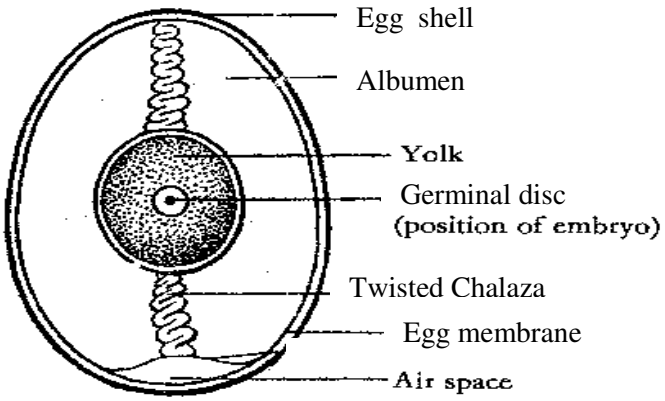
LESSON 4; BIRDS (REPRODUCTION IN BIRDS)

Content;

Reproduction in birds

- Birds reproduce by means of laying eggs.
- Their eggs are fertilized internally before they are laid out.
- A hen will sit on the eggs (incubate) until they hatch into young ones (chick

An illustration showing parts of a fertilized egg.



Functions of the parts.

Egg shell:Provids the inner part of an egg.

It is psorous to allow free circulation of air.

Air space: keep and provides oxygen to the embryo.

Egg Yolk; provides carbohydrates/salts, fats to the growing embryo.

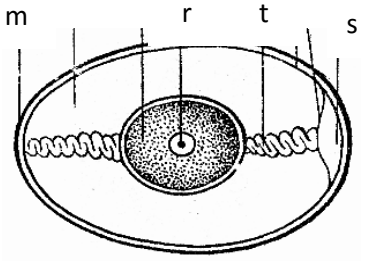
Embryo: develops into a chick under favourable conditions.

Albumen; Provides water and mineral salts to the growing embryo.

Chalaza; holds the Yolk and embryo in one position.

Learners' activity

1. Which type of fertilization occurs in birds
2. The diagram below shows a fertilized egg. Use it to answer the questions that follow



Name parts of an egg marked R,T

a) State the functions of each of the following parts
   i) s ii) m
b) What class of food is obtained from eating eggs?

SUBTOPIC: VERTEBRATES.

LESSON 5: GROUPS OF BIRDS. (Birds of prey and scavenger birds

Characteristics of birds of prey

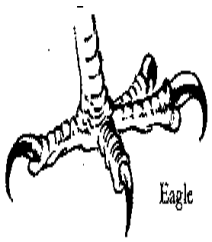
- ❖ Have strong sharp hooked beak for tearing their prey
- ❖ Have strong curved talons for easy gripping of their prey.
- ❖ Have a strong eye sight to locate their prey.

A Beak of a bird of prey



Strong, sharp and hooked beak

A foot of a bird of prey



Short curved talons for easy gripping of prey

Scavenger birds.

- ❖ Are birds which feed on flesh killed by other animals
- ❖ Scavenger birds are useful in the environment because they keep the environment clean by eating flesh of dead animals which may rot or smell.

Examples: crows, vultures, marabou storks

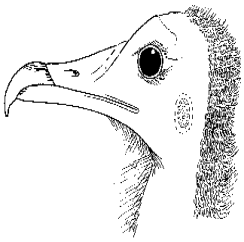
Examples of prey; smaller birds; chicks, frogs toads, tortoises/ turtles etc

Dangers of birds of prey to people

They eat people's chicks, rabbits.

Diagram showing a beak and foot of scavenger bird

Beak **Foot**





Strong, sharp and hooked beak Longer sharp, curved talons which grip fresh of the remains.

Note: scavenger birds have beaks similar to the birds of prey.

Compare the beaks of a bird of prey and a parrot.

Learners' Activity

1. State any one example of a scavenger birds
2. State the way a scavenger bird differs from a preying bird
3. How useful are scavenger birds in our environment
4. Apart from birds, name any other example of scavenger animals
5. State the meaning of the term scavenger birds

SUBTOPIC: VERTEBRATES

LESSON 6: GROUPS OF BIRDS (PERCHING BIRDS, SCRATCHING BIRDS AND CLIMBING BIRDS)

Perching birds:

These are birds that perch on branches of trees.

Have one toe pointing backwards and three toes pointing forward

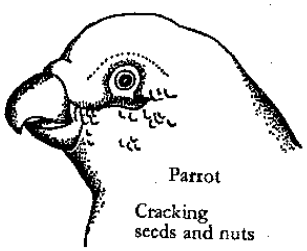
Note: Perching birds are grouped according to their habits and feeding.

These are seed eater, fruit eaters, insect eaters and nectar suckers.

Seed eaters: these have short conical beaks for easy splitting of seeds.

Examples include, pigeons, dove, weaver birds, finches, and parrot.

A structure of a head of a parrot



Insect eaters: These have short narrow beaks for easy picking up of the insects from barks of trees.

Examples include robins, sparrows, swift, swallows.

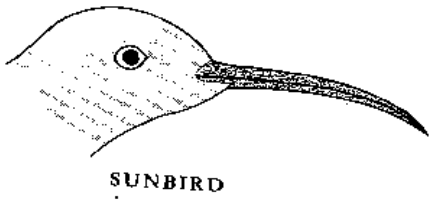
Note: Insect eaters have the ability to catch their prey on flight.
Structures showing a robin and sparrow birds.





Nectar suckers; these have long slender beaks for easy sucking of nectar from flowers. Examples are; the sun bird and humming bird.

An illustration showing a beak of a sun bird.



Fruits eaters: These have long stout beaks for collecting fruits from trees.

- ❖ They are also called foresters and help in seed or fruit dispersal
- ❖ A horn bill is the best example of a fruit eater

Scratching birds

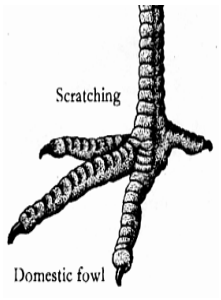
- ❖ These are birds which scratch earth to find their food.
- ❖ Such birds get worms, small insects and seeds from soil.

Characteristics of scratching birds.

- ❖ They have strong feet with thick toes and blunt talons.
- ❖ They have strong pointed beaks for picking up things from the ground.

An illustration showing a beak and foot of a scratching bird.

Strong foot thick toes and blunt claws from soil.



Strong short pointed beak for picking up



Climbing birds

- These are birds with two toes pointing forward and two toes pointing backwards.
- The toe arrangement helps them to climb trees looking for seeds and insects.
- They commonly live in trees and run about on branches of trees.

An illustration showing the toes of a climbing bird.



Two toes forward and two toes backwards.

Examples include parrots and wood pecker. They are the best examples of climbing birds.

Learners' Activity

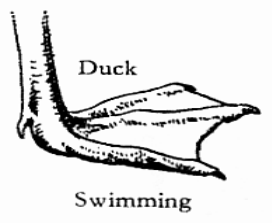
1. In a sentence explain the meaning of the term perching birds
2. Identify any two characteristics of the perching birds
3. Give two ways in which perching birds are useful to a crop farmer
4. In one sentence describe the following groups of perching birds:
   i) Seed eaters
   ii) Insect eaters
   iii) Fruit eaters
   iv) Nectar suckers
5. Give any one example of a nectar sucker
6. In one sentence describe how perching birds feed.
7. List the examples of scratching and climbing birds

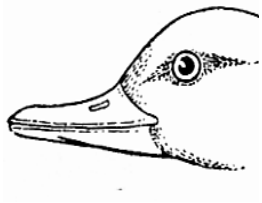
SUBTOPIC: VRTEBRATES (BIRDS)

LESSON 7: SWIMMING BIRDS

- These are birds with webbed feet for paddling in water as they swim.
- Examples include, swan, duck, goose, penguin, sea gull, pelican
- They have a spoon shaped beak for easy sieving of their food from mud/water.
- They have a layer of fats to keep them warm in water.
- They are commonly seen in water looking for their food.

An illustration showing the foot and a beak of a swimming bird.





A webbed foot for padding in water

Spoon shaped beak for easy sieving of food from water/mud.

Learners' Activity

i) What is meant by the term swimming birds?

ii) List any two examples of swimming birds

iii) State two ways in which swimming birds are adapted to their mode of life

iv) In the space below draw a foot of a swimming bird

SUBTOPIC: VERTEBRATES (BIRDS)

LESSON 8: WADING AND FLIGHTLESS BIRDS

Content

Wading birds;

- Wading birds are birds that walk through water or wade mainly to find their food.

Wading birds have the following characteristics.

1. Have long beaks for easy hunting of small fish, frogs and worms from water for food.

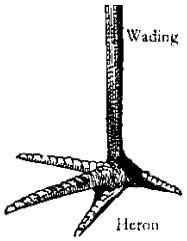
Examples of wading birds.

Ibis, heron, eaglet, crested crane, flamingo birds, storks.

2. Have long thin legs with half webbed toes widely spread out to prevent them from sinking in water.

An illustration showing a beak and a foot of wading bird.





A beak for a wading bird is long and strong.

Half–webbed toes to prevent sinking in water.

Flightless birds.

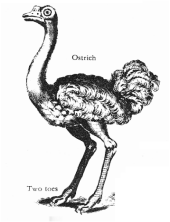
- These are birds which cannot fly but run very fast.
- Their bodies are heavier compared to the wings hence unable to fly.
- They have a lot of bone marrow hence heavier to fly in air with their weaker and smaller wings.

Examples of flightless birds includes;

Ostrich, kiwi, emu, penguin, cassowary

Note: ostriches are commonly kept in the zoo and their eggs are edible.

A structure showing an ostrich.



Weak and small wings compared to the body size.

Learners' Activity

1) In one sentence state the meaning of the following terms:
   i) Wading birds
   ii) Flightless birds
2) Give two examples of;
   i) Wading birds
   ii) Flightless birds
3) Name the flightless bird commonly kept in the zoo.

SUBTOPIC: VERTEBRATES (BIRDS)

LESSON 9: ADAPTATIONS OF BIRDS TO THEIR MODE OF LIFE

Adaptation means the features that make an organism suit a characteristic or behavior.

Adaptation of birds to their mode of life include:

Their front limbs are modified into wings for easy flight.

- Most have hollowed bones to reduce their body weight for easy flying.
- They have a stream lined body to overcome viscosity during flight.
- They have no pinna to obstruct the flow of air on flight.
- Their bodies are covered with feathers to provide warmth and colour to the bird.
- They have a nictitating membrane which protects their eyes against foreign bodies into the eye on flight.

Advantages of birds to people

- Birds provide people with meat and eggs as food.
- Some birds such as sun bird help in plant pollination.
- Some birds (scavengers) help to keep the environment clean
- Domestic birds are a source of income once sold.

Disadvantages of birds in the environment.

- Many birds spoil farmer's crops i.e getting raw materials to make their nests, feed on crops etc.
- Birds cause noise pollution especially weaver birds in the environment.
- Bird feathers keep vectors to human health like fleas and mites.

Learners' Activity

1) State any four ways in which birds are adapted to their mode of life
2) In four sentences state the importance of birds to people
3) State how birds can be dangerous in our environment

SUBTOPIC: VERTEBRATES (mammals)

LESSON 10: CHARACTRISTICS OF MAMMALS.

Mammals; These are worm blooded vertebrates whose skin is coloured with hair.

General Characteristics of mammals include;

- They have mammary glands
- They have well developed ear lobes to trap sound waves.
- They have fur on their bodies.
- They breathe through the lungs.

- They have four chambered hearts.\most mammals give birth to their young ones alive except the egg laying mammals
- They have back bones.
- All mammals are warm blooded.

Specific characteristics of mammals

- Their bodies are covered with fur
- They have mammary glands
- They feed their young ones on breast milk produced by the mammary glands.

Classification of mammals.

Mammals are grouped into nine sub classes according to their features and behaviour.

These are;

- Primates (most advanced mammals)
- Rodents (gnawing mammals)
- Ungulates (hoofed mammals)
- Chiroptera (flying mammals)
- Monotremes (egg laying mammals)
- Carnivores (flesh eaters)
- Marsupials (pouched mammals)
- Insectivores (insect eating mammals)

Learners' Activity

1) In a sentence explain the term mammal
2) Give a reason why mammals are referred to as vertebrates
3) List the different groups of mammals
4) In one sentence give a reason why a kangaroo is regarded as a mammal

SUBTOPIC: VERTEBRATES (MAMMALS)

LESSON 11: PRIMATES AND MONOTREMES

Primates (most advanced mammals)

- Primates are the most advanced subclass of mammals.
- They have a well developed set of teeth (32)
- Primates have an advanced brain.

Characteristics of primates.

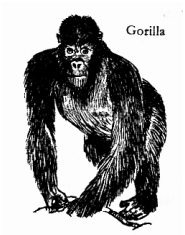
- They have five fingers and five toes on each foot.
- They use their front limbs for holding things while hind limbs for walking.
- All primates are omnivores feed on both flesh and vegetables)

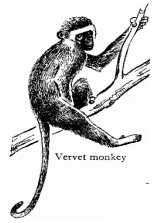
Examples of primates includes;

People, gorillas, chimpanzee, baboon, bush baby, monkey, apes, gibbon

Drawn structures showing a bush baby, a monkey and a gorilla.







A bush baby A gorilla A monkey

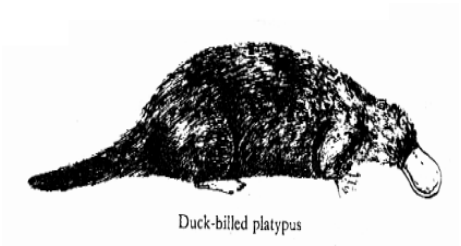
Egg – laying mammals (monotremes)

- These are mammals which reproduce by means of laying eggs.
- They are also called mammals because they feed their young ones on milk from mammary glands.

Examples of monotremes include;

There are only two examples of monotremes namely; duck billed platypus and spiny ant eater (echidna)

Illustrations showing monotremes





Duck billed platypus Spiny anteater

Learners' Activity

1) What is meant by the term monotremes?
2) Give any two examples of monotremes
3) State any two reasons why primates differ from other mammals
4) Explain why monotremes are grouped under mammals
5) In which way is duck billed platypus similar to a spiny ant eater?

SUBTOPIC: VERTEBRATES (MAMMALS)

LESSON 12 : FLYING MAMMALS (CHIROPTERA)

Chiroptera (flying mammals)

- These are the only mammals that fly.
- They have fold skin attached to the fore limbs which act as wings. Bats are the only true examples of chiropteras.

There are three types of bats namely;

- Fruit eaters or foresters.
- Insect eaters.
- Blood suckers (vampires)

Note; Bats are nocturnal animals i.e they are more active during the night.

- Bats use echoes to locate their food at night and dodge obstacles on flying.

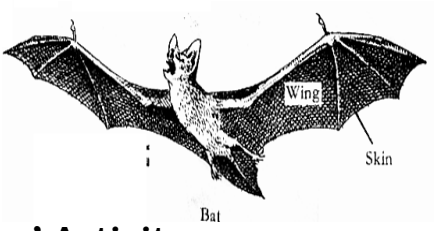
Importance of bats in the environment.

- Fruit eating bats help in seed dispersal.
- Insect eating bats help to eat harmful insects in the environment that may cause harm to people such as mosquitoes etc.

Disadvantages of bats.

- Vampire bats suck blood from animals which may cause anaemia to the animal and even death.
- Waste materials from bats cause a bad smell in a living house.

An illustration showing a bat flying.



Learners' Activity

1) State any one example of a flying mammal
2) Name the three types of bats
3) Of what importance are echoes to bats?
4) In one sentence state how bats are useful in our environment
5) How can vampire bats be dangerous to animals
6) In one sentence state a reason why bats are regarded as mammals

SUBTOPIC: VERTEBRATES (MAMMALS)

LESSON 13; POUCHED MAMMALS (MARSUPIALS)

Pouched mammals;

- These are mammals with pockets on their abdomen inside where mammary glands are found.
- They are commonly found in Australia and South Africa.

Examples of pouched mammals include;

Kangaroo, koalabear, wallabies, opossums

An illustration showing a kangaroo with its young one.



Note; The word marsupial means a pouch or a bag

- A kangaroo can leap or jump a great distance.

Learners' Activity

1) Apart from kangaroos, give any two other example of pouched mammals
2) Explain why Marsupials are called mammals
3) State two ways in which marsupials are adapted to their mode of life

SUBTOPIC; VERTEBRATES (MAMMALS)

LESSON 14; FLESH EATING MAMMALS (CARNIVORES)

Flesh eating mammals (carnivores)

These are sub groups of mammals with well developed canine teeth and feed on flesh.

Characteristics of fresh eating mammals.

- They have sharp claws for holding, killing and tearing their prey.
- They have soft pads feet to enable them run after their prey without making noise.
- They have a good speed, sense of smelling and vision even at night.

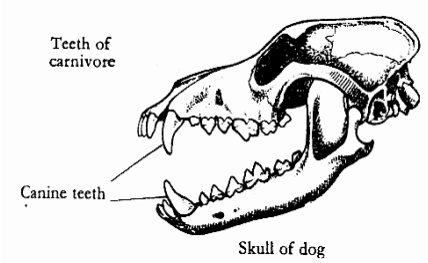
Groups of carnivores include;

Carnivores are sub divided into two divisions namely;

a) **Cat family**; these have features of the domestic cat.
   Examples include; lion, cheetah, leopard, tiger etc.

b) **Dog family**; these are carnivores with specific features to that of a domestic dog. Examples include, domestic dog, hyena. Jackals. Fox etc

An illustration showing the skull of a dog.



Note; Some carnivores are scavenger and therefore feed on flesh killed by other carnivores.

- Carnivores are also called preying mammals and are predators.

A predator is an animal that hunts and kills its prey.

Learners' Activity

1) Explain the term carnivores
2) State two ways in which carnivorous animals are adapted to their mode of feeding
3) Give any two ways in which scavengers are useful in the environment
4) Identify a group a carnivorous animals in which the the following animals belong
   i) Leopard
   ii) Domestic dog
5) State one difference between a preying mammal and a predator

SUBTOPIC: VERTEBRATES (MAMMALS)

LESSON 15. SEA MAMMALS (CETACEAN)

Sea mammals;

These are mammals which commonly live in water of seas and oceans.

Characteristics of sea mammals

- They breathe through the lungs.
- They reproduce by means of giving birth and feeding their young ones on milk from mammary glands.
- They have fur on their bodies.

Examples of sea mammals.

Whale, dolphins, porpoises, seals and dugongs.

Note; whales are divided in to two namely, blue whale and sperm whale.

- A whale is the largest mammal. A whale is over 30m long and over 150 tones in weight .The whale is not a fish.
- A thin layer of blubber insulates the body against heat loss and it is an important food store.
- Whales are hunted by people for their high quality oil.

Drawn structures showing different examples of sea mammals.

A whale Dolphin Seals Porpoise





- Sea mammals have some features similar to that of fish.
- All sea mammals are vertebrates and are warm blooded.

Learners' Activity

1) In one sentence explain the meaning of the word sea mammals
2) List any three examples of sea mammals
3) Write any two characteristics of sea mammals
4) Name the largest mammal
5) Of what importance is thin layer of blubber to a whale?

SUBTOPIC; VERTEBRATES (MAMMALS)

LESSON 16: GNAWING MAMMALS (RODENTS)

Gnawing mammals (rodents)

- These are mammals with well developed incisor teeth and chew rapidly.

Examples of rodents include;

- Rabbits
- Rats
- Squirrels
- Porcupine
- Mice
- Moles
- Bears

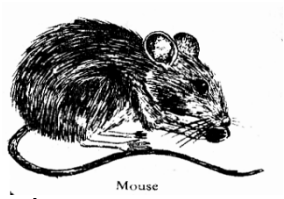
Characteristic of rodents.

- ❖ They have well developed incisor teeth for biting and chewing rapidly.
- ❖ They don't have canine teeth.
- ❖ Most gnawing mammals are vegeterians therefore, feed on vegetables.
- ❖ Most rodents are small in size for easy running very fast.
- ❖ Most rodents make holes in soil called burrows for protection and as a habitat.
- ❖ They have sharp strong claws for digging up root crops.

Disadvantages of rodents to crop farmers.

- ❖ All rodents are crop pests.
- ❖ They destroy farmer's crops by causing damage to them.
- ❖ Some destroy stored harvested crops in the granaries especially the rats..

Drawn structure showing a rat and a squirrel.



A rat



A squirrel

Learners' Activity

1) Write one sentence to explain the meaning of the word gnawing mammal
2) List any four characteristics of gnawing mammals
3) Give three ways in which rodents are a disadvantage to a crop farmer
4) State how rodents are adapted to their mode of feeding

SUBTOPIC: VEGETERIANS (MAMMALS)

LESSON 17: UNGULATES (HOOFED MAMMALS)

Ungulates (hoofed mammals)

These are mammals which feed on vegetables and have hooves on their toes.

Characteristics of ungulates or hoofed mammals.

1. They mainly feed on plant materials.
2. They have toes divided into two namely.

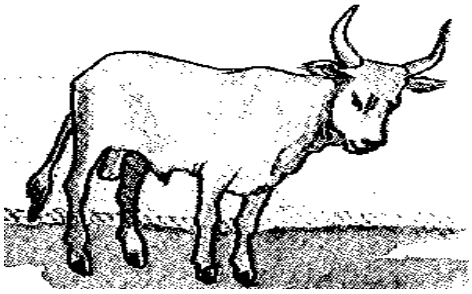
(i) Even toed , ungulates e.g cow, goat, sheep. Deer, camel etc

(ii) Odd toed ungulates e.g elephant, horse, zebra, donkey etc.

3. Some ungulates are ruminant and chew cud.
4. Ruminant ungulates have four chambered stomachs.
5. Some ungulates do not chew cud and have one true stomach.

Note: Cud is food an animal brings back from the stomach to chew again. This is called rumination. Ruminant animals are animals with four chambered stomachs and chew cud. e.g goats, sheep etc.

Diagram of a ruminant animal

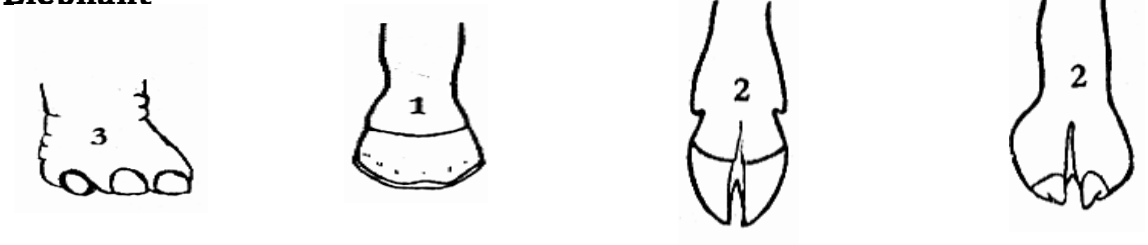


Examples of non- ruminant animals are, hippopotamus, pigs and warthogs.

Drawn structures showing different toes of ungulates.

Horse **Cow** **Camel**

Elephant



Insectivores.

- These are mammals that feed on insects.
- Most of them are nocturnals.

Examples of insectivores include;

-hedgehog – Antbear

-Porcupine – Shrew.

Things to note:

- A hedge hog stops and hides its head it curls or rolls into a ball for protection.
- A porcupine has spines for protection.

Learners activity

1. State any two characteristics of ungulates

2. How are odd toed ungulates different from even toed ungulates?

3. In one sentence explain the term ruminants
4. Give two examples of ruminant animals
5. How does a porcupine protect its self.

SUBTOPIC: VERTEBRATES (COLD BLOODED)

LESSON 18: REPTILES (SNAKES)

Reptiles.

- Reptiles are animals which move by crawling
- The word reptile comes from reptalia meaning crawlers.
- Reptiles commonly live in warm countries.

Characteristics of reptiles.

- All reptiles are cold blooded (poikilothermic)
- Reptiles breathe through their lungs.
- They reproduce by means of laying eggs fertilized internally.
- All reptiles have their bodies covered with scales.
- They have three chambered heart i.e two atria and one ventricle.

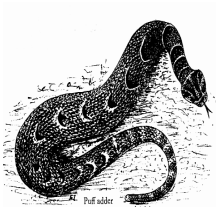
Groups of reptiles.

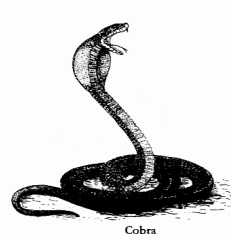
The main groups of reptiles include , snakes, lizards, tortoises, alligators, crocodiles.

Snakes.

- Snakes are groups of reptiles with no limbs and move by gliding/slithering/crawling caused by contraction of their muscles.
- They moult to grow a new skin and increase in size.
- They have a forked tongue which acts as a sense organ for smell and touch.
- Snakes commonly move with their tongues out for protection and easy trapping of its prey.
- Snakes are carnivorous animals.

Diagrams of different snakes





Note; Moulting is the removal of the outer old skin to allow the snake grow a new skin and increase in size.

Classification of snakes;

Snakes are grouped or classified according to their features and adaptations

There are basically three groups of snakes. These are;

- ❖ Poisonous snakes
- ❖ Non-poisonous snakes
- ❖ Constrictors.

Learners activity

1. In One sentence explain the term reptiles.
2. Give any two characteristics of reptiles
3. Identify any two groups of reptiles.
4. In a sentence, state what is meant by the term moulting as used in reptiles
5. State any one structural difference between poisonous and non poisonous snakes

SUBTOPIC: COLD BLOOD VERTEBRATES (REPTILES)

LESSON 19: POISONOUS AND NON-POISONOUS SNAKES.

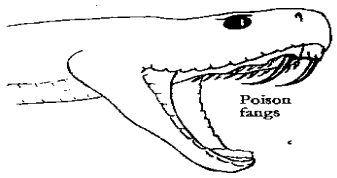
Poisonous snakes;

- ❖ These are groups of snakes with poison glands and fangs.
- ❖ They have a pair of long hollow teeth (fangs) connected to the poison glands.
- ❖ When snakes bite, they inject their poison in the bitten area of the animal. This poison from snakes is called venom.
- ❖ Snake venom can be used to make serum used for providing treatment against snake bites.

Effect of snake poison on blood.

- Venom lowers the temperature of blood thus clotting it, once clotted, the part affected is cut off (amputated).

Diagram show a head of a poisonous snake



Note: each type of a poisonous snake has different types of venom.

Some snakes have their poison gland situated at the back on the mouth with others near the front part of the mouth.

First aid for snake bites.

- ❖ Calm the casualty
- ❖ Identify the fang marks.
- ❖ Tie slightly above the bitten part.

- ❖ Take the casualty to the nearest health unit.

Examples of poisonous snakes.

Cobra, black mamba, puff udder, Gabon viper

Non-poisonous snakes.

- ❖ These are groups of snakes with fangs with no venom.
- ❖ They kill their prey by suffocating them to death

Examples; Green snakes, brown house snake.

Note; Non-poisonous snakes help to feed on other organisms such as frogs, rats and mice.

- ❖ Constrictors are snakes with developed fangs.
- ❖ They kill their prey by crushing and suffocating them.
- ❖ They lick their prey making it slippery for easy swallowing.

Examples include; pythons, anaconda, boa.

Note: the jaws of a snake are specially constructed to enable them to swallow their prey much larger than their width.

Learners activity

1. How does a poisonous snake differ from non poisonous snake
2. State any three characteristics of poisonous snakes.
3. Give two examples of poisonous snakes.
4. How does venom affect blood?
5. What first aid would you give to a P.2 boy who has been bitten by a snake?

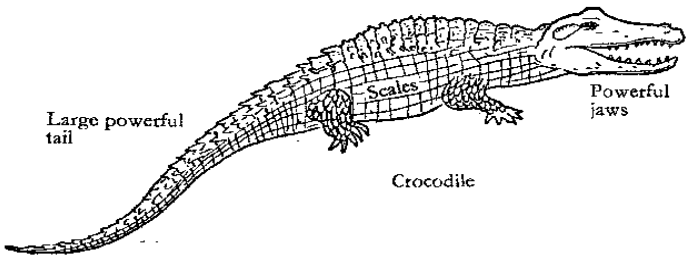
SUBTOPIC: COLD VERTEBRATES (REPTILES)

LESSON 20: CROCODILES AND ALLIGATORS.

Crocodiles and alligators.

- ❖ Crocodiles are the largest reptiles.
- ❖ They are very lazy and lethargic
- ❖ They have a long strong jaw for feeding on some aquatic animals.
- ❖ They have a long powerful tail for swimming and attacking their prey.
- ❖ The female lay hard-shelled eggs in sand or mud.
- ❖ Alligators have similar features to the crocodiles however, they live in big waters.

An illustration showing a crocodile.

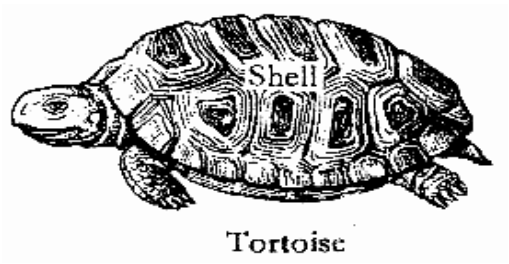


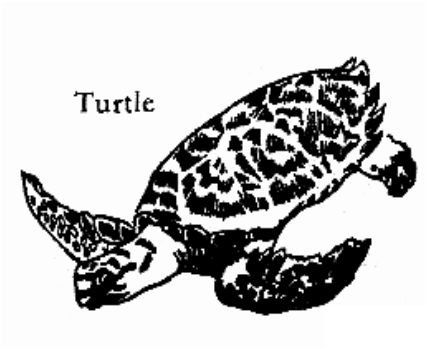
Tortoises and Turtles/Terrapins.

Tortoises are reptiles enclosed in a complete hard shell made of bony plates.

- ❖ They do not have teeth but have sharp cutting edges for proper digestion of their food.
- ❖ They withdraw and hide in their hard shell in case of danger.
- ❖ Turtles have flippers for easy swimming in water
- ❖ All tortoises/terrapins and turtles use lungs for breathing.
- ❖ They reproduce by means of laying eggs commonly laid in sand.
- ❖ Tortoises commonly live on land while turtles live in muddy waters.

Structure showing a tortoise and a turtle.





A tortoise with hard shell. Turtle with flippers for swimming.

Note; some tortoise eat plants while others eat small insects.

Learners' activity

1. Identify any one habitat for crocodiles.
2. State any two characteristics of crocodiles
3. How are crocodiles and alligators adapted to swimming?
4. In two sentences, state how a tortoise is adapted to its mode of life.
5. State how reptiles reproduce

SUBTOPIC: COLD BLOODED VERTEBRATES (REPTILES)

LESSON 21. LIZARDS AND CHAMELEONS

Lizards:

Lizards have two pairs of limbs i.e front and hind limbs for movements.

Groups of lizards include:

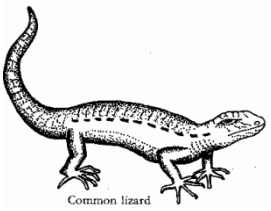
Common lizards, geckoes and chameleons.

Characteristics of lizards.

- They have a fleshy forked tongue for easy trapping of their prey.
- They have movable eye lids.
- They moult to grow new skins and increase in size.
- Geckoes are commonly found in houses and move up side down the ceilings.
- They have suction pads on their feet to enable them walk upside down the ceilings.
- A chameleon has building eyes close to the top of its head to see in all directions back, sideways and forward)
- Chameleons feed on insects such as mosquitoes, house flies using its sticky forked tongue.
- Chameleons camouflage to protect themselves from enemies and easy location of their food.

Diagrams of a common lizard and chameleon

Common Lizard



Chameleon



Importance of reptiles.

- Some reptiles are sources of food to some people.
- Snakes provide skins for making leather.
- Reptiles attract tourists from other foreign countries.
- Reptiles help to eat harmful insects in the environment.

Learners activity

1. List two examples of lizards
2. In four sentences, explain how lizards are adapted to their mode of life.
3. State how a chameleon protects its self against danger.
4. State how geckoes are adapted to moving upside down the ceilings
5. Give any two importance of reptiles to people

SUBTOPIC: COLD BLOODED VERTEBRATES(AMPHIBIANS)

LESSON 22: CHARACTERISTICS OF AMPHIBIANS.

Amphibians;

- ❖ Are cold blooded vertebrates that live both on land and in water.
- ❖ Amphibians are adapted for early life on water and later life on land.

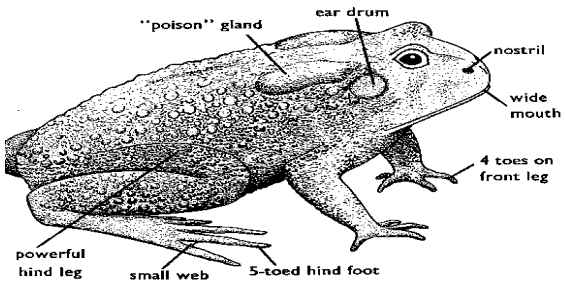
Examples of amphibians.

These include toads, newts, frogs and salamander.

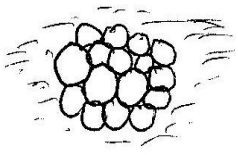
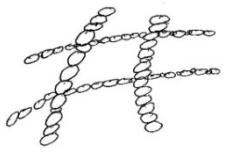
Characteristics of amphibians.

- ❖ On land they use lungs while in water they use moist skin to breathe.
- ❖ They live both on land and in water.
- ❖ All amphibians are cold blooded animals (poikilothermic)
- ❖ They reproduce by means of laying eggs fertilized externally.
- ❖ They have webbed feet for easy swimming in water.
- ❖ Their young ones called tadpole have a tail and breathe through gills like fish.
- ❖ A newt and a salamander have tails compared to a frog and a toad.
- ❖ They have back bones.

A structure showing external features of a toad.



Differences between a frog and a toad

Frog	**Toad**
	

Frog: Lay eggs in big masses (cluster) batches

Toad: Lay eggs in a double ribbon-like structure called spawn.

Frog: Breathes through their moist skin and the lungs

Toad: Breathes through lungs only

Frog: Commonly live in water at late stages.

Toad: Commonly live in water at early stages and on land at late stages.

Frog: Have long flexible hind legs to make long jumps

Toad: Have short hind legs and make short jumps

A frog: has a smooth shinny skin with no poison glands.

A toad: has a rough warty skin with poison glands

Learners' activity

1. In one sentence, explain the term amphibian
2. Give two example of amphibians
3. State two characteristics of amphibians
4. State any three differences between a frog and a toad.
5. How is a newt similar to the salamander?

SUBTOPIC: COLD BLOODED VERTEBRATES (AMPHIBIANS)

LESSON 23. RESPIRATION IN AMPHIBIANS

How amphibians respire.

- A frog breathes through its moist skin and mouth cavity in water and lungs for breathing on land.
- A frog keeps its skin moist by secretions from the mucus glands.
- A toad also uses lungs and mouth cavity for breathing.
- Amphibians do not have diaphragms and ribs.
- A tadpole uses external gills for breathing.

Movement;

- The hind limbs of amphibians are used for crawling and leaping.
- The front legs of amphibians are used for absorbing pressure of the shock of landing.

Feeding;

- Adult frogs and toads are carnivorous as they feed on worms, beetles, cockroaches, houseflies and other insects.

- ❖ Sometimes toads and frogs leap towards an insect and trap it using their sticky tongues.
- ❖ A tadpole is herbivorous and feeds on plants in water.

Note: Toads and frogs hibernate, a state when the body activities are slowed down e.g feeding. This is also called **Aestivation.**

Adaptations of a frog to living in water.

- ❖ Frogs have streamlined bodies to enable them move easily in water.
- ❖ Frogs have fully webbed hind feet for swimming in water.
- ❖ Frogs use their skins and mouth cavity for breathing while in water.
- ❖ Frogs can close nostrils when under water to prevent water from entering into the body.

Learners activity

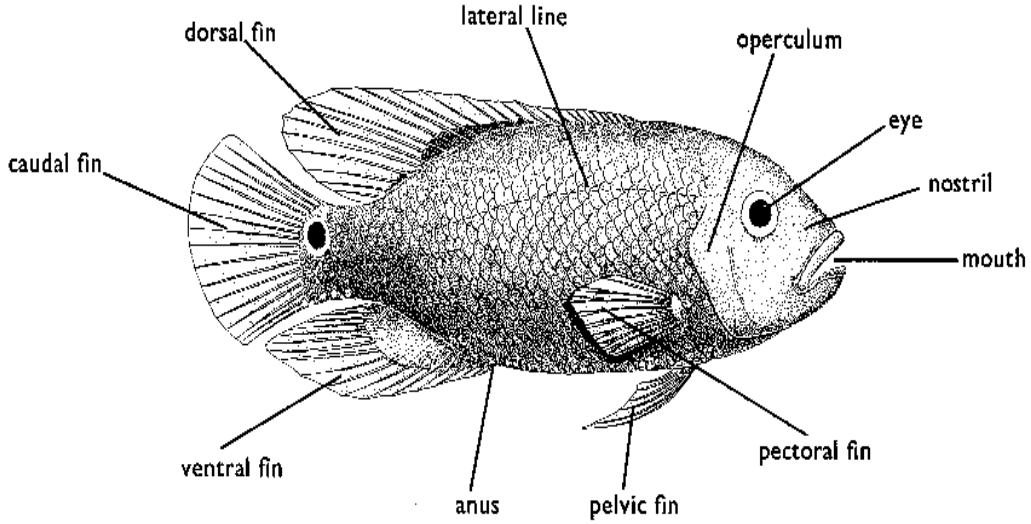
1. In one sentence, state how amphibians respire
2. How are the hind limbs of amphibians adapted for movement?
3. State how the following amphibians obtain food.
   i). adult frogs and toads
   ii). Tadpoles
4. In a sentence, explain the term aestivation.
5. In three sentences, state how a frog is adapted to living in water.

SUBTOPIC: COLD BLOODED VERTEBRATES (FISH)

LESSON 24: CHARACTERISTICS OF FISH

- ❖ They reproduce by means of laying eggs fertilized externally on water.
- ❖ They use their fins for swimming in water.
- ❖ They are cold blooded vertebrates and breathe in dissolved oxygen in water using gills.
- ❖ A young fish is called a **fry**.

An illustration showing the external parts of a fish.



Functions of the parts.

Scales - covers the body of the fish.

Gill cover - Protect the gills from external damage. Its also called operculum

Nostril – for smelling and tasting food.

Tail fin – For steering on swimming or changing directions.

- It's also called the caudal fin.

Dorsal fin – for protection against predators/defence.

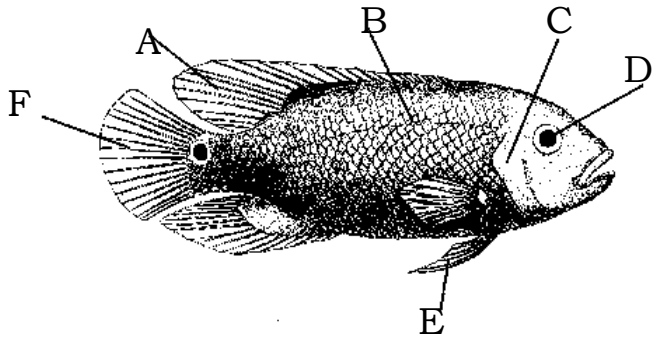
Pectoral and pelvic fins. – For slowing down or stopping or act as brakes during swimming.

Mouth; is a passage of food and water with dissolved oxygen to the gills.

Lateral line – detects sound waves in water.

Learners activity

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



a]. name part B ,C, D

b]. state the functions of parts marked F, A and E

1. What name is given to the young fish?
2. State the type of fertilization that occurs in fish.

SUBTOPIC: COLD BLOODED VERTEBRATES (FISH)

LESSON 25: TYPES OF FISH

Types of fish.

There are basically three types of fish namely;

- ❖ Bony fish
- ❖ Cartilaginous fish
- ❖ Lung fish

Bony fish.

These are fishes with a bony skeleton and covered with overlapping scales.

Examples include;

Tilapia, Nile perch, herrings, Salmon fish.

Cartilaginous fish

These are fish with no true bones but just soft bones called the cartilage.

They do not have a swim bladder and gill covers.

Examples of cartilaginous fish are;

Shark, dog fish, rays, skates.

Lung fish;

These are fish commonly found in dirty waters of pools, Swamps and rivers.

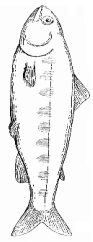
The commonly hibernate during the dry season and continue living in wet season.

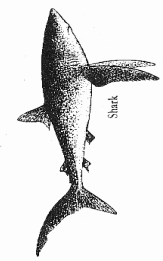
Examples of lung fish include;

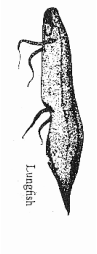
Emmamba, epiceratodus, are the common examples of lung fish.

Diagrams showing different types of fish

Bony fish **Cartilaginous fish** **Lung fish**







Reproduction in fish.

- ❖ Female fish lay eggs in shallow water where the male sheds sperm over them.
- ❖ Fish undergo external fertilization.

Many eggs are laid but only a few hatch and develop into adults.

Note; most fish do not take care of their young ones except the tilapia fish.

Learners activity

1. Identify any two types of fish
2. How does a fish reproduce?
3. Give two examples of cartilaginous fish.
4. Which fish cares for its young ones?

SUBTOPICS: COLD BLOODED VERTEBRATES (FISH)

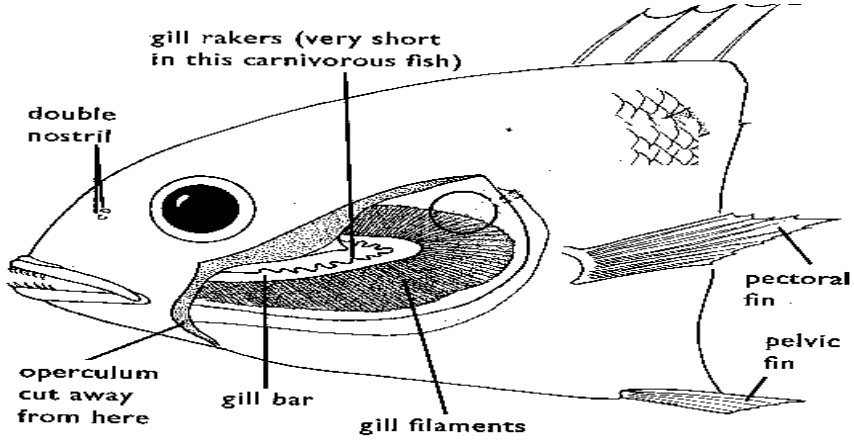
LESSON 26: BREATHING OF THE FISH.

Breathing system of a fish.

- Fish breathe in dissolved oxygen using gills.
- Dissolved oxygen in water is allowed to enter through the mouth cavity and trapped by the gill filament.
- Gill rakers help to trap any foreign body that enters with water to avoid damaging the filaments.
- Gill bar helps to hold the gill filament.
- Gaseous exchange takes place in the gill filament.
- A fish has a number of gill filaments to increase the surface area for respiration (intake of oxygen).

Note: A fish will die shortly in case it is removed from water due to lack of dissolved oxygen.

An illustration showing parts of the gills.



Adaptations of the fish to living in water.

- Fish use gills for breathing.
- They are stream lined for easily swimming in water.
- Fish use swim bladder for buoyancy in water.
- Some fish are slippery to escape easy from their enemies.
- Fish have lateral line to detect sound waves in water.

- They have fins for easy swimming in water.

Learners activity

1. State how a fish breathe
2. In the space below, draw a structure of a gill and name the following parts;
   i]. gill raker. ii] gill bar iii] gill filament
3. State any two ways how a fish is adapted to living in aquatic environment

SUBTOPIC: INVERTEBRATES

LESSON 27: GROUPS OF INVERTERBRATES (Coelenterates, sponges and echinoderms)

Invertebrates;

- ❖ These are animals with no back bone or vertebral column/spine.
- ❖ Most have got an exo-skeleton and do moult.

Groups of invertebrates

These are basically six groups of invertebrates namely;

Coelenterates, molluscs, Echinoderms, sponges, worms and Arthropods.

Coelenterates.

- ❖ These are stinging animals with one body opening.
- ❖ Their opening works as both the mouth and Anus surrounded by tentacles.

Examples of coelenterates includes;

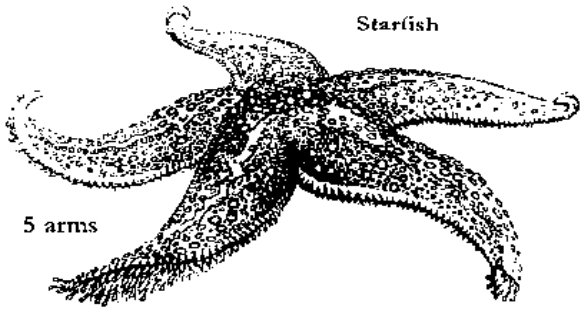
Hydra, jelly fish, sea anemones and corals

Echinoderms and sponges

- ❖ These are animals which live in seas.

Examples include, star fish, sea urchin and sea cucumbers

An illustration showing a star fish



- ❖ Sponges also live in fresh water and commonly live in colonies.
- ❖ They breathe and feed through many holes on their bodies.
- ❖ Food and oxygen are absorbed as water flows through their holes on the body.

Learners activity

1. Explain the term invertebrates in one sentence
2. Identify any two groups of invertebrates
3. Give two examples of each group of invertebrates in (2) above.
4. What characteristic is shared by all invertebrates
5. How does a star fish obtain its food.

SUBTOPIC: INVERTEBRATES.

LESON 28: MOLLUSCS.

Molluscs;

These are invertebrates which are soft bodied and usually protected by a shell.

They live in shells in seas and other fresh water bodies. Some of them live on land.

Examples of molluscs.

Oyster, octopus, cuttle fish, garden snail, water snail, slugs, squids.

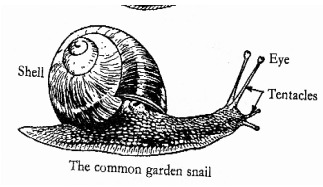
- The garden snail and slugs live on land.
- They have tentacles for detecting sound, smell and temperature.
- Sea molluscs have gills for breathing while land molluscs use simple lungs.

Illustrations showing different examples of mollusks

Slug



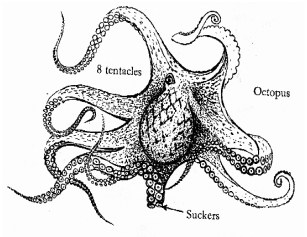
Garden snail



oyster



Octopus



Dangers of molluscs to people.

- Fresh water molluscs are vectors to people.
- They spread worms that cause bilharzia.
- This worm is called schistosome.

Learners activity

1. State what is meant by the term molluscs
2. Write any three examples of molluscs
3. State two ways in which some molluscs are dangerous to human health.
4. Draw and name parts of a garden snail.

SUBTOPIC: INVERTEBRATES (WORMS)

LESSON 29: SEGMENTED WORMS.

Worms;

- These are long thin and soft bodied invertebrates.
- They use their moist skins for breathing.
- They have hydrostatic type of skeleton.

Categories of worms

- worms are grouped into three major groups namely:
  - segmented worm (annelids)
  - round worms (nematodes)
  - flat worms.

Segmented worm:

These are worms with segmented bodies or rings. They mostly live in moist places.

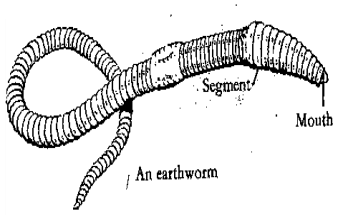
Examples of segmented worms **include:**

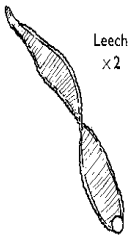
An earthworm, bristle worm and leech.

Earth worms feed on plant materials.

Below are diagrams showing an earthworm and a leech

earthworm leech





Note; An earthworm is a hermaphrodite. i.e have both female and male reproductive organs.

- ❖ Earth worms help in aeration of soil as they make channels in the soil.
- ❖ Earth worms come out of the soil when it has rained to breathe in oxygen.
- ❖ Earth worms also soften the soil.
- ❖ Their excreta help in the formation of humus.

How earthworms move.

Earthworms move by contraction of their body muscles.

Learners activity

1. what are segmented worms
2. Give two examples of segmented worms
3. Identify any other two groups of worms apart from segmented worms
4. Why do earth worms come out of the soil when it has rained?
5. State the importance of earth worms to a farmer

SUB TOPIC: INVERTEBRATES(WORMS)

LESSON 30

FLAT WORMS.

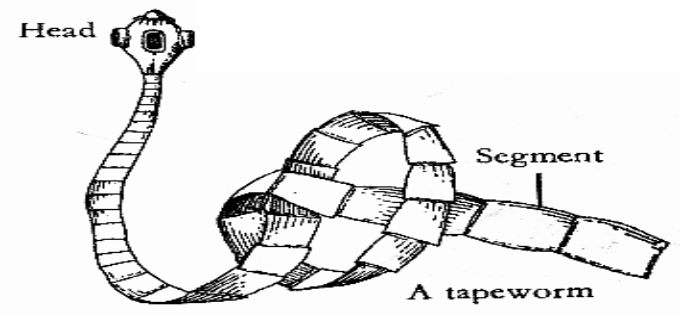
Flat worms:

- ❖ These are worms with flat and segmented bodies made up of three layers.
- ❖ They are parasites to animals and live in the animals' intestine.
- ❖ They feed on animals digested food.

Examples of flat worms.

- ❖ Tape worm, liver flukes.
- ❖ tape worms live in the small intestines in animals and feed on the digested food
- ❖ They have the hooks to attach themselves on the walls of the stomach.
- ❖ They have the suckers for sucking digested food from the stomach walls.
- ❖ Their bodies are covered with mucus to prevent themselves from hot substances sent to the stomach.
- ❖ Liver flukes are paper like and live in the liver of the affected animal causing damage to it

a) Diagram showing parts of a tape worm.



b) Diagram of a liver fluke.

Learners activity

1. List two examples of tape worms
2. How do tape worms enter into our bodies
3. State the dangers of having tape worms in our bodies
4. Give any one way of avoiding tape worm infestation
5. Draw and name parts of a tape worm (i.e. segment, Suckers, hooks.

SUBTOLPIC: INVERTEBRATES.

LESSON: 31

ROUND WORMS

- These are groups of worms with a cylindrical body.
- They are also parasites to animals and people**.**
- Some live in water and others in soil.
- The commonest type of round worms lives in animal's small intestine and usually seen through faeces of infected animals.

Examples of round worms

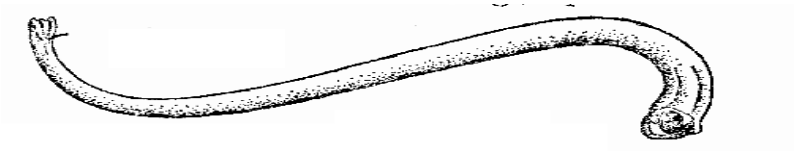
- hook worms
- pin worms
- guinea worms
- ascaris worms
- filarial worms

- eel worms
- Thread worms.

How hook worms enter our body?

- by penetrating through soles of our feet when we walk bare-footed, especially in dirty places.
- they enter through the skin pores and stay in the small intestines sucking blood.
- as they suck blood, they cause anaemia to the host.

A DIAGRAM OF A HOOKWORM



Dangers of worms to people

- They suck blood hence causing anaemia.

WAYS OF PREVENTING HOOK WORM INFECTION

- By wearing scandals/shoes when visiting dump places such as latrines.
- By washing hands after visiting a latrine.
- By washing fruits before eating them in raw form.
- Through proper disposal of human wastes.

Learners activity

1. Outline the characteristics of hook worms
2. List any two examples of hook worms
3. Identify ways by which hook worms enter into our bodies
4. State any one way in which worms are dangerous to people.
5. State any three ways of preventing hook worm infection

SUB-TOPIC: INVERTEBRATES

LESSON 32 : SINGLE-CELLED INVERTEBRATES

single celled animals:

- These are very tiny (microscopic) animals whose bodies are made up of a cell-membrane, cytoplasm and a nucleus.
- They are also known as unicellular organisms.
- Such single-celled animals are called protozoa.

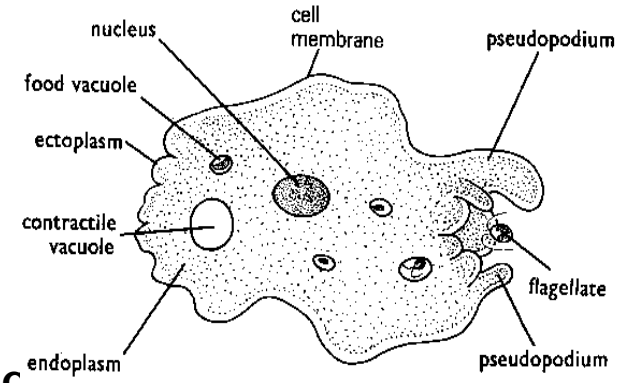
- Many of them are found living in ponds, ditches, seas, lakes, rivers and inside bodies of other animals.
- They are too small to be seen by our naked eyes. Therefore they are observed through an instrument called microscope.

Examples of Single-Celled Animals

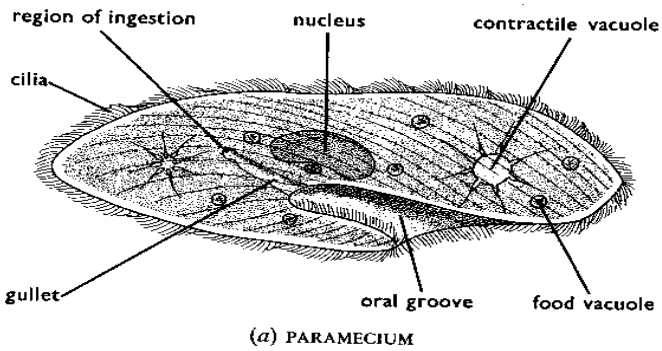
- Amoeba
- paramecium
- plasmodia
- Chlamydia
- trypanosomes
- schistosomes etc.

Structures of an Amoeba and Paramecium

amoeba



paramecium



(a) PARAMECIUM

C

- They live in water to protect them against drying up.
- They reproduce by binary fission
- They feed by engulfing food particles.
- They move by means of pseudopodia (false legs).
- They are single-celled-unicellular in nature.

Characteristic of a Paramecium.

- It is a unicellular organism.
- It has a nucleus, cell membrane and cytoplasm.
- It moves by the help of cilia.
- It also reproduces by binary fission
- Its body is covered by cilia.

Dangers of Protozoa.

- Most protozoa cause diseases to people. e.g.
    - Amoeba- amoebic dysentery.

- plasmodia- malaria
- Chlamydia- trachoma
- Trypanosomes- sleeping sickness to people and nagana to live stock.

Learners activity

1. In one sentence, explain the term single celled animals
2. Name any three examples of single celled animals
3. How does an amoeba obtain its food?
4. Draw the structure of an amoeba and name the parts; nucleus, pseudopodium and cell membrane.
5. State any one way in which protozoa are dangerous to people

SUB TOPIC: INVERTEBRATES (ARTHROPODS)

LESSON 33:

GROUPS ARTHROPODS (MYRIAPODS)

Arthropods:

These are animals with jointed legs and segmented bodies.

- ❖ Their bodies are covered with an exo-skeleton.
- ❖ The exo skeleton controls their growth and size.
- ❖ Arthropods do moult to remove their exo-skeleton in order to grow a new one and increase in size.

Sub groups of arthropods.

Arthropods are sub divided into four sub groups. myriapods, arachnids, crustaceans, insects.

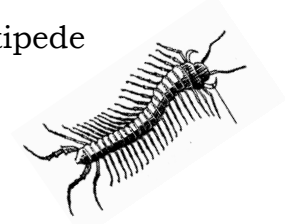
Myriapods;

Myriapods are arthropods with many jointed legs with an exo-skeleton.

Examples of myriapods include millipedes and centipedes.

Diagram showing a centipede and millipede.

Centipede



Millipede



- ❖ A centipede has one pair of jointed legs on each segment.
- ❖ A centipede is a carnivore and feeds on insects and other small worms.

- ❖ A centipede has poison glands which produce poison used to inject in its prey and for protection.
- ❖ A millipede is a herbivore and makes holes in soil hence helping in soil aeration.
- ❖ A millipede protects itself from enemies by curving up into a ball like structure/by coiling.
- ❖ Some small millipedes produce a smelly fluid for protection.
- ❖ They also roll on their backs when disturbed to scare their enemies

Similarities between centipedes and millipedes

- ❖ Both have jointed legs on each segment
- ❖ Both have an exoskeleton
- ❖ Both roll on their backs when disturbed to scare their enemies

Differences between centipedes and millipedes

- ❖ A centipede is a carnivore while a millipede is a herbivore
- ❖ Unlike a centipede a millipede has more legs
- ❖ A centipede has poison glands for protection while a millipede protects itself by coiling

Learners activity

1. What are arthropods?
2. Mention the different groups of arthropods.
3. List any two characteristics of arthropods
4. In two sentences, state how a centipede is similar to a millipede
5. How does a millipede protect itself from enemies

SUBTOPIC: INVERTEBRATES (ARTHROPODS)

LESSON 34:

GROUPS OF ARTHROPODS (ARACHNIDS)

Arachnids

- These are arthropods which have four pairs of legs.

Characteristics of arachnids.

1. Have no antennae.
2. Have two main body parts (head and abdomen).
3. Have four pairs of legs – eight legs.
4. Have a simple eye and also compound eyes.

Examples of arachnids include

Ticks, scorpions and spiders.

Spiders

- Spiders are commonly seen on walls of houses.
- They use **lung books** for breathing
- They make webs for their nests and also for trapping prey.
- Spiders are carnivorous, trap small insects and suck their fluids for food.
- The males also use the web to trap the females for mating.

Reasons why spiders are not classified as insects.

- They have two main body parts instead of three
- Spiders have for pairs of jointed legs instead of three.
- Spiders use lung books for breathing while insects use spiracles.

Scorpion

- A scorpion has a large tail with poison which it injects into its enemies after stinging them.
- A scorpion produces live young ones.

Ticks

Ticks suck blood from animal hence spreading tick borne diseases to animals.

Examples of tick borne disease include:

East coast fever, red water, heart water, anaplasmosis.

They are all caused by protozoa spread by ticks to cattle.

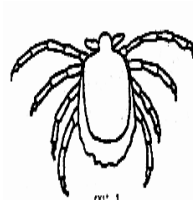
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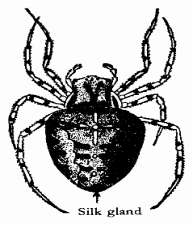
Tick borne diseases can be controlled on the farm by:

- Dipping and spraying the animals with acaricides.
- Grazing animals on new pasture.
- By double fencing (best method).

Drawn structures showing a tick, spider, scorpion and a mite.

tick scorpion Mite spider





Learners activity

1. What are arachnids?
2. List any two characteristics of arachnids.
3. Give two reasons why spiders are not classified as insects

4. Give two examples of tick borne diseases
5. In two sentences, state how a farmer can control spread of tick borne diseases on a farm.

SUB TOPIC: INVERTEBRATES (INSECTS)

LESSON 35: CHARACTERISTICS OF INSECTS.

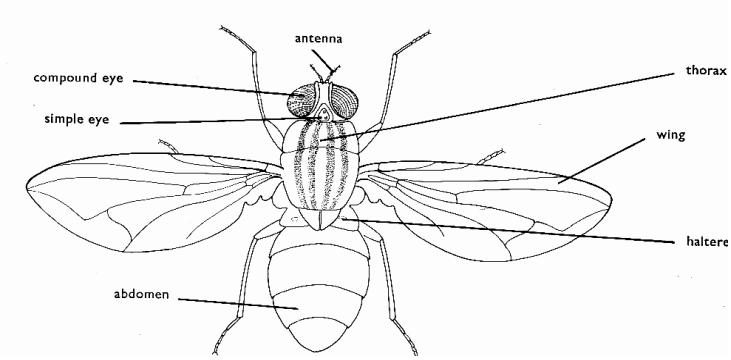
Insects

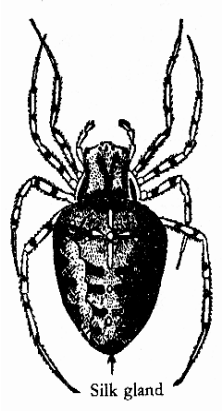
- These are arthropods with three main body parts.
- They have three pairs of jointed legs
- Insects breathe through organs called spiracles located on their abdomen.
- Have one pair of antennae/feelers
- Insects have an exo-skeleton and do moult.

Examples of insects:

- Houseflies, tse-tse flies, dragon flies, grasshoppers, cockroaches, moth, bees etc.

External parts of a housefly.





Function of the above parts.

a) Compound eyes: used for vision or sight.
b) Antennae: for smelling and feeling.
c) Proboscis: for sucking food or fluids.
d) Mandibles: for chewing its food.
e) Wings: for flying.
f) Halteres: for balancing in air while flying.
g) Spiracles: for gaseous exchange/breathing.

Importance of the thorax to the insect

- Provides attachment of wings.
- Is where wings and jointed legs are attached
- Has halteres used by the insect to balance in air during flight.

Learners' activity

1. List down four characteristics of insects
2. State the function of the following parts of an insect;
   i]. antennae ii]. Spiracles iii]. Halteres
3. In the space below, show the life cycle of a house fly (diagram)
4. What name is given to the larva of a mosquito?
5. Explain the following terms;
   i]. metamorphosis
   ii]. Moulting
   iii]. Incomplete metamorphosis

SUB-TOPIC: INVERTEBRATES (INSECTS)

LESSON 36

REPRODUCTION IN INSECTS.

Reproduction in insects

- most insects reproduce by means of laying eggs.
- there are basically two types of metamorphosis namely complete metamorphosis and incomplete metamorphosis.

Complete metamorphosis

This is a type of metamorphosis (complete life cycle) in which an insect undergoes four distinct stages of development.

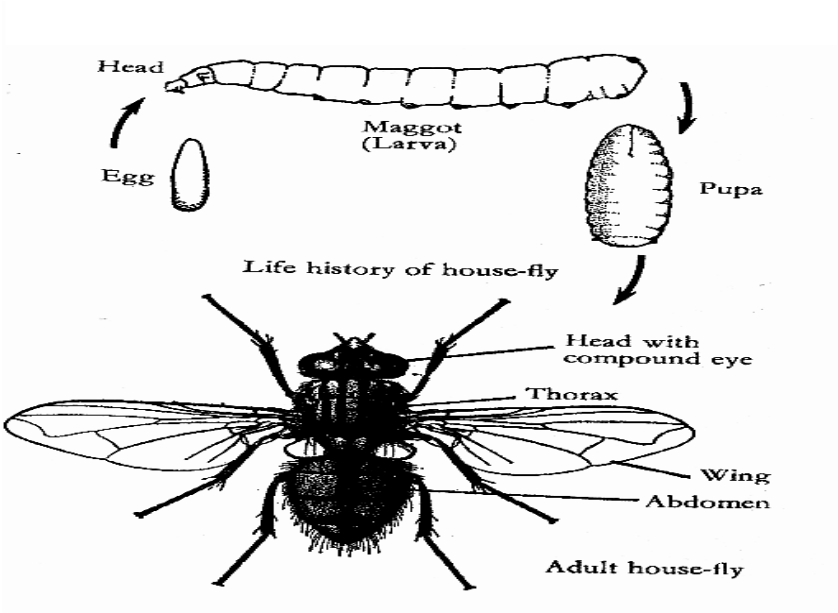
These include eggs, larva, pupa and adult.

Note: the larva stage of a housefly is the most active stage while the pupa stage is the most dormant stage

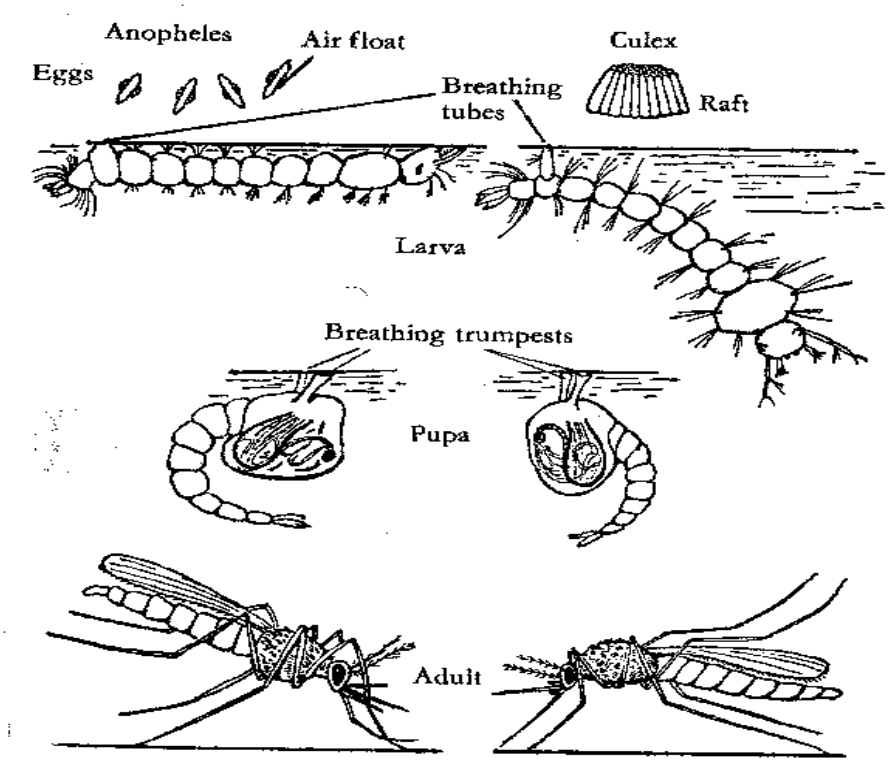
The larva stage of the following insects ;

- housefly-maggots
- mosquito-wrigglers
- butterflies-caterpillar
- cockroach-nymph

A diagram showing a complete metamorphosis of a housefly.



A diagram showing a complete metamorphosis of a anopheles and culex mosquito.



Life history of the mosquito

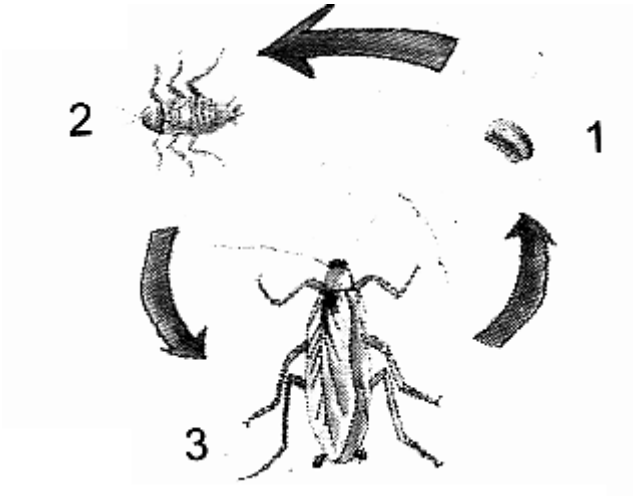
Examples of insects that undergo complete life cycles

Houseflies, mosquitoes, bees, wasps, butterflies, moth.

Incomplete metamorphosis.

- This is type of life cycle in which insects undergo three stages of development.

A diagram showing incomplete metamorphosis of a cockroach



Examples of insects which undergo incomplete metamorphosis, cockroaches, grasshoppers, locusts.

THEME: MATTER AND ENERGY

TOPIC: SOUND ENERGY.

Sound

- Sound is a form of energy produced by means of vibration of an object.
- Sound is regarded as form of energy because it enables people to do work.
- vibration is the movement of an object to and from or up and down .

Types of sound

- Loud sound, soft sound, noise, high and low sound.
- Music is an organized sound produced by regular vibrations while noise is sound produced by irregular vibrations.

Sources of sound

- A source of sound is where sound waves originate from
- Sound travels through a medium by sound waves.
- Sound travels fastest in solids, faster in liquids and fast in gases.

N.B sound doesn't travel through a **vacuum**.

Reason; there is **no medium** in a vacuum.

Natural sources of sound

These are materials that produce their own sound naturally i.e. sound from birds, animals, thunder and volcanic eruptions.

Artificial sources of sound.

These are materials controlled by humans in order to produce sound.

They are mainly musical instruments.

e.g. guitar, drum, keyboard, flute, tube fiddle, xylophones etc.

How living things produce sound.

- Mammals produce sound by the vibration of their vocal cords (human change the tongue and the lips to produce sound).
- Birds produce sound by vibration of their rings of cartilage in the trachea.
- Insects like bees and mosquitoes produce sound by rapid flapping of their wings. grasshoppers and locust produce sound by rubbing their hind legs against their wings.

Learners' Activity

1) In one sentence explain the term sound
2) List two main sources of sound
3) How is sound produced?
4) Give a difference between noise and music
5) How does the voice of a human being produce sound?

SUB TOPIC MUSICAL INSTRUMENTS.

LESSON 2. GROUPS OF MUSICAL INSTRUCMENTS.

Musical instruments,

- All musical instruments are materials used to produce sound.
- They are used to accompany or give a beat to the flow of music.

Groups of musical instruments.

There are basically three categories of musical instruments basing on how they produce sound, how they are played and their features.

1. **PERCUSSION MUSICAL INSTRUMENTS**

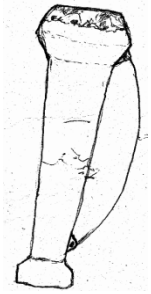
   These are musical instruments which produce sound by vibration of their skins or the wood by beating or hitting them.

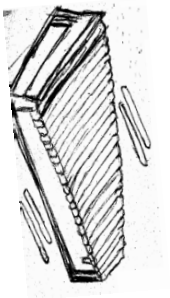
Examples of percussion musical instruments.

Xylophones, drums, long drum, bells, thumb pianos, brass band, drums, rattles, clappers or shakers.

Diagrams showing different examples of percussions.

A long drum A drum Xylophone bell






Note; pitch of percussion musical instruments can be determined by heating their skin to expand or by tightening the skin.

Learners' Activity

1) Write one word to mean instruments that produce sound by hitting
2) List two example of such instruments
3) How does a drum produce sound?
4) In which way drums similar to xylophones
5) In the space below draw one example of a percussion instrument

SUB TOPIC MUSICAL INSTRUMENTS.

LESSON 3. WIND MUSICAL INSTRUMENTS (AEROPHONES).

Wind musical instruments.

- These are musical instruments which produce sound by the vibration of air blown inside them
- Some have holes numbered to produce different pitch of sound. Each hole produces a different pitch of sound.

Examples of wind musical instruments.

flute, trumpet, panpipes, empty bottles, horns etc.

Learners' Activity

1) Why is panpipe called a wind instrument?
2) Apart from panpipes give any two other examples of wind musical instruments
3) How would you change the pitch of sound in a bottle half filled with water?
   (a) In order to produce a high pitch
   (b) In order to produce a low pitch
4) In the space below draw and name any one wind musical instrument

SUBTOPIC MUSICAL INSTRUMENTS.

LESSON 4: STRING INSTRUMENTS (CHORDOPHONES)

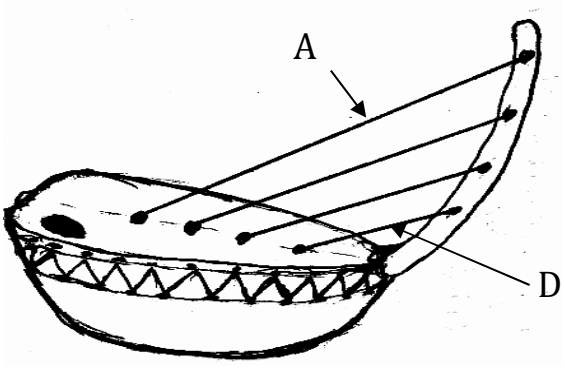
String musical instruments.(chordophones)

- These are instruments made of strings and produce sound by vibration when they are plucked/bowed.
- They are mainly played by plucking of their strings or by bowing.

Examples of string musical instruments.

Guitar, tube fiddle, lyre, a harp, violin.

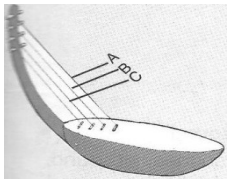
Diagram showing a structure of a bow harp.



- Strings of a bow harp have different lengths to produce different pitch of sound.
- From the diagram above, string A will produce low pitched sound while string D will produce high pitched sound when bowed.

Learners' Activity

1) Use one sentence to explain string instruments
2) Write two examples of string instruments
3) How does a bow harp produce sound
4) The diagram below show a musical instrument. Use it to answer the questions that follow.



a) Identify the instrument above
b) Identify the string which produces the highest sound
c) Give a reason for your answer

HOW SOUND TRAVELS

LESSON 5

SPEED OF SOUND

Speed of sound

- For sound to travel there must be a medium.
- Sound needs a medium to transmit sound waves from the source to the destination.
- A medium should be a state of matter such as solids, liquids and gases.
- Sound travels fastest in solids, faster in liquids and fast in gases.
- The speed of sound in normal air is 330m/sec.

Class activities:

a) How sound travels through solids.

Place a watch on one end of a wooden table place your ear on the other end, you will clearly hear the tickling of the clock hands.

b) How sound travels through liquids.

Put a stone in water and hit it using another stone from normal air.

The sound heard in loud showing that sound travels in liquids.

Factors affecting the speed of sound.

The following are some of the factors that interrupts the speed of sound.

- Wind, heat (temperature) and altitude.
- wind carries sound waves further to many directions
- Wind can also obstruct the sound waves by blowing it in opposite directions.
- During a hot day, sound waves move at a higher level compared to cold days.
- Sound waves find it easy to move along a lower altitude than going up a hill or mountain.

SUB TOPIC : TERMS USED IN SOUND

LESSON 6 ECHOES:

- An echo is a reflected sound formed as a result of obstruction of sound waves.
- Echoes have the same characteristic as the original sound.
- Smooth hard surfaces produce the best echoes while soft surfaces absorb sound.

Advantages of echoes:

- Bats use high pitched echoes to trap their prey at night in darkness.
- Bats use echoes to dodge obstacles at night.
- Pilots use echoes from hills, cliffs ends of tall building to avoid accidents.
- Sailors and sea men use echoes to determine the depth of the sea using an echo sounder.

Disadvantages of echoes.

- Echoes make sound difficult to interpret.
- Echoes cause accidents and noise pollution.

How are echoes reduced in cinema halls and theatres.

- Use of thick curtains.
- Use of porous materials such as soft boards in the speakers.

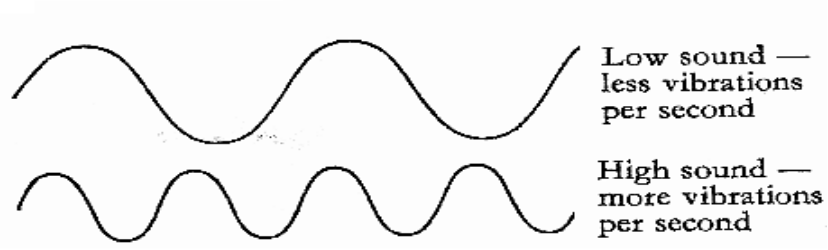
Volume of sound

- Volume is the loudness or softness of sound.
- The volume of sound depends on the amplitude of the vibration produced.
- Amplitude is the width of vibration.

Frequency

- Frequency is the number of vibrations produced per second.
- The greater the amplitude, the louder the volume of sound and vise versa.

Diagram showing frequency produced by different strings.



Learners' Activity

1) Explain the term echo
2) Why are echoes produced?
3) How are echoes useful to human beings?
4) State any one danger of echoes in our environment
5) Why are walls and ceilings of cinema halls fitted with soft boards?

SUBTOPIC: TERMS USED IN SOUND

LESSON:7PITCH OF SOUND.

Pitch of sound.

- pitch of sound is the highness or lowness of sound produced
- When objects vibrate, the sound produced can either be high or low.
- Pitch of sound can also be caused due to the amplitude produced.
- The faster the body vibrates, the higher the frequency and sound produced.

Factors that affect pitch of sound.

The following are the conditions that may make produced sound heard with a low or high pitch.

- Frequency.
- Tension of the string.
- Surface area for vibration.
- Length of the string.

- The smaller the surface area for vibration, the higher the pitch produced.
- High frequency produces high pitched sound.
- When a string of a musical instrument is short, it will produce high pitched sound.

An experiment showing pitch of sound.

Bell A Bell B Bell C



Observation:

Bell A: Will produce sound of the highest pitch.

Bell B: produced low pitched.

Bell C: will produce the lowest pitched sound.

Learners' Activity

1) Which term refers to the highness or lowness of sound?
2) Mention one factor that determines the pitch of sound.
3) How can you change the pitch of sound of a string instrument
4) State the two ways of storing sound
5) Mention any one way of reproducing stored sound

SUB TOPIC: THE MAMMALIAN EAR

LESSON:8

STRUCTURE OF THE MAMMALIAN EAR.

Human ear.

The human ear is a sensory organ used for hearing sound.

The ear also helps in balancing the body in the right position.

Parts of the ear.

The ear is divided into three main regions namely.

- The outer ear.
- The middle ear.
- The inner ear.

The outer ear.

- The outer ear is made up of the pinna and auditory canal. The pinna helps to trap or collect sound waves and direct them to the auditory canal.
- In the outer ear, there is hair to trap dust and other foreign bodies before damaging the ear drum.
- The ear drum is made up of a thin soft membrane sensitive to sound waves.
- It vibrates according to the pattern of sound waves received from the vibrating object.

The middle ear.

This consists of the three bones called the ossicles. i.e malleus (hammer), incus (anvil) and stapes (stirrup).

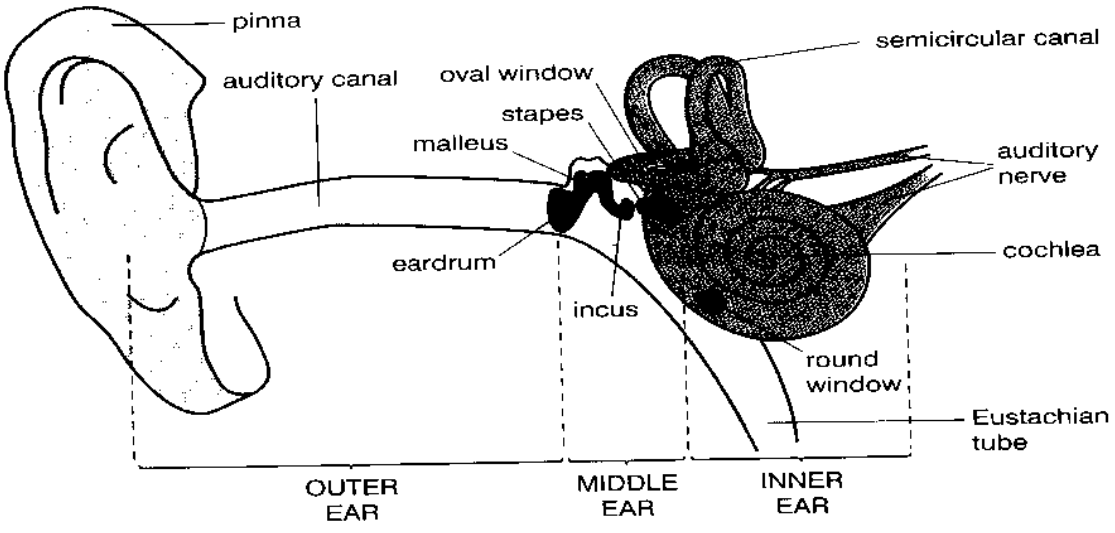
The ossicles amplify and transmit the vibrations produced by the ear drum across the middle ear to the inner ear.

It also contains the Eustachian tube to balance air pressure between the ear and atmospheric pressure.

The inner ear.

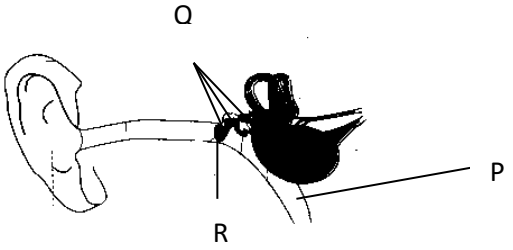
- This consists of the cochlea, semi-circular canals and the auditory nerves.
- The cochlea contains two fluids i.e perilymph and endolymph to convert sound vibrations into impulses.
- The auditory nerve helps to carry sound impulses to the brain for interpretation.
- The semi-circular canals help to balance the body in a right posture.

Diagram showing the parts of the human ear.



Learn

1) The diagram below show the human ear. Use it to answer the questions that follow



a) Name the parts labeled P and R
b) What general name is given the structures labeled Q?
c) State the function of the pinna
2) Apart from hearing, give any one other function of the ear.
3) State two ways of caring to the human ear
4) In a sentence, give a difference between a partial and sensory deafness
5) State how partial deafness can be corrected

SUBTOPIC: SOUND DEVICES

LESSON 9: STORING AND REPRODUCING STORED SOUND

Devices used in storing sound.

- Sound devices are materials used when recording and reproducing sound.
- We can store sound either by recording it on sound devices or writing it in solfa notation.
- We need to store sound for future use.

Sound devices used to record or store sound include

- Video Compact Magnetic Tapes.
- Video Compact Discs (VCDS)
- Digital Video Discs (DVDS)
- Computer Diskettes.
- Audio Compact Discs (CDS)

Devices used to reproduce the stored sound.

- Stored sound can be reproduced by playing the devices with stored sound in compact magnetic disc players.

Examples include:

Radio cassette, video disc players, computer monitor, gramophones/digital video disc player.

TOPIC: SOUND ENERGY

SUB-TOPIC: MAMMALIAN EAR

LESSON: 10 DISEASES AND DISORDERS OF THE HUMAN EAR

DISEASES OF THE HUMAN EAR:

1.otitis

2.outer ear -infection

3.inner-ear - infection

DISORDERS OF THE HUMAN EAR:

1. Foreign body in the human ear. e.g seeds/grain/soil/insects/chemicals.
2. Deafness-inability to hear.

- It is caused by infection of the ear if not detected early.
- can be through inheritance
- Others by damaging the ear drum after piercing it with a sharp object.

Types of deafness

Disorder (defect)

1. **partial deafness**

   Inability to hear

Removing the wax by syringing

2. **sensory deafness** caused by old age, infections, serious skill fracture

-Unable to differentiate between sounds

-a person hears but cannot understand.

-By good feeding to keep healthy even at old age

-Avoid travelling in vehicle which are under bad mechanical conditions

-treatment of any infection as soon as the symptoms are noticed.

3. **permanent deafness**

A person is totally unable to hear any sounds.

-common in deaf people

Cannot be corrected

Care for the human ear:

- Eating a balanced diet to keep healthy.
- Avoid staying near noisy places.
- Treat infections as soon as symptoms are sighted
- Avoid pushing sharp/piercing object into the ear.
- Clean the ear daily with clean water and soap.

Compare the human ear with the organs of other animals used for hearing e.g. the snake, fish, insects, amphibians, birds.

THEME: THE HUMAN BODY.

TOPIC: CIRCULATORY SYSTEM.

SUBTOPIC: COMPONENTS OF THE CIRCULATORY SYSTEM.

LESSON: 1

Components of the circulatory system.

The body consist of seven main systems namely, reproductive, skeletal, digestive, respiratory, nervous, circulatory and excretory systems.

- The circulatory system is also called the transport system of the body.
- It involves the supply of body cells with fluids in the body.
- Components of the circulatory system are the features that connect to allow smooth flow of the body fluids.

Diagram showing the main blood circulation

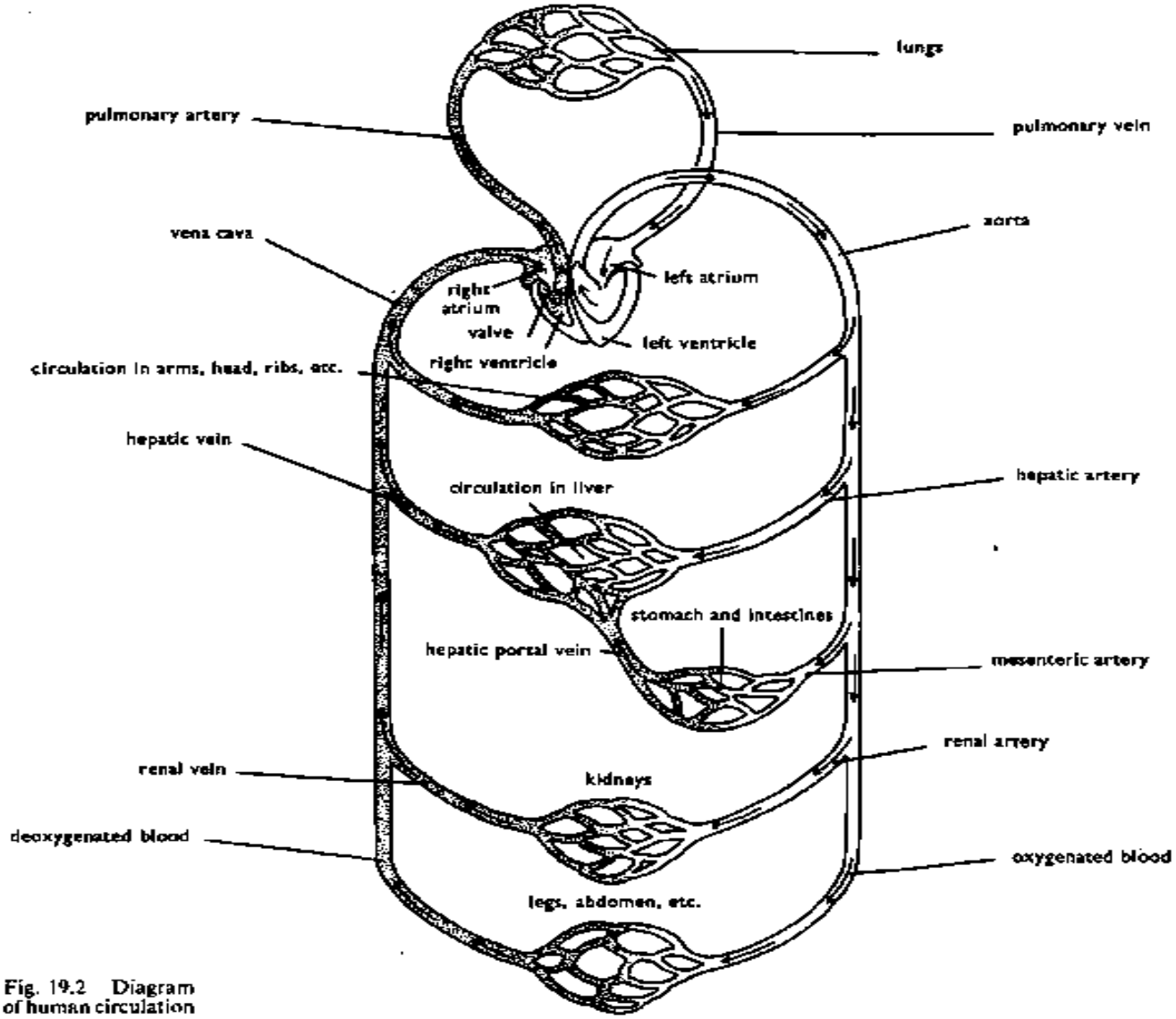


Fig. 19.2 Diagram of human circulation

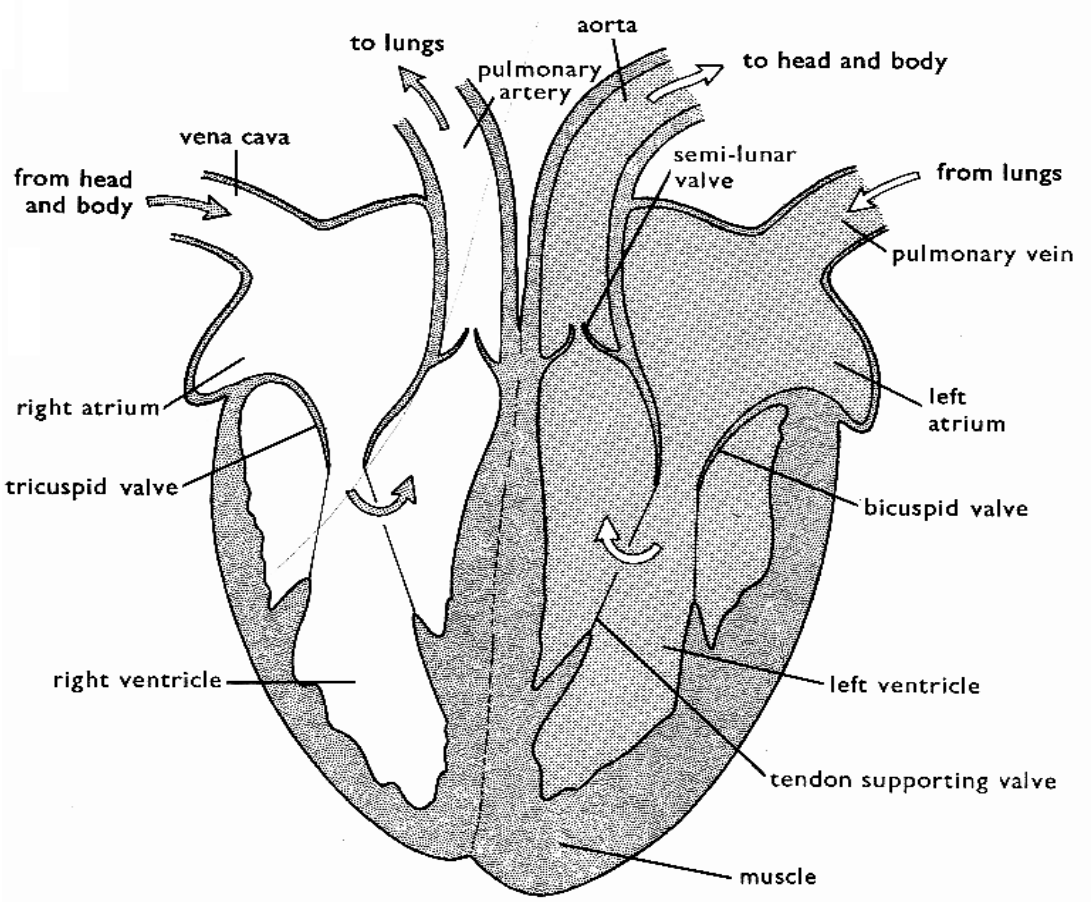
COMPONENTS OF A CIRCULATORY SYSTEM

These are the heart, blood, blood vessels.

The heart;

- The heart is the main circulatory organ in the mammalian body which pumps blood to all body parts.
- It's enclosed in the thorax in a tough membrane called pericardium.
- The heart has four chambers, the two upper chambers and two lower chambers.
- the heart is made up of cardiac muscles

The structure of the human heart.



Note; the heart is protected by the ribcage and the normal pumping of the heart is 72 times per sec

Learners' Activity

1) Name the main organs of the circulatory system.
2) List the three blood vessels of the circulatory system
3) Apart from the red blood cells mention any other two components of blood.
4) What is the role of valves in veins
5) Identify any one disease of the circulatory system

SUBTOPIC: THE HUMAN HEART

LESSON 2:

HOW THE HEART WORKS

How the heart works;

Circulation of blood in the heart is supported by four main vessels. These are;

Vena cava, pulmonary artery, pulmonary vein and aorta.

Vena cava: it receives blood with less oxygen called deoxygenated blood from all parts of the body to the heart.

- Blood is then pushed down from the right upper auricle, to the ventricle and then to the lungs via the pulmonary artery.
- Blood visits the lungs to pick oxygen and drop off carbondioxide.
- Oxygenated blood (blood with more oxygen) is then carried back to the heart through the pulmonary vein to be pumped to all parts of the body through the aorta.
- The heart has valves to prevent backward flow of blood in the heart.
- It's also separated into two sides by the septum to avoid de-oxygenated blood from mixing with the oxygenated blood from mixing with the oxygenated blood.
- The left part of the heart is made up of thick walls due to its resistance to high blood pressure.
- Doctors are able to listen to the flow of blood or heart beat using an instrument called **stethoscope** and **asplymometer** for the blood pressure.

Learners' Activity

1) List the two upper chambers of the heart
2) Which blood vessel leads blood from the body to the heart?
3) Which part of the heart pumps blood to the lungs?
4) Why is the left ventricle wall thicker than the right ventricle wall?
5) Why does blood flow to the lungs before it is supplied to the rest of the body parts?

SUBTOPIC: BLOOD

LESSON 3: COMPONENTS OF BLOOD.

Blood.

- ➲ Blood is the red liquid that flows continuously in the body.
- ➲ It becomes bright red when oxygenated and dark red when de-oxygenated.

Components of blood.

Blood components are

- ➢ platelets (thrombocytes)
- ➢ plasma (fluid of blood)
- ➢ white blood cells (leucocytes)
- ➢ red blood cells (erythrocytes)

Note: an adult person has a capacity of 5-6 liters of blood in the body.

Red blood cells.

These are blood components made of circular disc shapes and oxygen.

- They are made in the red bone marrows of short bones.
- They appear red due to the existence of the haemoglobin.
- When the haemoglobin combines with oxygen ,it forms oxy-haemoglobin blood which is reddish bright in colour.

Diagram of a red blood cell



FUNCTION OF RED BLOOD CELLS.

- ➢ Helps to carry oxygen around the body.

Note: Plasmodia parasites attack the red blood cells hence causing malaria to the people.

SUBTOPIC: BLOOD COMPONENTS

LESSON: 4

PLASMA AND WHITE BLOOD CELLS

Blood plasma

- ➢ It's the liquid or watery part of blood
- ➢ It's pale in colour.

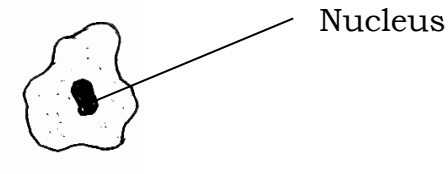
Components of plasma.

- ❖ Blood proteins, digested food, hormones, mineral salts and water.

- ❖ Blood plasma transports carbondioxide from all body parts to the lungs.
- ❖ blood plasma transports digested food to all parts of the body
- ❖ Blood plasma also transport hormones from the glands to where they are needed.

White blood cells.(leucocytes)

These are blood cells with a nucleus but with no haemoglobin in their cytoplasma.

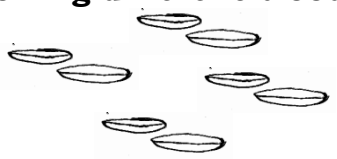


- ❖ White blood cells are commonly made from lymph nodes the spleen and grey bone of long bones.
- ❖ They help to fight against diseases causing germs in the body by engulfing and producing more anti bodies.
- ❖ The white blood cells have an irregular shape to enable them engulf the germs.

Blood platelets. (thrombocytes)

- ❖ Blood platelets are also made in the red bone marrows.
- ❖ They help to reduce over bleeding by clotting around the wound.
- ❖ They are very many in the body with no nucleus and live shortly.

Diagrams showing different blood cells



Note; shortage of blood platelets result into uncontrolled bleeding in case of a wound.

- ➢ Too many white blood cells in the body may cause a disease called leukaemia

Learners' Activity

1) How useful are the following components of blood in the body?

a) Red blood cells

b) White blood cells

c) Platelets

d) Blood plasma

2) Identify a disease that attacks the following

a) Red blood cells

b) White blood cells

SUBTOPIC: BLOOD GROUPS.

Blood groups

- Blood is grouped according to the presence of antigens A or B in the red blood cells.
- there are basically four different blood groups
  - ♣ blood group A
  - ♣ blood group B
  - ♣ blood group AB
  - ♣ blood group O
- When a person bleeds and becomes anaemic victim needs to replace the lost blood. This can be done through blood transfusion.
- Blood transfusion is the transfer of screened blood from one person of the same group to another.
- A person who receives the donated blood is then called a blood recipient.
- One who gives out blood is called a blood donor.
- A universal recipient is a person who can receive blood from any other blood group, however can donate blood to persons with blood group AB.
- blood group O is also called a universal blood donor because can donate blood to any other blood group but receives blood from blood group O only
- Blood before transfusion should be screened and stored safely in the blood bank.
- In Uganda it's done at Nakasero blood bank.

LESSON: 6

SUBTOPIC: BLOOD VESSELS

ARTERIES AND VEINS.

Blood vessels;

- Blood vessels are muscular tubes that help in proper circulation in the human body
- They run from the heart to all other parts of the body.

Types of blood vessels.

There are basically three types of blood vessels namely

arteries,

veins

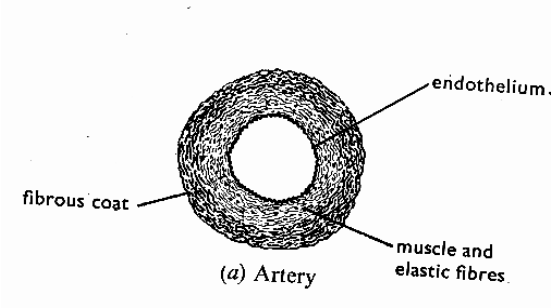
capillaries.

Arteries.

- Arteries are mainly blood vessels that carry blood away from the heart.

- They have thick walls and narrow blood passage or lumen.
- They lack valves.
- Blood in arteries flows at a high pressure.

The structure of an artery



Note: most arteries carry oxygenated blood except pulmonary artery

Veins:

These are blood vessels that carry blood towards the heart.

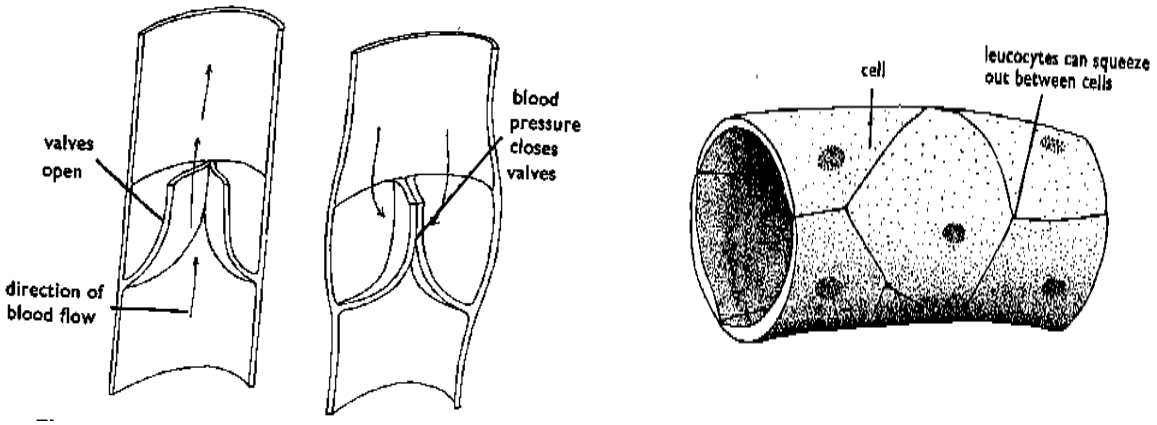
- they have valves, wider lumen and thin walls
- Valves in veins open in one direction to prevent back ward flow of blood.
- Blood in veins flows at a low pressure.

Capillaries

- These are the smallest blood vessels that help to connect the veins to arteries.
- Capillaries help to allow the exchange of blood materials.
- All veins carry deoxygenated blood except the pulmonary vein.
- the pulmonary vein carry oxygenated blood

Structures showing veins and blood capillaries.

vein Blood capillaries



Note: the aorta is the biggest artery while the vena cava is the biggest vein in the body.

Learners' Activity

1) Identify any two blood groups
2) Give the functions of the following blood vessels
   a) Arteries b) Veins
3) Give any two structural differences between arteries and veins
4) State any one functional difference between arteries and veins

DISEASES OF THE CIRCULATORY SYSTEM

LESSON 7

BLOOD AND HEART DISEASES

Blood diseases

These are disease which commonly attacks the blood components,

- ❖ Malaria, leukaemia, anaemia, haemophilia, AIDS, diabetes and sickle cell anaemia.

Diseases that attack the heart.

These include

- thrombosis
- heart attack
- hypertension
- stroke

Anaemia is caused due to lack of iron in one's diet.

- ❖ Iron helps in the formation of haemoglobin which easily combines with the oxygen in the red blood cells.
- ❖ Sickle cell anaemia is a condition when one's red blood cells are single celled and therefore unable to carry enough oxygen around the body.
- ❖ Haemophilia is condition in which one's blood is unable to clot in case of an injury.
- ❖ Leukaemia is blood cancer which makes the number of white blood cells abnormally higher.
- ❖ Malaria is caused by plasmodia germs spread by female anopheles mosquito. These commonly attack and destroy the red blood cells.

Heart diseases;

These are diseases that mainly affect the normal functioning of the heart.

They include; coronary thrombosis, hypertension and heart attack.

Coronary thrombosis

This is a disease that affects the heart and is caused due to the blockage of the coronary arteries that supply oxygenated blood and digested food to the heart.

It makes the cardiac muscles weak and may stop working due to limited oxygen and digested food supply.

Hypertension.

This is a disease of the walls of the arteries making or reducing their lumen.

This caused mainly due to smoking of poisonous drugs contained in tobacco.

The poisonous drugs damage the cardiac muscles reducing their functioning.

Diabetes;

This is caused due to the presence of too much glucose in the body.

This disease commonly affects people who feed on a lot of sugary foods and do not do heavy work to burn the glucose in the body.

Learners' Activity

1) Write four diseases of the circulatory system
2) Identify one vector disease of the circulatory system
3) Mention one circulatory disease which affects white blood cells
4) Mention one cause of heart diseases
5) Suggest one way of improving proper functioning of the circulatory system.

SUB TOPIC: DISEASES OF THE CIRCULATORY SYSTEM

LESSON: 8

HIV AND AIDS

HIV and AIDS

- HIV and AIDS is a disease that affect the circulatory system.
- HIV stands for : Human Immunodeficiency Virus
- AIDS stands for : Acquired Immune Deficiency Syndrome
- This disease attacks one's immune system making the body lack defence to infections.
- The victim's body becomes weak or unable to defend itself from infections due to the destroyed white blood cells.
- HIV does not kill the victim, it's the secondary infections untreated that kill the victim.

Ways through which HIV and AIDS is spread.

- ❖ Having unprotected sex with an infected person.
- ❖ Sharing skin piercing objects with an infected person.
- ❖ Through transfusion of unscreened blood.
- ❖ Through some cultural practices such as circumcision.

Effects of AIDS.

- ❖ Having AIDS makes one's immunity destroyed resulting into easy attack by infection.
- ❖ AIDS causes death of the victim.
- ❖ A family or community can easily lose an important person in case of death.
- ❖ AIDS has led to orphans and increased number on street children.

Ways of controlling the spread of HIV and AIDS.

- ❖ Having protected sex with trusted sex partners
- ❖ Avoid sharing skin piercing objects with an infected person
- ❖ Through transfusion using screened blood.
- ❖ Avoid sharing knives during cultural practices such as circumcision/ tattooing.

NOTE: AIDS Victims should be given a lot of care by encouraging them to promote personal hygiene, feed well and take their drugs in time. Tuberculosis victims are mistaken to be HIV victims due to the same signs and symptoms.

Learners' Activity

1. Write the following in full
   i) HIV ii) AIDS
2. Identify the cause of AIDS
3. Suggest two ways in which AIDS is spread
4. Why are adolescent girls at a higher risk of getting HIV and AIDS than boys of the same age group
5. Suggest a piece of advice adolescent boys and girls for the prevention of HIV and AIDS
6. List two disorders of the circulatory system.
7. Suggest one way of increasing the volume of blood circulation in the body.

TOPIC: CIRCULATORY SYSTEM

SUB-TOPIC: HEART DISORDERS

LESSON 9: DISORDERS OF THE CIRCULATORY SYSTEM/CARE OF THE HEART

Disorders of the circulatory system

- cuts
- strings
- burns
- scalds
- Hiccups.

Care of the organs of the circulatory system

- Eating a balanced diet.
- doing regulatory physical exercises
- Regular visits to hospital for medical check up
- Avoid eating too fatty/oily food stuffs.
- Avoid rough games.
- Take much care to accidents.

Ways of increasing volume of Blood in Circulation

- Eating a balanced diet.
- Eating foods mainly rich in iron e.g. greens, animal liver and kidneys
- Taking ferrous tablets with advice from a medical worker.

THEME: HUMAN HEALTH

TOPIC: ALCOHOL IN OUR SOCIETY

LESSON 1

SUBTOPIC: TYPES OF ALCOHOL.

Alcohol:

Alcohol is a chemical substance that makes people drunk once taken in excess.

Types of alcohol.

There are basically two types of alcohol namely;

- Ethyl (ethanol) alcohol
- Methyl (methanol) alcohol

Ethyl (alcohol) is the most common type of alcohol found in alcoholic drinks.

It's the type of alcohol formed immediately after the ripening of a plant fruit.

Plant fruits ripen due to ethylene hormone.

Methyl alcohol (e.g. methanol) is the most dangerous type of alcohol.

It can easily cause blindness in case of contact with the eyes.

Examples of alcoholic drinks include:

'malwa','tonto' and beer,kwete.

Reasons why people drink alcohol.

People drink alcohol for a number of reasons

- People drink alcohol due to excitement or happiness
- To celebrate their successes
- To forget their problems
- To quench thirst

Learners' activity

1. In one sentence, explain the term alcohol.
2. Identify any two examples of alcoholic drinks
3. Mention the two main types of alcohol.
4. Give any two reasons why people take alcohol

SUB TOPIC: ALCOHOL AND ALCOHOLISM.

LESSON 2: METHODS OF PRODUCING ALCOHOL.

Methods of producing alcohol.

There are basically two methods of producing alcohol namely;

- Fermentation method.

- Distillation method

Fermentation method.

Fermentation is the process of turning sugar from plant juice and water into alcohol by the help of yeast..

This is aided by yeast

The sugar found in fruit juice is worked upon by yeast to form fermented alcohol.

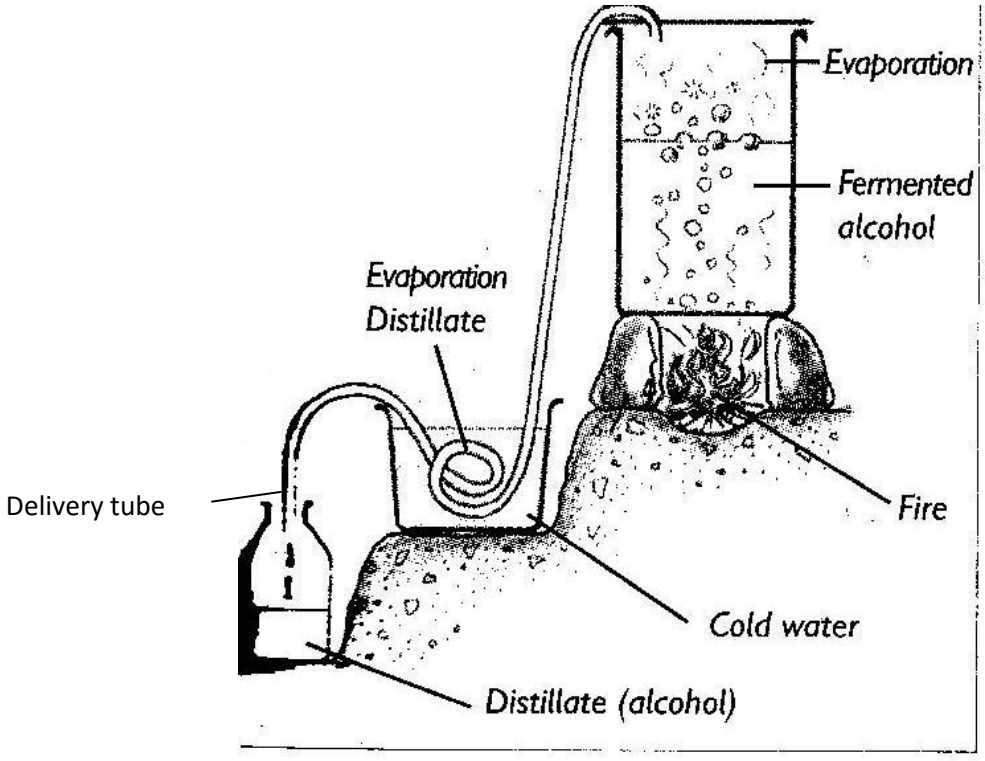
Examples of plant materials used to produce fermented alcohol are;

Ripe banana, cassava flour, maize, millet, sorghum

Distillation method.

- This is a process of obtaining pure alcohol from fermented alcohol by boiling, evaporating and condensing of the alcohol vapour to form distillate.
- Distillation method involves two processes namely; evaporation and condensation of the vaporised alcohol into a liquid.
- The liquid obtained using this method is called a distillate.
- Examples of alcoholic drinks obtained through this method are waragi, enguli, kasese, liralira whisky, rum gin, vodka.
-

Diagram showing distillation method of making alcohol.



- Heat source provides the heat to cause evaporation.
- Cold water helps to condense the vapourised alcohol into a liquid.

Note: home distillation of alcohol is illegal due to the likely accidents that may occur.

Learners' activity

1. In one sentence, explain each of the following terms;
   a] fermentation b] distillation
2. State the importance of each of the following during distillation;
   a] cold water ii] heat source
3. In one sentence, give a reason why home distillation of alcohol is illegal.
4. Give any three examples of plant local materials used to produce fermented alcohol
5. Define the term distillate

TOPIC: ALCOHOL AND ALCOHOLISM

LESSON 3: ALCOHOLICS AND ALCOHOLISM

Uses of alcohol in the society.

- Alcohol is an important drug in the society recommended on most celebrations.
- Alcohol (methyl alcohol) is used by doctors to sterilize medical instruments that cannot be boiled on cleaning.
- Alcohol can be used in some thermometers.
- Alcohol (methylated spirit) can be used to clean the skin before an injection is taken.
- Alcohol is also used as a disinfectant on wounds.
- Alcohol can be used by builders to mix paints and dyes.

Alcoholism.

- This is a condition that results from the prolonged use of alcohol.
- It results into the body's addiction to alcohol.
- It also makes the body functioning controlled by the alcohol in take.
- The person who is addicted to taking alcohol for his or her normal body functioning is called an alcoholic.

Factors that may lead one to take alcohol

- Stress
- Sad news
- Peer pressure

- Family background or life styles.
- Seductive advertisement.

Learners' activity

1. Explain the following terms;
   a] alcoholic b] alcoholism
2. Mention any three factors that may lead to alcoholism
3. State any two ways in which alcohol is important in the society.
4. State how alcohol affects;
   i] an individual ii] the family iii]. The community
5. State the law governing the use of alcohol in Uganda.

SUBTOPIC: ALCOHOL AND ALCOHOLISM.

LESSON 4: EFFECTS OF ALCOHOLISM.

Effects of alcoholism.

The habit of taking alcohol causes social and health problems in the society.

These effects are caused to; individuals, family or the community.

a) Individuals.

The following are the effects that may result from alcoholism to an individual.

- It causes damages to body organs such as, liver, brain and stomach walls
- Leads to personal neglect .(self neglect)
- Leads to loss of appetite for food resulting into stomach ulcers.
- Leads to poverty since most of the money is spent on buying a alcohol.

b) To the family;

The following are effects that can be caused in case one of the family members is an alcoholic.

- Family poverty.
- Family neglect.
- Loss of family respect.
- Antisocial behavior, child abuse, separation of spouses.
- Causes immorality in children.

c) To the community.

- Alcoholism leads to road accidents by drivers working under the influence of alcohol.
- Alcoholism also leads to increased crime rates in the community.

- Alcoholic officials delay community services since most times they are drunk.

Laws governing alcohol in Uganda.

- Persons below 18yrs of age are not allowed to drink alcohol in public places.
- All public places dealing in alcohol should be licensed after fulfilling certain standards.
- Drivers are not allowed to drive under the influence of alcohol.
- All forms of home distillations, transportation and possession of alcohol is illegal.

SUBTOPIC: SMOKING

LESSON: 5

TYPES OF SMOKING

Smoking

- This is the regular use of tobacco by a person.

Commonly smoked drugs:

- Njaga, marijuana, Bhangi.
- opium.
- cocaine. it is sniffed through the nose.
- Tobacco. This contains Nicotine and tar.

Ways people use tobacco include;

- Through the burning pipes.
- Through burning cigarettes.
- By sniffing tobacco powder.
- By chewing the leaves of tobacco.

Note; tobacco contains a dangerous gas called carbon monoxide and dangerous chemicals namely Nicotine and Tar.

Types of smoking.

There are two types of smoking namely,

- Active smoking.
- Passive smoking.

Active smoking is the act of inhaling tobacco smoke directly from a burning cigarette.

Passive smoking is the act of inhaling air contaminated by tobacco smoke from an active smoker.

Reasons why people smoke;

People have different reasons why they smoke

- Some smoke to warm their bodies.

- Some smoke due to peer pressure.
- Some smoke to concentrate on their work.
- Some smoke to feel confident.
- Some smoke to look sophisticated/ important.

SUBTOPIC: SMOKING

LESSON: 6

EFFECTS OF SMOKING.

Effects of smoking.

- Tobacco smoking is harmful to one's health.
- Tobacco contains poisonous chemicals and a gas.

These are nicotine, tar and carbon monoxide gas.

Disease caused due to smoking.

Diseases that result from smoking affect the respiratory system. they include;

- Lung cancer, emphysema, tuberculosis.
- Tuberculosis, bronchitis and pneumonia are worsened by smoking.

Smoking is also dangerous to pregnant mother in the following ways;

- Causes miscarriage/abortion.
- Causes pre mature birth/ still birth.
- Causes under weight births.

Effects of smoking to the community.

- Smoking can easily result into fire out breaks in an area.
- Smoking causes air pollution.
- It creates bad practices among children in the area.

Effects of smoking to the family.

- All family members become passive smokers.
- Young children copy bad habits from elders who smoke.
- It can also lead to loss of family income since much of the money used for smoking.

How to avoid smoking.

- Keeping busy during free time by involving in football, volleyball, and music to avoid thinking about smoking.
- Avoid joining peer groups of people who use tobacco and other drugs.
- Advise friends who smoke about the dangers of smoking.

Learners' activity

1. Explain the term smoking

2. Identify the different ways people use tobacco
3. Differentiate between passive and active smoking.
4. Give any two reasons why people smoke.
5. State two ways in which smoking can be dangerous to pregnant mother and to the family.
6. Outline any two ways of controlling smoking

SUBTOPIC:DRUGS IN SOCIETY.

LESSON 7:ESSENTIAL DRUGS.

Drugs;

A drug is any chemical substance when introduced in the body affects the normal functioning of the body systems.

Drugs can be introduced in the body voluntarily or involuntarily.

Types of drugs.

There are basically two types of drugs namely.

- Essential drugs.
- Narcotic drugs.

Narcotic drugs are drugs which cause addiction after a prolonged use or dependency.

Examples of narcotic drugs are,

Tobacco, alcohol, marijuana, opium etc.

Essential drugs.

These are drugs used by people to meet their health problems.

- ❖ They are categorized into four groups
  - Pain killers – for reducing pain.
  - Curative drugs – used to cure diseases.
  - Preventive drugs commonly vaccines used to prevent diseases
  - Contraceptives –mainly used in family planning.

Qualities/ characteristics of essential drugs.

The following are the attributes of essential drugs:

- ❖ They should be common and affordable.
- ❖ They should have less side effects and meet people's health problems.
- ❖ They should have value for money.

Ways drugs are introduced in the body.

- By swallowing (tablets)
- By injections (injectables)

- By drinking (syrups)
- By smearing (ointments)

Learners activity

1. In one sentence, explain the term drug.
2. Identify the different types of drugs.
3. What are essential drugs?
4. In three sentences, explain the qualities of essential drugs.
5. State any two ways in which essential drugs are introduced in the body

TOPIC: DRUGS.

LESSON 8.

SUBTOPIC: TYPES OF ESSENTIAL DRUGS.

Types of essential drugs:

Essential drugs are grouped into two types according to their characteristics namely;

- ♣ Traditional drugs.
- ♣ Laboratory manufactured drugs.
- ♣ Traditional drugs are drugs which have existed before the introduction of science and technology to human health
- ♣ Traditional drugs can also be modernized in the laboratories.

Examples- blackjack cures wounds

- ♣ 'bombo' grass for cough etc.
- ♣ 'enkejje' for measles

Characteristics of traditional drugs.

♣ They are used in their raw form mainly

♣ Their side effect on human health is not known.

♣ Their purity and quality changes.

♣ They are commonly not packed and sealed.

Laboratory manufactured drugs.

These are drugs which are commonly made from the laboratory with both manufactured dates and expiry dates.

Examples include:

Cough mixtures, chloroquine, paracentamol, pirtons, ORS for rehydration, capsules etc. These drugs are commonly found in clinics, hospitals and other health units.

Characteristics of laboratory manufactured drugs

- ✌ They are well packed and sealed to prevent contamination.

- Have expiry dates
- Are the same for every quantity made and they have labels, names and what they cure.
- Their stability and strengthen are known.
- They have same purity and quality.

Learners activity

1. State the difference between traditional drugs and laboratory drugs.
2. Give two examples of traditional drugs.
3. Outline any two characteristics of traditional drugs.
4. List down any three characteristics of laboratory manufactured drugs
5. Give any two examples of laboratory drugs

SUBTOPIC: DRUGS IN SOCIETY

LESSON 9

DRUG PRESCRIPTION

Drugs prescription;

This is the written information given by a health worker on how to use a certain drug.

Prescription of drugs is based on the age, weight of the patient, sex or gender and duration or length of illness.

Prescribed drug consists of ; name of the drug, the disease it cures, time of taking the drug, the dosage.

Importance of drug prescription.

- It prevents people from taking under or over dose.
- It helps the patient to avoid drug misuse.

Under dosage; is when one takes less than the recommended dose.

Drug misuse; is the act of using a drug without or against the recommended advice. It is the wrong use of a drug.

Dangers of buying drugs from shops or markets.

- Drugs may be harmful or expired.
- Such drugs are not well prescribed and stored.
- Drugs may be contaminated
- They may be spoilt/damaged
- They may be fake drugs.

Learners' activity

1. Explain the following terms;
   i] drug prescription ii] drug misuse

2. Give two reasons why health workers should give drug prescription to their patients.
3. State any two dangers of buying drugs from shops.
4. State any two ways in which people misuse drugs today.

SUBTOPIC: DRUGS IN OUR SOCIETY

LESSON 10: DRUG STORAGE AND DRUG ABUSE.

Drug storage.

- Drugs need to be kept in a clean cool dry place to prevent them from contamination.
- Cold chains are used to keep vaccines where there is no electricity
- Drugs should also be kept away from children to prevent child poisoning at home.

Dangers of poor storage of drugs.

- Drugs may easily become contaminated and lose its curative value.
- Poorly stored drugs instead become poisonous to one's health.
- Keeping drugs in children's reach can easily cause child poisoning in homes.

Drug abuse;

- Drug abuse is the use of drugs in a way that is harmful to one's health. Drugs abused can be either legal or illegal.

Reasons why people abuse drugs.

- To quench thirst
- To improve performance
- To concentrate on work
- To feel warm
- To celebrate successes.

Effects of drug abuse;

- It can cause health damages to the body organs such as the brain, liver, pancreas etc.
- Drugs abuse can cause abnormalities or improper body function.
- Drug abuse can easily result into death. It leads to divorce/spouse/child abuse.

Note; drugs of dependency are drugs which cause addiction incase of prolonged use.

Drug dependency is when one's body becomes addicted to a certain drug.

Life skills to safe guard against drug dependency.

- Keeping busy with sports and games in free time
- Avoid peer groups which exercise the use of common drugs.
- Engage in good social clubs.

- Never wish to taste any drug any day.

Learners' activity

1. What is drug abuse?
2. Why do people abuse drugs?
3. Give any two effects of drug abuse to an individual.
4. Explain what is meant by the term drug dependency.
5. State any two life skills of safe guarding against drug dependency

P.6 SCIENCE LESSON NOTES TERM 2, 2020

THEME 1: THE WORLD OF LIVING THINGS

TOPIC: CLASSIFICATION OF PLANTS

Flowering plants. Are plants which bear flowers.

Groups of flowering plants

- Dicotyledonous plants
- Monocotyledonous plants

Dicotyledonous seeds

Characteristics

- ✓ Seeds have two cotyledons
- ✓ Plants have network leaf venation
- ✓ They undergo epigeal germination
- ✓ They mainly have tap root system

Monocotyledonous plants

Characteristics

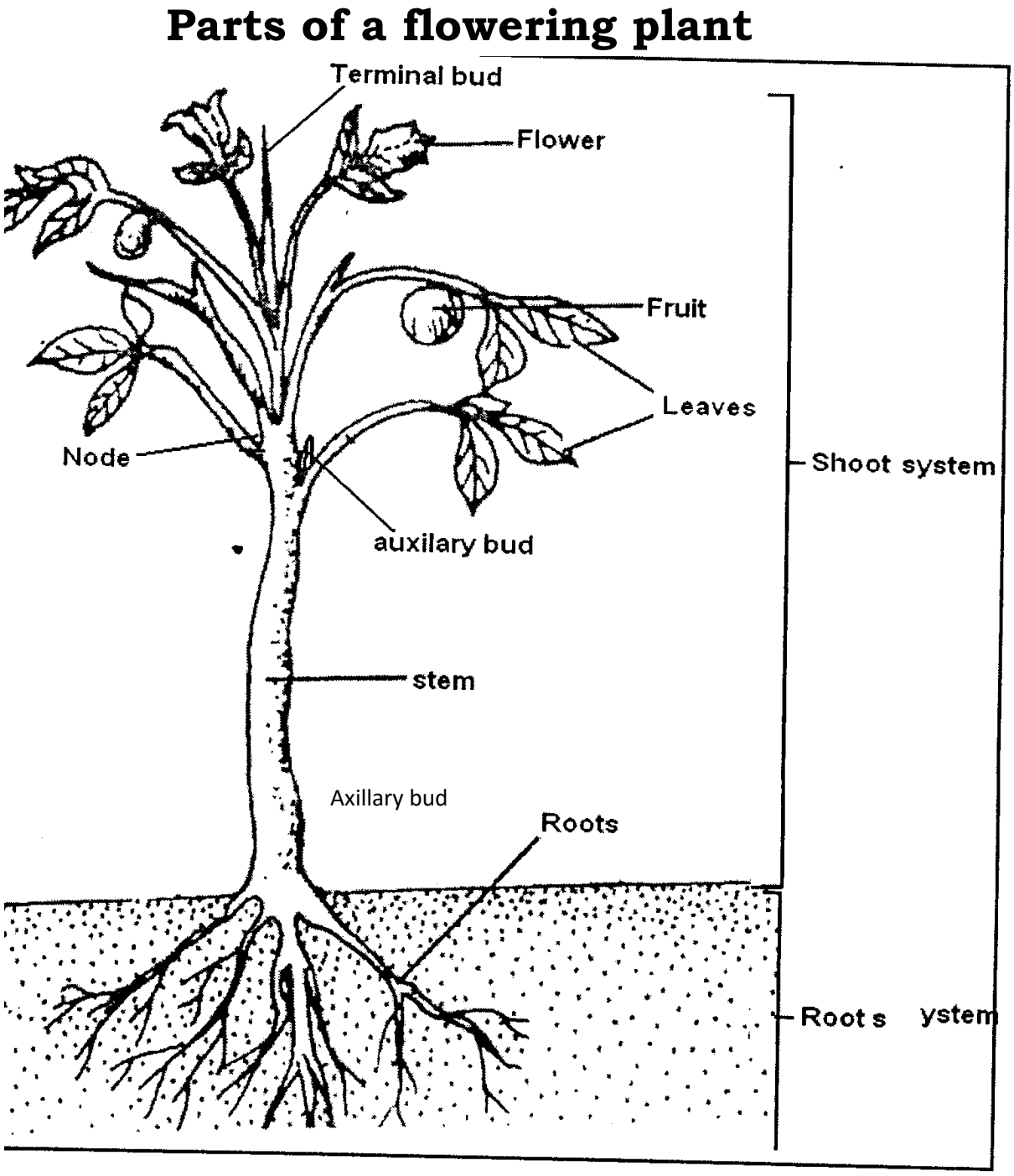
- ✓ Seeds have one cotyledon
- ✓ Plants have parallel leaf venation
- ✓ They undergo hypogeal germination
- ✓ They mainly have fibrous root system

Examples of dicotyledonous plants

- Beans
- Ground nuts
- Soya beans
- Oranges
- Simsim
- Peas
- Coffee
- Cotton
- Mangoes etc

Examples of monocotyledonous plants

- Maize
- Sorghum
- Rice
- Millet
- Oats
- Barley
- Wheat etc



Functions of each part of a flowering plant.

Roots:

This is a part of a plant which grows in the soil.

- 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.

Functions of roots to plant

- Roots hold the plant firmly in the soil
- Roots absorbs water and mineral salts from the soil by the process of **osmosis**

NOTE: Osmosis is the movement of water molecules from the region of low water concentration to the region of high water concentration through semi – permeable membrane.

- In some plants roots store food for the plants
- Some roots help to give plants extra support
- Roots act as tubes to take water and mineral salts to the stem
- Roots help plants to breathe

Types of roots

- Primary roots
- secondary roots

Primary roots.

These are roots which grow from the radicle i.e tap roots and fibrous roots

Secondary roots

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

- Prop roots
- Clasping roots
- Stilt roots
- Roots of bulbs like onions
- Buttress roots
- Roots of yams
- Roots of rhizomes

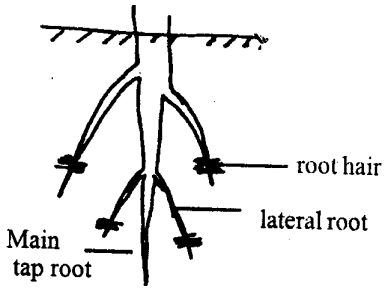
Root system.

1. **Tap root system**. This type of root is formed when the radicle forms a large root with small lateral branches like:

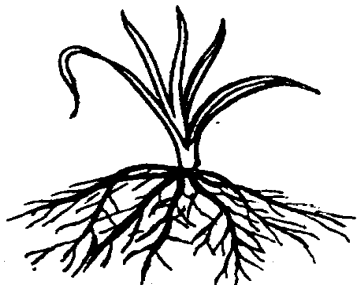
- Roots of beans
- Roots or carrots

2. **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. It has characteristics of monocotyledonous plants like maize, millet, sorghum etc.

1. Tap root system



2. The fibrous root system



Kinds of roots

1. Prop roots. These are adventitious roots commonly found on the maize plant, millet, rice, sorghum and wheat.

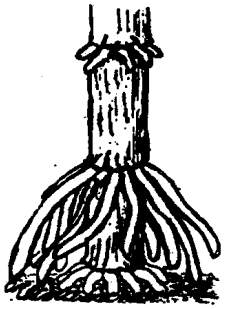
Characteristic of prop roots.

They develop from nodes near the ground level at the time of flowering.

Reasons for development of prop roots

It gives extra support to the plant because its going to be heavy with the fruit

Diagram of a prop root.



2. **Buttress roots.** These are roots which grow from above the ground from the stem.

Functions of buttress roots

-They give extra support to the plant

-Examples of plants with buttress roots are:

-Silk cotton tree

Diagram of buttress roots

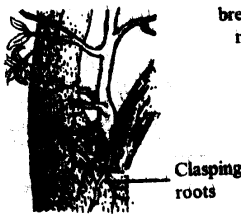


3. **Clasping roots.** These are also adventitious roots found on climbing plants

Function of clasping roots

They enable the plant to climb and clasp other plant for support.

Diagram of clasping roots

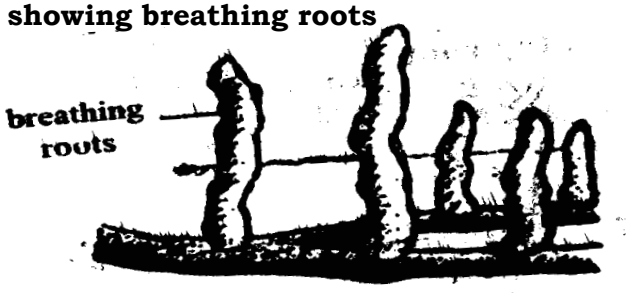


4. **Breathing roots.** These are aerial roots which grow upwards and act as breathing organs. Such roots are found in many plants growing in water logged areas. Examples of plants with breathing roots are: Mangroves,

Functions of breathing roots

- They act as breathing organ for the plant

Diagram showing breathing roots



5. **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

Diagram showing stilt roots



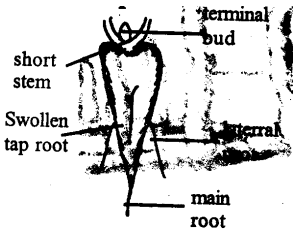
6. **Storage roots.** These are special roots which store food mainly starch. Examples of storage roots are;

- The swollen tap root of a carrot
- The branch roots of cassava
- The adventitious roots of sweet potatoes

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.

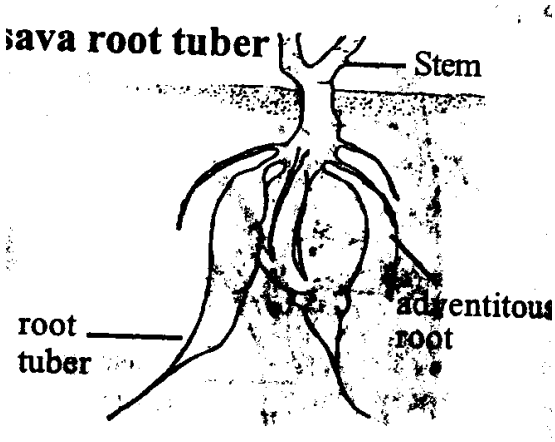
a carrot tap root.



Cassava root tuber

- A cassava is a swollen root tuber
- It's an adventitious root which branches from the stem
- It is swollen because it stores food. (starch)

Diagram of a cassava root tuber



Sweet potato root tuber

- This is a swollen adventitious roots which develop from a node of creeping sweet potato stem.
- The adventitious roots become swollen because it stores food mainly starch

Osmosis.

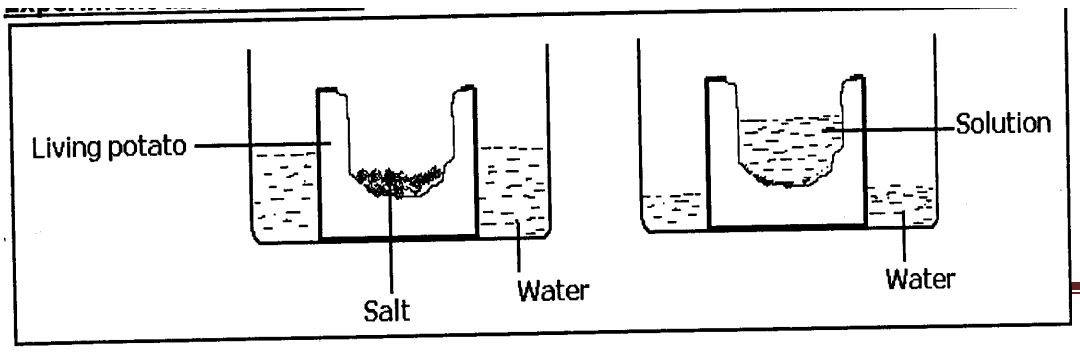
This is the movement of water molecules from a region of low water concentration to a region of high water concentration through semi permeable membrane.

Importance of osmosis

- Osmosis help plants to absorb water and mineral salts from the soil.
- Osmosis enables water to move from the soil to the roots up to the leaves with the help of capillary attraction

Note: Capillary attraction is the force that enables water molecules to rise from a region of lower concentration to a region of higher concentration

An experiment to illustrate osmosis

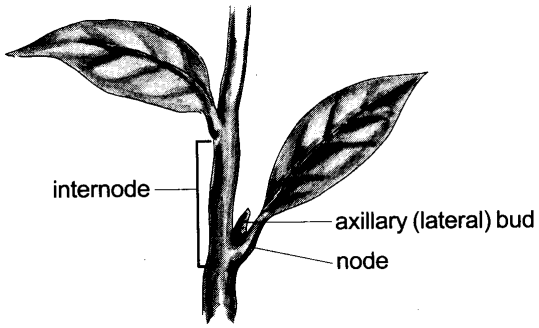


Uses of roots to man or animals

- Some roots are used as food to man e.g cassava, carrots and sweet potatoes
- Some roots are used as local medicines
- Roots are used as fuel.

Stems.

Parts of a stem



- The growing tip of a plant is called a terminal bud
- The angle between each leaf and the stem is called the <u>axil</u>
- In the axil is the axillary or <u>lateral bud</u>
- 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

Types of stems

- Upright or erect stems
- Underground stems
- Climbing or creeping stems

Upright/erect stems.

These are stems found on either dicotyledonous or monocotyledonous plants

- They grow straight in space

Examples include

- Woody plants
- Beans
- Peas
- Pineapples
- Maize
- Soya beans etc

Underground stems

There are four kinds of underground stems mainly.

- Stem tubers
- Bulbs
- Rhizomes
- Corms

Characteristics of underground stems

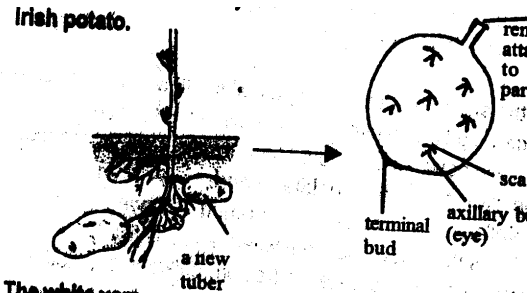
- They have scaly leaves at nodes
- They have buds or eyes or side shoots in the axil with scaly leaves
- They have terminal bud which grow into a shoot

Stem tubers

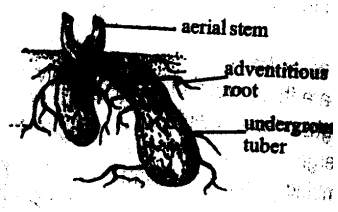
These are swollen underground stems which store food e.g irish potatoes and white yam

Diagram of:

Irish potato



White yam



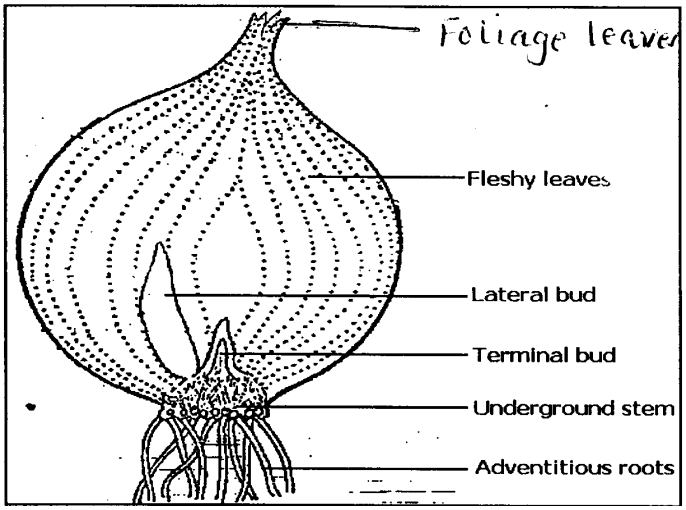
Bulbs:

- 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

Diagram of a bulb of an onion



Functions of each part

- Foliage leaves manufacture food for the plant
- Storage/fleshy leaves store food for the plant
- Scaly leaves protect the fleshy leaves
- Stem provide attachment to the leaves

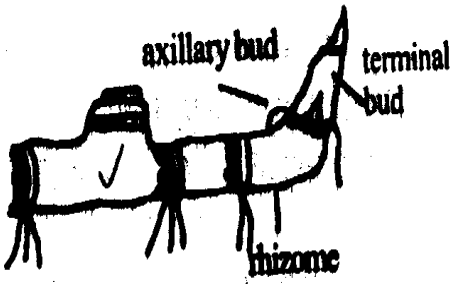
Rhizomes These are horizontal underground stems.

Examples of rhizomes

- Ginger
- Cana lily
- Turmeric
- Zoysia grass

- Stalons of spear grass and couch grass

Rhizome of a ginger



Corms

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

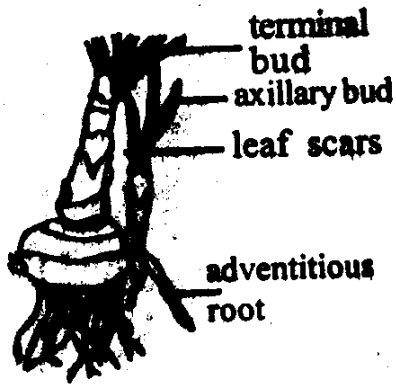
Characteristics

- It has scaly leaves, buds and adventitious roots.

Examples of corms

- Coco yams
- Gladiolus
- Crocus

Diagram of a corm



Climbing or creeping stems (weak stems)

These are weak stems which cannot support themselves upright.

Characteristics

- They climb other plants for support
- They normally creep along the ground

Ways in which plants climb others.

Using tendrils.

Here the lateral bud of a plant or the leaf tip develops into a tendril. E.g

- Passion fruits
- Pumpkins
- Gourds
- Vanilla
- Cucumber
- Water melons
- Cowpeas

Using hooks.

Some plants climb by using hooks

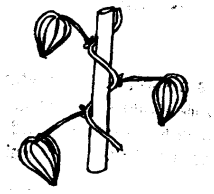
Hooks are down ward pointing structure which prevent the climber from slipping off to other plant e.g the Rose plant

Twinning or clasping.

Here some climbers or clasp their weak stems around a support. E.g

- Morning glory,
- Some beans
- White yams
- Tomatoes

A diagram for a clasping stem



Stem propagation.

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

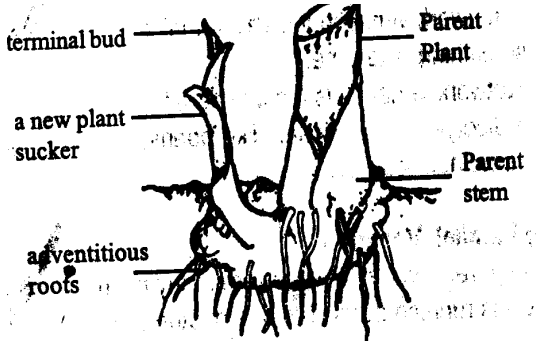
Examples of plants propagated from stems

- 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 are ;

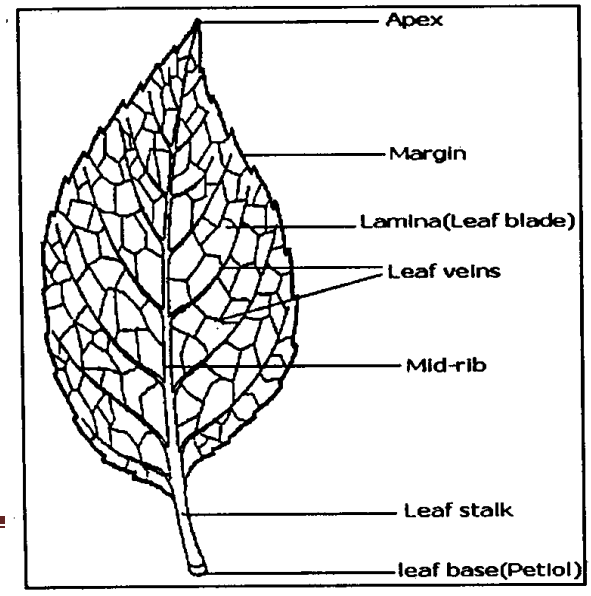
- Sisal
- Banana
- Aloevera
- Pineapples etc.

Uses of stems to animals/man

- Most stems from woody plants are used for timber and firewood
- Some stems are used as a herbal medicine to treat some sicknesses
- Stems are used as food for wild animals
- Some stems are used as human food especially stem tubers.

Leaves.

Parts of a leaf (Structure)



Leaf venation.

This is the arrangement of veins in a leaf

Types of leaf venation

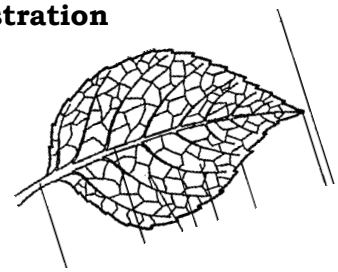
There are two types of leaf venation and these are:

- Net work leaf venation
- Parallel leaf venation

Network leaf venation

In network venation, the veins make something like a net. Network venation is a characteristic of dicotyledonous plants like beans, peas, hibiscus etc

An illustration



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.

An illustration

Types of leaves

- Simple leaves

- Compound leaves

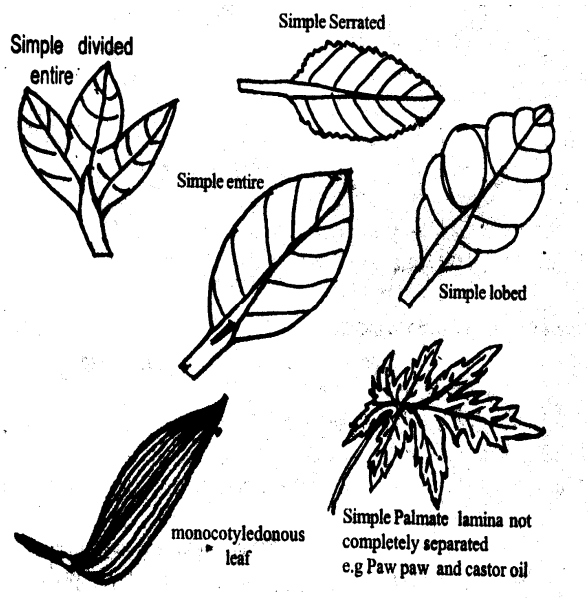
Simple leaves

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

Diagram of simple leaves.

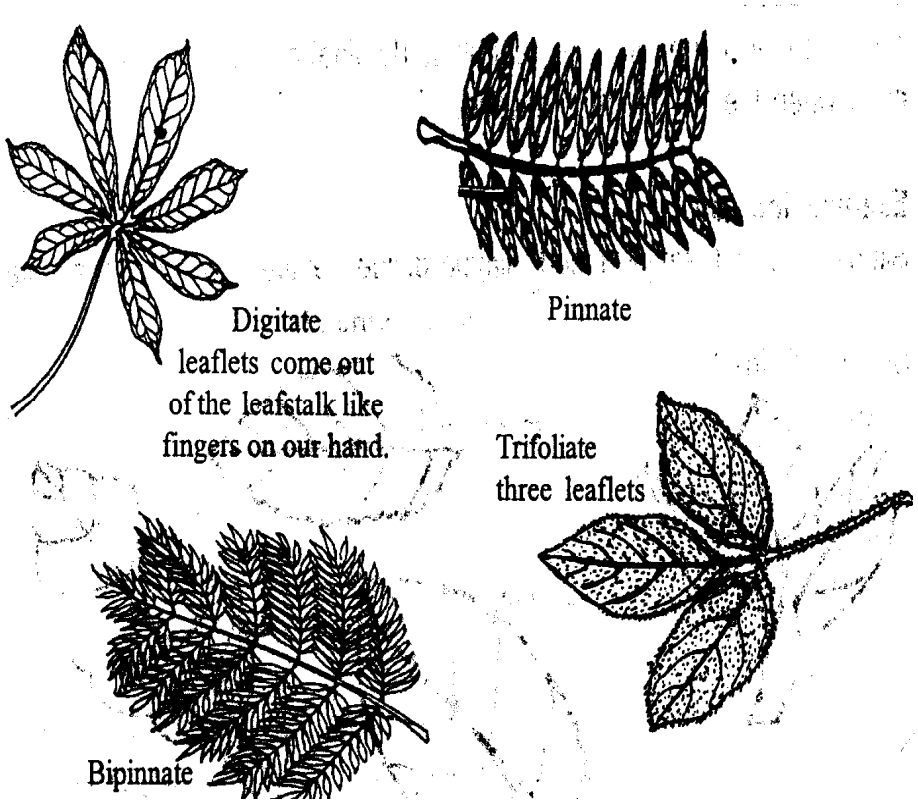


Compound leaves

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



Types of compound leaves

- Compound pinnate
- Compound bi pinnate
- Compound triofoliate
- Compound digitate

Functions of l eaves 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 (stoma – singular)
- 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, aloevera

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

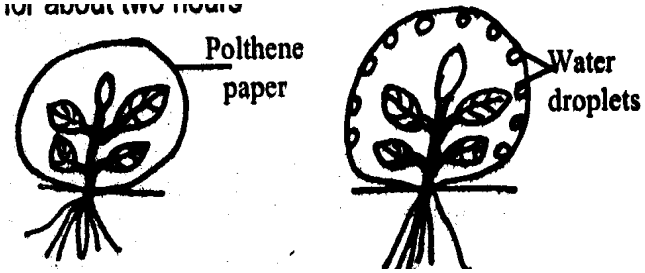
Process that take place in leaves

Transpiration

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

Experiment to show that plants lose water.

- Get a transparent polythene paper without a hole on it
- Look for a plant which is well placed in the sunlight
- Tie the polythene paper on one of the branches or around the shoot as shown below



- 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 which determine the rate of transpiration

a) **Temperature.** Plants lose a lot f water on a hot day than a cool day

b) **Light.** Light increases the rate of water loss, i.e the stomata are open during day and closed at night

c) **Wind**. When it is windy, the rate of transpiration is very high because more vapour is blown away from the leaf surfaces.

d) **Large surface area of the leaf.** This increases the rate at which water is lost due to the number of stomata it may have.

e) **Humidity.** This is the amount of water vapour in the atmosphere. High humidity leads to low transpiration because there is a lot of water vapour around a leaf so no more vapour can escape.

f) **Number of stomata in a leaf.** The greater the number of stomata, the greater the rate of transpiration and the reverse is true.

Note: When a plant loses more water than it gains through the roots, the plant wilts.

A wilting plant has droopy leaves and the stem is very weak. If water is provided, the plant soon recovers from the wilt.

Importance of transpiration to plants

- It is through this process that water and mineral salts are pulled from the roots to the upper parts of the plant where they are used
- It helps in cooling the plant. The leaf which is too warm loses heat as water evaporates from its surface

How plants reduce the rate of transpiration

- Leaves have a layer of wax, which helps to cover the stomata
- Some plants reduce the rate of transpiration b shedding their leaves. Trees that shed their leaves during the dry season are called deciduous trees
- Some plants reduce the big size of leaves to thorns e.g cactus plants

Photosynthesis.

This is the process by which plants make their own food/starch.

Photo- means light and

Synthesis means building up

Conditions/requirements for photosynthesis

- Chlorophyll
- Water
- Carbon dioxide
- Sunlight energy

Chlorophyll

This the green pigment(colouring 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

Water.

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

Functions of water

- Water combines with carbon dioxide to make starch.

Carbon-dioxide

This is a raw material needed for photosynthesis to take place. 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.

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 network 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

Flowers

- A flower is a reproductive part of a plant.
- It's 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

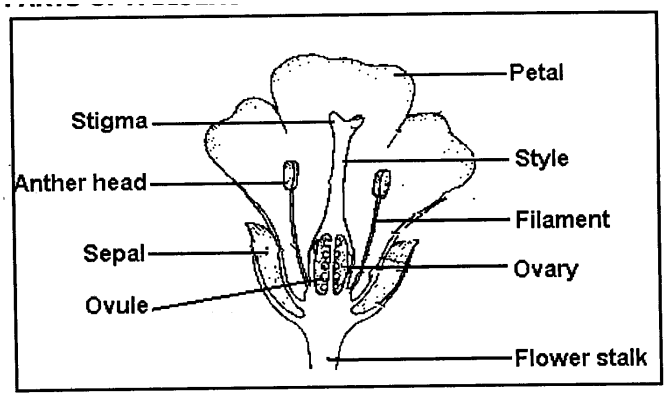
The external structure of a flower

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.

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

Style.

This is a tube running from the stigma to the ovary. It holds the stigma upright in order to get pollen grains

Stigma.

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

Stamen.

This 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 its 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

Pollination

Pollination is the transfer of pollen grains from anther to the stigma

This process is necessary if seeds are to be formed

Types of pollination

There are two types of pollination

- Self pollination
- 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 don't produce nectar
- The flowers don't have scent. A scent is a good smell

Examples of plants that undergo self-pollination.

- Beans
- Ground nuts
- Simsim
- Tomatoes

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

Cross pollination

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

This type of pollination results in healthier seeds and plants.

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.

- Pawpaws
- 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

Disadvantages of cross pollination

- Cross pollination can result into un desirable plant breeds

Agents of pollination

These are the factors or ways responsible for the transfer of pollen grains to the stigma. Agents include;

- Wind
- Insects
- Flowing water
- Animals
- Birds etc

Wind.

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 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 featherly stigma to increase chances of pollen sticking to them
- The flowers are not scented.

Insects

- Insects are able to pollinate flowers as they visit them to collect nectar
- They rub themselves on the anthers so on visiting another flowers or coming out of the very flower, pollination takes place

Examples of insects which pollinate flowers during day time

- Honey bees
- Butterflies
- Beetles

Examples of insects which pollinate flowers during the night

- Moths

Characteristics of insect pollinated flowers

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

Birds.

- 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 base of the petals where nectaries are found

Water.

- 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.

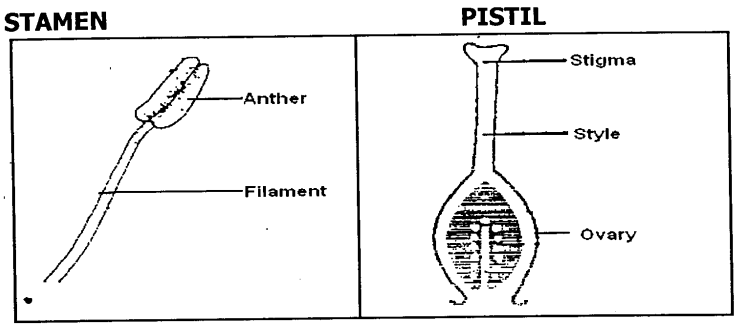
Fertilization

- 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 grows on the stigma down through the style to take the pollen grain to the ovary to meet the ovule
- This meeting of the pollen grain with the ovule will lead to fertilization

Diagram of a female and male part before fertilization

stamen **pistil**



- After fertilization, ovules develop into seeds
- Ovary develop into fruit
- Calyx, corolla, stamen and style wither slowly and fall off, but in some flowers the calyx may remain

Importance of pollination

- Pollination allows fertilization to take place in crops
- Pollination allows high yields in farmer's harvest

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

Seeds

A seed is a fertilized ovule of a flower

Groups of seeds

- Monocotyledonous seeds
- Dicotyledonous seeds

Monocotyledonous seeds

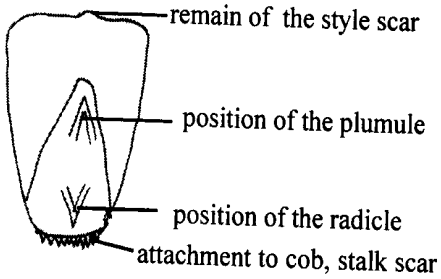
These are seeds with only one cotyledon e.g maize grain, rice, millet etc

These seeds are also called grains or cereals

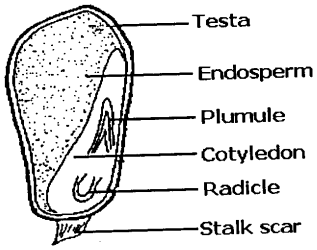
Dicotyledonous seeds

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

External parts of a maize grain



Internal parts of a maize grain



A maize grain

A maize grain is not a seed but a fruit. It is a fruit because it has two scars i.e style scar and stalk scar

Functions of each part of a maize grain

1. Testa

It is the hard outer covering of the fruit

It protects the inner delicate parts

2. **Endosperm**

It stores food for the embryo in monocotyledonous plants

3. **Cotyledon**

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

4. **Style scar.**

It is the part where the style was attached.

5. **Stalk scar.**

It is the part where the fruit was attached to the cob

6. **Embryo.**

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

It consists of two parts the plumule and the radicle

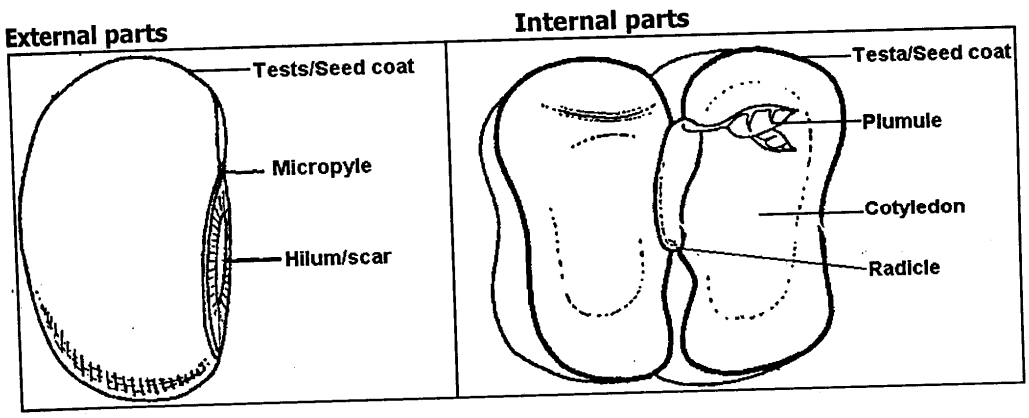
7. **Plumule.**

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

8. **Radicle.**

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

External part of a bean seed **Internal part of a bean seed**



Functions of each part

The functions of the part of dicotyledonous seed are the same as those of monocotyledonous seed apart from the following.

Hilum.

It is a scar left behind which attached the seed to either the pod, ovary or fruit

It is the same as the stalk scar of a maize fruit

Cotyledon

It provides food to the germinating embryo in the dicotyledonous seed

Micropyle

This is a small hole which allows air and water into the seed during seed germination.

Germination

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

Types of germination are;

- Epigeal germination
- Hypogeal germination

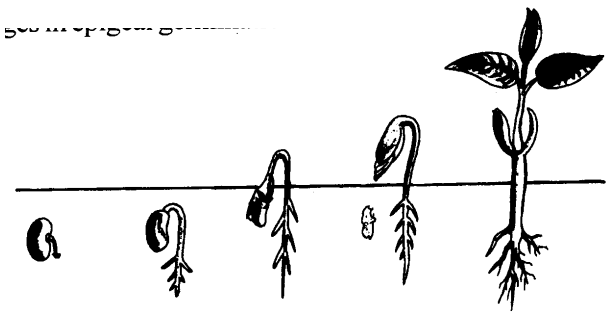
Stages in seed germination (Epigeal germination)

- 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 coleoptile in monocotyledonous plants

Epigeal germination

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

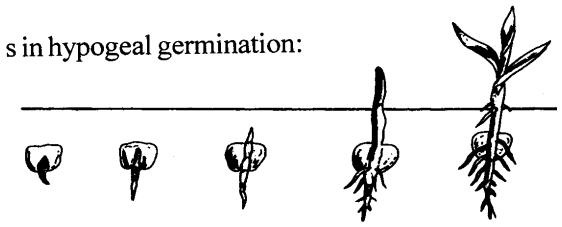
A diagram showing stages in epigeal germination



Hypogeal germination

This is the type of germination in which the cotyledons remain below the ground

Stages in hypogeal germination



Note: epigeal germination is a characteristic of dicotyledonous plant where as hypogeal germination is a characteristic of 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

Tropisms;

This is the growth movement of plants to response to a stimulus (singular) stimuli (plural)

Or

It is the plant response towards stimuli

A stimulus

Is defined as any change in the environment to which the plant is sensitive to the type of stimulus involved

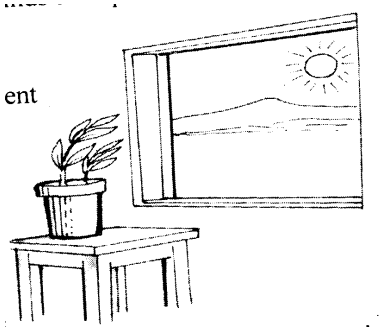
There are five different kinds of tropisms. Namely.

- Phototropism
- Geotropism
- Hydrotropism
- Thigmo tropism/haptotropism
- Chemotropism

Phototropism

This is the growth movement of plant shoot towards light.

Experiment showing phototropism



Geotropism

This is the growth movement of plant roots towards the direction of the force of gravity.

Plant roots grow downwards due to the force of gravity.

Hydrotropism

This is the growth movement of plant roots towards the source of water or moisture

Thigmotropism/haptotropism

This is the growth movement of certain parts of some plants in response to the stimulus which help climbing plants such as yams and beans to twine or clasp on other plants.

Chemotropism

This is the growth movement of plants parts towards a source of chemicals, e.g pollen tubes grow towards the stigma, through the style towards the ovary and finally towards the ovules.

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

Fruit

A fruit is a developed ovary

OR. A fruit is any structure in a flowering plant which contains seeds

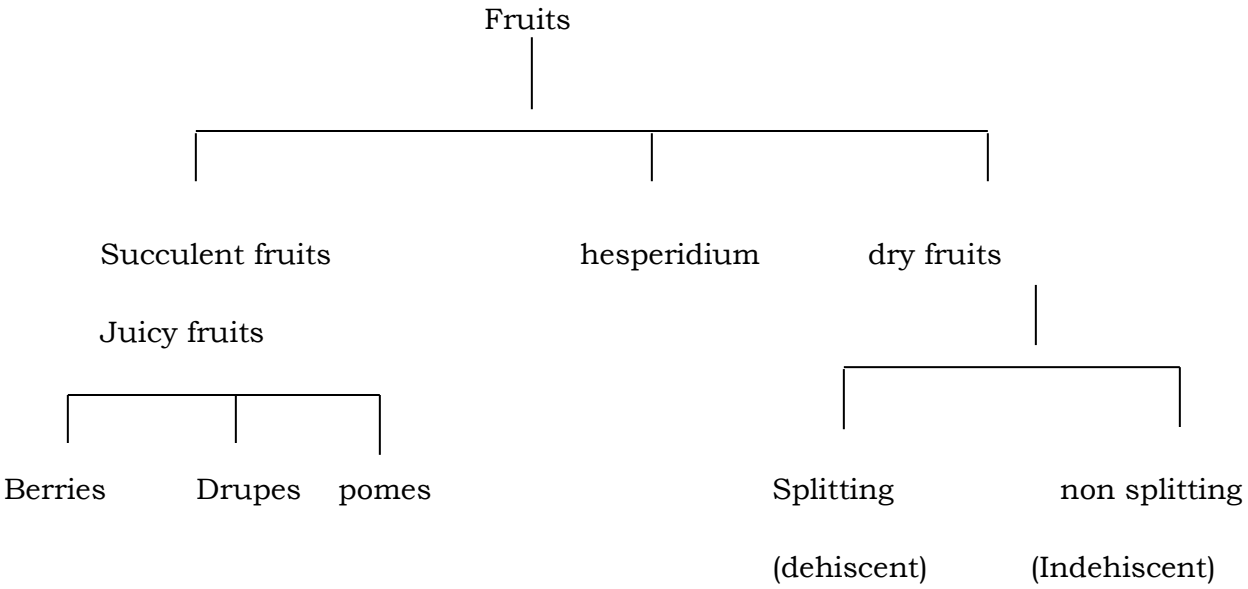
Difference between a fruit and a seed

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

Functions of fruits

- Fruits protect seeds
- Fruits assist in scattering of seeds when ripe

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.

The pericarp is the outer covering of a fruit.

Berries.

A berry has many seeds inside

- Its pericarp is divided into three layers
    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

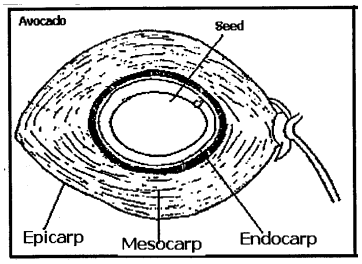
These are fruits whose pelicarp is usually dry, hard and woody.

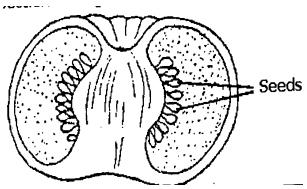
They are further divided into two subgroups

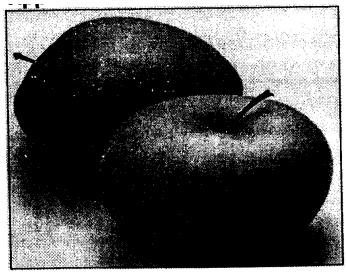
i) **Dehiscent or splitting fruits** The pericarp (pod or capsule) split to disperse the seeds e.g beans, peas, and castor oil

ii) **Indehiscent or non- splitting fruits** These usually have one seed only, the pericarp does not split to disperse the seeds instead many of such fruits have special structures for seed dispersal. Examples are (nuts) coconuts and cereals e.g rice. Others include; black jack, sunflower, tridax and many other winged fruits

Diagram of a drupe **a berry** **a pome**







Dispersal of seed and fruits

Dispersal is the scattering of fruits and 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.

Importance of dispersal

- Dispersal prevents overcrowding of plants
- It reduces competition for light and nutrients
- It enables plants to colonise a new area

- Dispersal minimize epidemic disease among crowded seedlings
- Dispersal increases chances of survival of species

Agents of seed dispersal

There are five agents namely.

- Animals
- Wind
- Explosive mechanisms (self dispersal)
- Flowing water
- Man

Animals

Fruits dispersed by animals have the following characteristics

- They are succulent fruits (juicy)
- They have features which make them attached easily to the fur of animals
- Have brightly coloured epicarps
- They have scent

Examples of fruits dispersed by animals include.

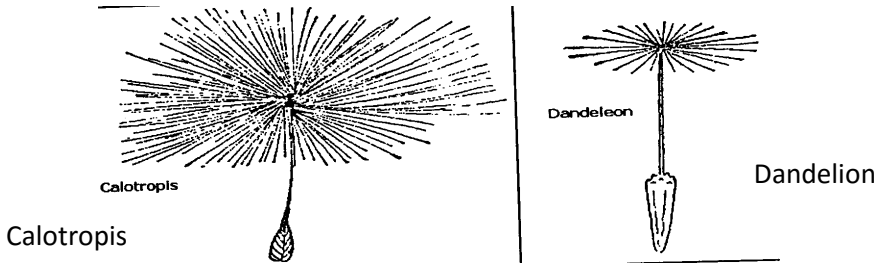
- Mangoes
- Paw paws
- Guavas
- Tomatoes
- Passion fruits
- Black jack fruit

Wind

Many fruits and seeds dispersed by wind have the following special adaptations

- The seeds are small and light
- They can easily be carried by wind e.g orchid
- Some seeds have a tuff or hair e.g cotton plant seed
- Some fruits have parachute like hair e.g dandelion
- Some seeds have wind like floating mechanism e.g jacaranda
- Some seeds have a censer mechanism when wind blows the dry season are thrown out the capsule e.g poppy

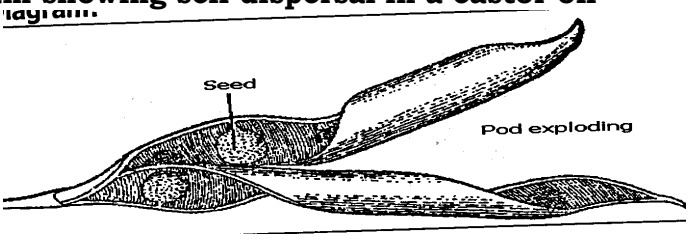
Illustration of wind dispersed seed



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. Examples are peas, beans, castor oil etc.

Diagram showing self dispersal in a castor oil



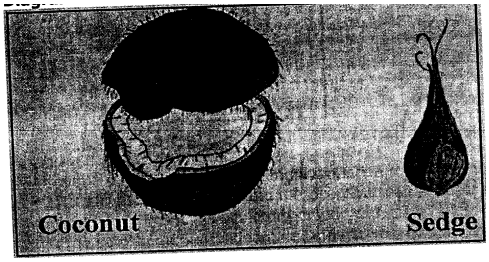
Water.

Characteristics of seeds and fruits dispersed by water.

- 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

Diagram showing seed/fruits dispersed by water



Man

Man has caused the spread of many plants into areas where these plants did not occur naturally by farming and cultivation. E,g coconut originated from Indomatayan region, guava, sweet potatoes and cassava originated from tropical America

Non – flowering plants.

These are flowers that do not develop flowers

Groups of non – flowering plants

- Spore producing plants
- Conifers

Spore producing plants

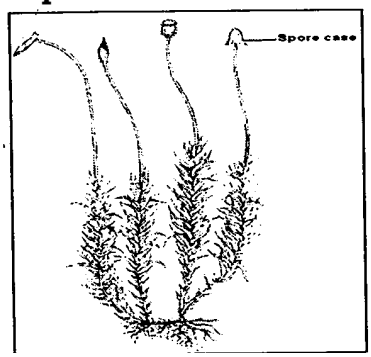
These are plants that reproduce by means of spores e.g mosses, ferns, liverworts etc

- **Mosses**

These are tiny green plant that commonly grow on bricks, walls, barks of trees, where enough moisture can enable them to grow

The spore of mosses are produced and stored in a capsule (spore case)

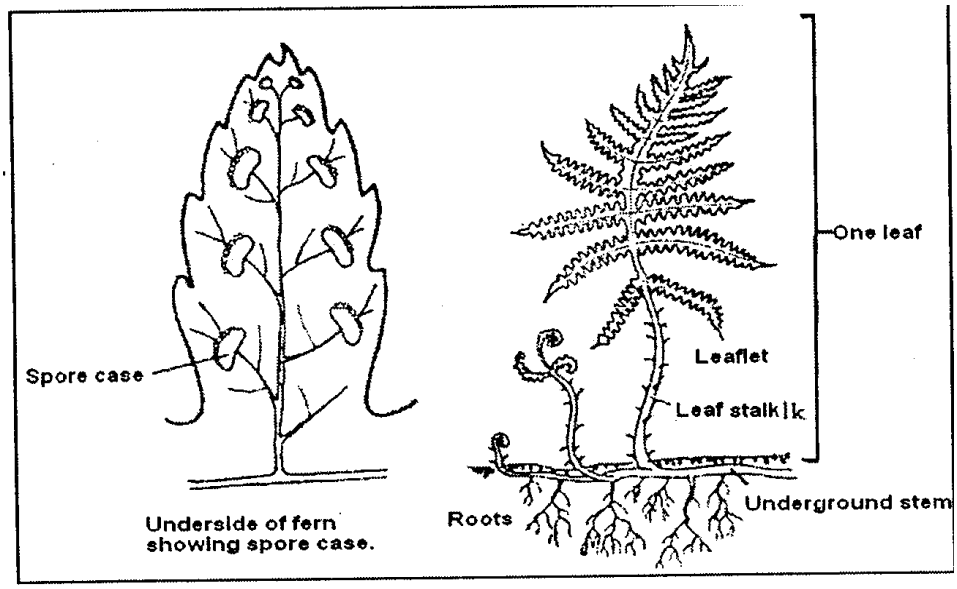
Diagram of a moss plant



- Ferns. They have underground stems with adventitious roots

Ferns reproduce by spores that grow in special spore cases on the back of the leaves

Diagram of a fern



- Lichens. Commonly grow on rocks, barks 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.

Coniferous plants

characteristics

- Conifers have proper roots, upright stem and small needle like leaves
- Conifers reproduce by special seeds found in cones. Cones do not develop from flowers, examples include; pine, cedar, cypress, podo, firs etc

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

Fungi

These are living organisms that do not have chlorophyll and reproduce mainly by means of spores.

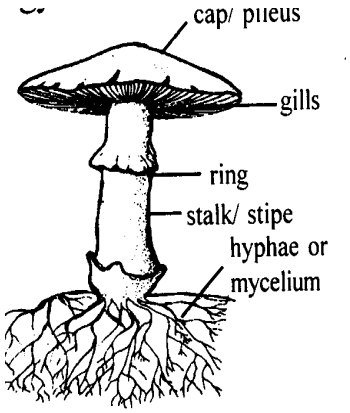
Characteristics of fungi

- Some exist either as one cell(unicellular) and as many cells (multicellular) organisms
- They do not have chlorophyll
- They reproduce by means of spores and by budding
- They have nuclei in their cells
- They feed saprophytically or parasitically

Note:

- Saprophytes feed by absorbing food from decaying matter
- Parasites are living organisms that depend on other living organisms for both food and shelter, examples fungi include; mushrooms, moulds, toadstools, puffballs, yeast, death caps etc

Structure of a mushroom.



Functions of some parts of a mushroom

Cap/pileus it protects the gills

Gills. They produce and store the spores

Mycelium. They absorb nutrients from decaying matter.

Uses of fungi

- Yeast is a source of vitamin B
- Yeast is used in making or brewing of alcohol
- Fungi helps in decomposition of organic matter
- Penicillium mould are used to produce medicine e.g penicillin antibiotics
- Yeast is used to increase the volume of dough in bakeries
- Fungi are source of local medicine
- Mushrooms are eaten as food.

Dangers of fungi

- Some fungi cause food to go bad and at sometimes cause food poisoning.
- Some fungi cause a number of diseases in plants and animals
- Some fungi are poisonous to man when eaten e.g toadstools.

THEME 2: SCIENCE IN HUMAN ACTIVITIES AND OCCUPATIONS

TOPIC: KEEPING CATTLE

ANIMAL HUSBANDRY:

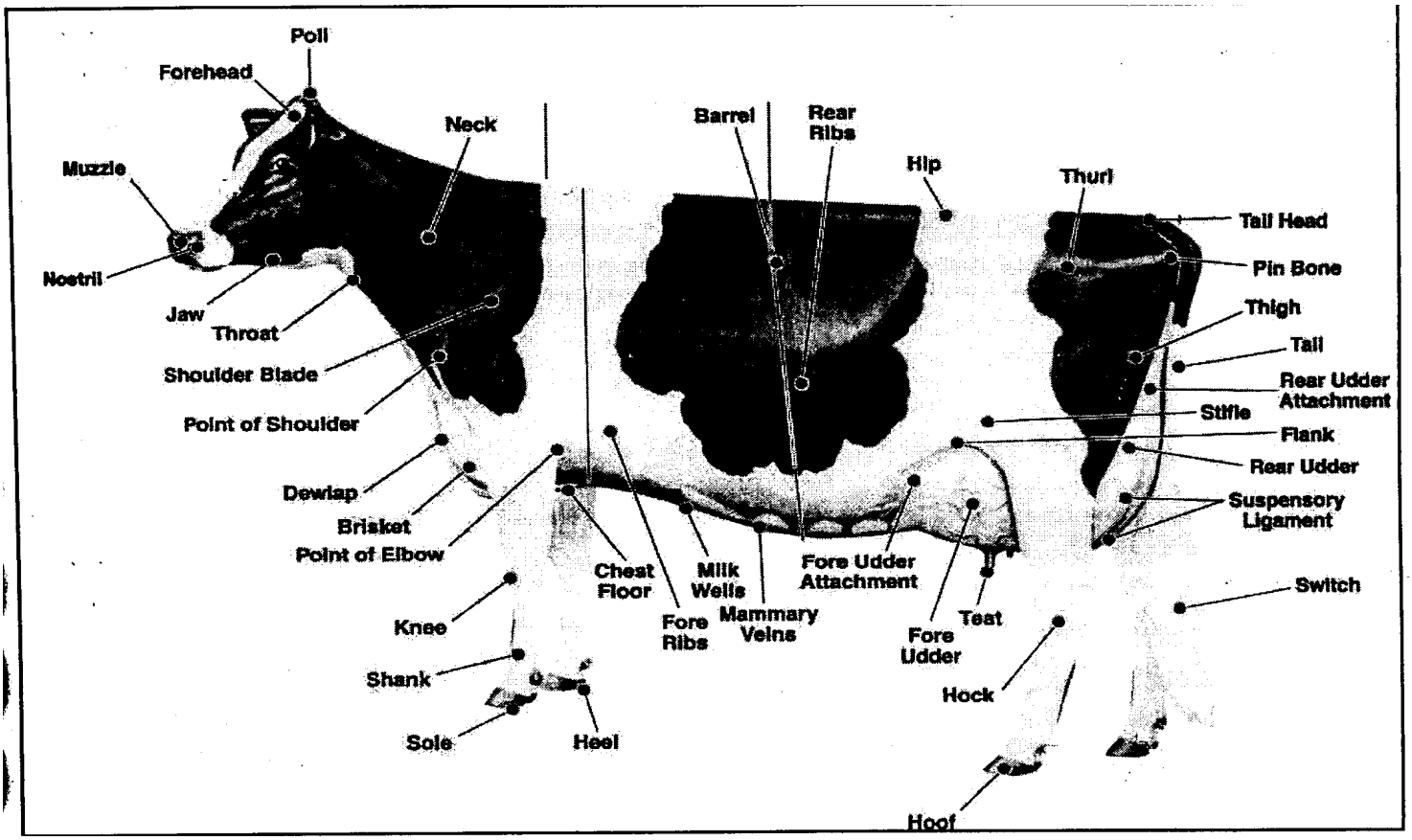
This is the rearing and management of farm animals

Cattle;

This refers to cows, calves, bulls, heifers and bullocks

Cattle keeping. Is the rearing of cows, calves, bulls heifers and bullocks.

Diagram of a cow and a bull



External features of a cow and a bull.

- Horns
- Eyes
- Legs
- Hooves
- Tail
- Udder
- Ears
- Hump
- Shoulder
- Teat
- Knee
- Dewlap
- Switch
- Shoulder
- Lock
- Muzzle
- Back
- Belly
- Poll
- Hind quarter

Types of cattle

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

- Dairy
- Beef cattle
- Dual purpose

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 more milk
- They have plenty of space between their hind legs

Beef cattle

- This is the type of cattle kept for meat production

Characteristics of beef cattle

- They have a rectangular body shape
- They have small heads
- They have small udder
- They mature quickly
- Have short legs with long broad backs
- They have the ability to survive drought without losing weight

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

Breeds of cattle

A breed is a family of animals with specific characteristics like milk yield, size, colour a particular origin

Examples of dairy breeds of cattle

- Friesians
- Ayrshire
- Guernsey
- Jersey
- Brown swiss
- Jamaica hope

Examples of beef cattle breeds

- Aberdeen angus
- Hereford

- Galloway
- Charolais
- Boran
- American Braham
- Short horn
- Santa Gertrudis

Dual purpose

Examples of dual purpose breeds

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

Types of cattle breeds

- Exotic cattle breeds: These are breeds of cattle imported from other countries
- Indigenous/local cattle breeds: These are breeds of cattle that have been in East Africa for a long time.
- Cross breeds: These are products got after cross breeding a local breed with an exotic breed.

Characteristics of types of breeds of cattle.

Exotic breed	**Local breed**
Have specific colour	Have different colour
Grow faster	Grow slowly
Produce a lot of milk	Produce little milk
They are easily attached by tropical diseases	They are resistant to tropical diseases
Need a lot of pastures and water to drink	Can survive on poor pasture and little water
Need high management skills	Are easy to keep and care for

Breeding of cattle

This is the mating of selected animals in a planned manner

Types of breeding

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

- To improve the quality of local breed
- To increase on the milk or meat production
- To improve on resistance to diseases
- To improve on the rate of growth
- To adopt to difficult conditions

Reproduction in cattle

Reproduction: Is the process by which living organisms produce other living organisms which resembles them

Service/insemination

This is the act of depositing semen into the female reproductive organs

Types of service/insemination

- Natural insemination. This is where a bull deposit semen into the vagina of a cow

Advantages of natural insemination

- It is cheap
- 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

- It encourages inbreeding
- Small cows can be injured by big bulls
- It can lead to a wide spread of veneral diseases

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

Artificial insemination

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

Advantages

- It controls venereal diseases
- It controls inbreeding
- It controls injuries in small cows by big bulls
- It is cheaper than keeping a bull
- It improves on the quality of animals
- Semen from a dead bull can be used

Disadvantages

- 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

Heat periods

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 (cows)

- A cow mounts other cows
- The cow allows other cows
- The cow loses appetite to graze
- The vulva swells and changes colours
- There is mucus discharge from the vulva
- The cow urinates frequently
- The cow allows the bull to mount it without resisting
- The cow makes a lot of noise
- Lactating cows reduce milk production
- The cow become restless

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 ova.

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

This 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 incalf 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

- The udder increases in size
- The cervix closes up
- The uterus enlarges
- The cow stop experiencing signs of heat
- There is mucus around the cervix
- Reduction in milk production

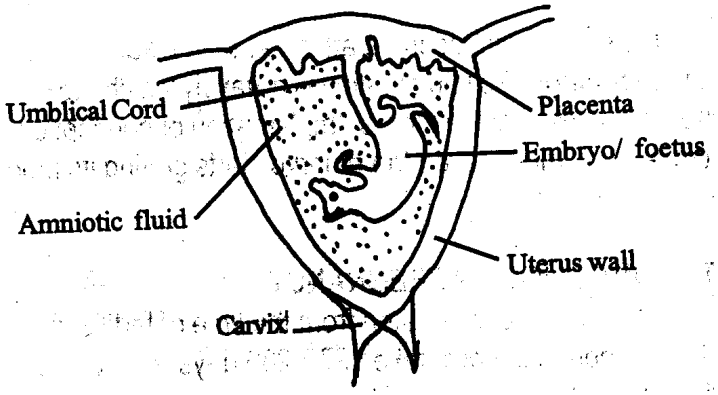
Steaming up the animal

This is the feeding of a pregnant cow on proteinous 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



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 opens
- 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 cow

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

- It contains anti – bodies which kill germs

Cattle management of a farm

Housing cattle.

This is the construction of houses favouring good health of cattle

Types of cattle houses

Permanent houses and semi- permanent

Calf pens. These are houses for calf

Byre (cattle shed) These are houses for mature cattle

Importance of housing cattle

- Housing protect cattle from bad weather conditions
- Housing protect cattle from predators
- Housing protect animals from thieves
- It is where farm animal produce are kept
- It is where farm records are kept
- For keeping farm and food utensils
- 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

Fencing cattle

A fence is a barrier of live or dead material which divides the grazing 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 using plants e.g 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 acts as wind breaks thus controls soil erosion
- Natural fences maintains soil fertility by adding humus
- Fencing makes culling easy
- It is easy to separate animals according to their type, age, sex etc.

Pasture

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

Types of pastures

- **Natural pastures**: It is the grass which grows on its own and are eaten by animals, examples of natural pastures
- Kikuyu grass
- Rhodes grass
- Guinea grass
- Nandi grass
- Elephant grass
- Guatamala grass
- Alfalfa grass

Prepared pasture

It is pasture made out of fodder crops. Fodder crops are crops grown for feeding animals, examples of fodder crops are;

- Maize silage

- Hay
- Sorghum
- Millet
- Oats
- Napier grass
- Clovers
- Sweet potatoes

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 desmodium
- Some pasture are used as local medicine for animals

Cattle feeding.

This is the giving of enough nutritious food to the cattle

Types of cattle feeds

Animal feeds is the food given to live stock

- **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 etc
- **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. OR: it is the proper use of grassland by live stock

Methods of grazing

1. Paddock grazing/Paddocking.

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

Paddocking is also called rotational grazing.

Advantages

- Paddocking controls pests and diseases
- It controls overgrazing
- It gives a farmer time to do other activities
- Manure is distributed on a farm
- It protects animals from destroying peoples crops
- It requires less labour
- It protects animals from predators
- Grass has enough time to grow
- Ensures proper use of grass

Disadvantages

- 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

- It is cheaper when handling a small number of livestock
- The livestock farm can do other activities

- Fencing is not required
- The farmer selects the best pasture

Disadvantages

- Teathering is expensive in terms of replacing ropes
- Ropes can injure animals
- It can be used when rearing many areas
- It leads to over grazing
- Animals lack enough exercise
- Animals are restricted to one type of pasture

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

- 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

- 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

- Water trough
- Feeding trough

- Fodder garden
- Store
- Labour
- Well constructed shade
- Drainage way to remove water and dung

Advantages

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

Disadvantages

- 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

5. Herding

This is a method where animals graze freely with the guidance of a herdsman

Advantages

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

Disadvantage

- Animals can easily be attacked by diseases
- Animals can easily get lost
- Animals can destroy peoples' property.
- Herding leads to overgrazing

Farm structures

1. A crush

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

Illustration of a crush

Advantages

- It is used when carrying out vaccination
- It is used when making identification mark like tattooing, branding etc
- It is used when spraying and Deworming animals
- It is used when carrying out insemination

2. **Spray race**

It is a confined place where animals are sprayed.

3. **Dip tank**

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

Uses if 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 personel to apply correct quantity of acaricides

CATTLE MANAGEMENT PRACTICES

1. Animal identification marks.

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

Ways of 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 ear
- **Ear tattooing**. This is a method where a number or symbol is permanently cut into the animals ears.
- **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 (Dis-budding)

This is the practice of removing horn buds from the animals head

Methods of dehorning

- **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.
- **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.
- **Using spoon dehorner.** This is a tool used to scoop out the horn bud from an animals 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

- It is painful to animals
- It can cause damage to the animals brain
- It can lead to cause of disease
- Poor operation can lead to death of animals

Castration

This is the removal of testis from male animals

Methods of castration

- 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.

Reason for castration

- Castration prevents undesirable male animals from breeding
- Castrated bulls are easy to handle
- Castrated animals grow fat and produce good meat
- Castration prevent random mating which can cause unwanted pregnancies

Deworming animals

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

Methods of deworming

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

Removal of teats

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

Milking

It is the act of removing milk from the udder of a lactating cow. Milk is a white liquid got from the cow's udder.

Methods of milking

- **Hand milking**. This is where a person uses clean hands to get milk from the udder of a cow.
- **Machine milking**. This is where a machine is used to milk an animal.

Preparation for milking

- Wash the udder with warm water to stimulate milk production
- Wash the milking containers using hot water to kill germs
- Apply the milking cream on the teats to prevent cracking on the teats
- Clean the milking parlour
- Draw some milk into the strip cup to test for mastitis
- Milk must be filtered to remove foreign bodies like grass, hair, small insects etc
- After milking, the milking parlour and milking equipment should be washed.
- Give the cow some feeds to keep it busy during milking.

A strip cup

It is a farm equipment used to test for mastitis

Lactometer

It 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

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

Milk products.

- Butter
- Cheese
- Yoghurt
- Whey
- Ghee
- Ice cream

Other cattle products

- Hides
- Beef
- Horns
- Hooves
- Cow dung

Preservation of hides

- Wet salting
- Suspension drying

Animal pest/animal parasite

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

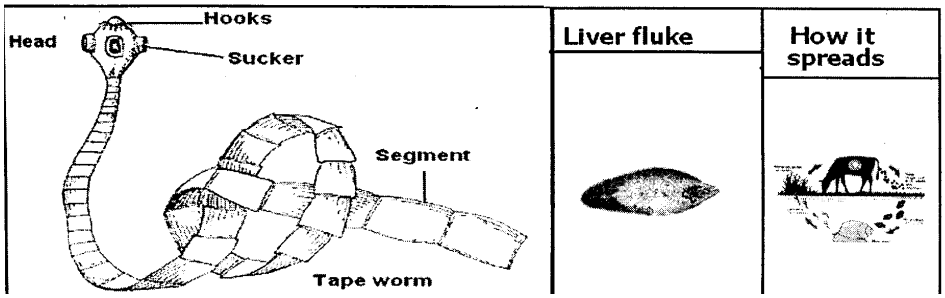
Examples of internal parasites/pests

- Tape worms
- Round worms
- Liver fluke

Control of internal pests/parasite

- Deworming animals

Illustration of internal parasites.

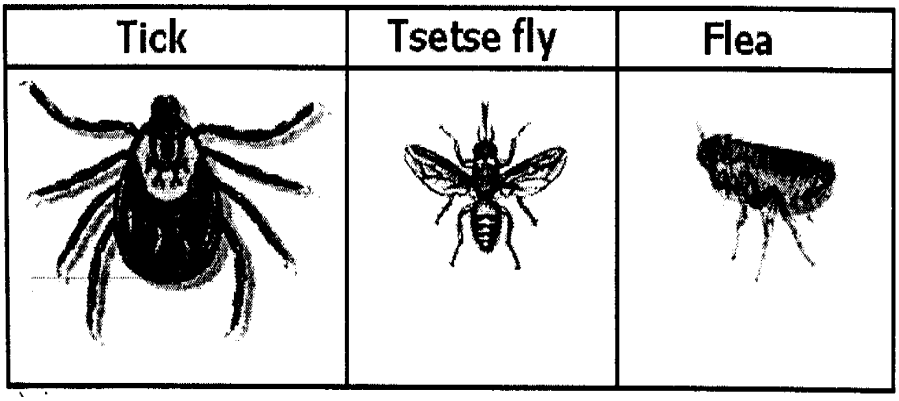


- **External parasites (Ecto parasite).** These are parasites found on the body of animals (host)

Examples of external parasites

- Ticks
- Mites
- Lice
- Fleas
- Tsetse flies

Illustration of external parasites.



Control of external parasites/pests.

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

Cattle diseases.

Cattle diseases are grouped according to their causative agents

Signs of sickness in animals

- Rise in body temperature and pulse rate
- Loss of appetite
- Prolonged cough
- Rough fur
- Difficult in passing out urine/dung
- Diarrhoea
- Abnormal salivation

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

Prevention and control of rinder pests

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

Foot and mouth disease.

- 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
- Sores in the mouth and 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

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

Nairobi sheep disease

Refer to fountain

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

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

Mastitis. It is an infectious disease caused by bacteria.

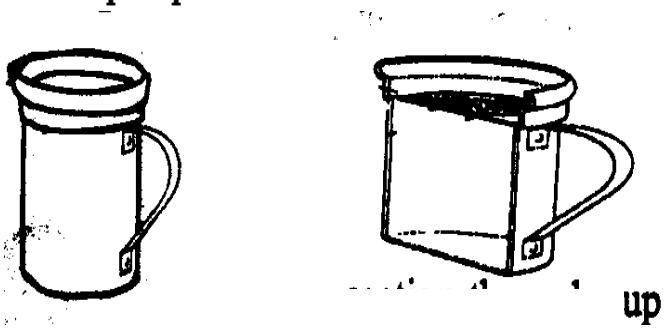
It affects the mammary glands of mammals like cattle buffaloes, sheep, goats bitch woman etc.

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 by the use of 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

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 brucella is spread

It is spread when an animal eats infected materials contaminated by discharge from another infected animals.

Brucella 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 foetuses or do not remove placenta without hand gloves
- Boil milk from infected animals before drinking

Contagious bovine pleuropneumonia. It is spread by breathing discharged bacteria from the nose of other infected cattle

Signs and symptoms

- Rise in temperature
- Discharge of thick mucus from the nose and mouth
- Quick breathing
- Loss of appetite followed by hard painful coughing

Prevention and control

- Isolate and slaughter all infected animals
- Regular vaccination of animals
- 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

Protozoan cattle diseases

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

- East coast fever
- Nagana
- Red water
- Heart water
- Coccidiosis
- 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
- 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 becomes restless pressing the head against hard objects.

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

Prevention and control.

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

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

Practices that harm cattle at home, field, transit and abattoir

- Castration
- Dehorning
- Removal of extra teats
- Ear tagging
- Beating animals
- Over using animals for Ploughing
- Under feeding animals
- Putting many animals in a small vehicle during transportation

Farm records

A farm record is a 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

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

Requirements or factors to consider before starting a farm

- Land/water sources
- Capital
- Labour
- Good management

THEME 3: THE ENVIRONMENT

TOPIC: RESOURCES IN THE ENVIRONMENT

Environment

Means all things that surround man.

Components of environment

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

Land.

- Land is made up of soil, rocks and minerals
- Many activities of human beings are done on land and they include;
    - Crop growing
    - Rearing animals
    - Construction of buildings
    - Recreation
    - Mining of minerals

Water:

- This includes surface and underground water
- Surface water includes lakes, rivers, wells, streams and ponds
- Areas with a lot of water in the soil (water logged are called wet lands (swamps)

Animals and plants

Animals and plants can be found on land and in water, animals include

- Vertebrates
- Invertebrates

- Plants make the vegetation cover on land

Air.

Air surrounds the earth and make up the atmosphere

Components of air include

- Nitrogen
- Oxygen
- Carbon dioxide
- Rare gases

Resources.

Resources are things that are needed by people to satisfy their needs (wants)

Types of resources

- Renewable resources
- Non – renewable resources

Renewable resources

These are resources that can be replaced by natural process.

e.g

- Air
- Plants
- Animals
- Soil
- Water
- Sun

Non- renewable resources

These are resources that cannot be replaced by any means, once they are used up. e.g,

- Oil
- Coal
- Minerals
- Natural gas

Groups of resources

- Living resources

- Non – living resources

Living resources

These are resources which have life like

- Plants
- Animals

Non living resources

These are resources which do not have life e.g

- Soil
- Water
- Sun
- Minerals
- Fossil fuels

Note: Resources can be classified according to common characteristics

Classification of resources

- **Common resources. (global resources)** These are resources that are used by every one and belong to nobody. They exist in plenty and extend beyond boundaries e.g
  - water
  - air
  - sun
- **Inexhaustible resources.** These are resources that will not be exhausted e.g
  - Wind energy
  - Rainfall
  - Tidal power
  - Solar energy
- **Exhaustible resources.** These are resources which people use and can be exhausted
- **Recyclable resources.** These are resources that do not get destroyed or lose value through use.

  They can be reprocessed and then re-used many times. Examples include

  - Metallic scrap
  - Waste papers
  - Polythene papers
  - Plastic scrap materials

Harvesting of resources.

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

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. During this process, sun light is trapped by the help of chlorophyll. 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 cooker
- Solar drier
- Solar cell (solar panel)

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 light 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's 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.

Diagram of solar water heater, a solar heater and a solar drier

Air and wind.

- Air is a mixture of gases
- Wind is moving air

Uses of air

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

How man affects 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

Water

Water is made of two hydrogen atoms and one oxygen atoms (H_2O

- The main source of water is rain
- Wetlands, lakes, rivers, swamps springs, under ground water tables are also sources of water

Importance of water

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

How water can be polluted.

- 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.

Soil

It is a natural medium in which plant roots grow

Importance of soil

- It provides plants with nutrients for growth
- It provides raw materials for building
- Clay soil is used for making models and pottery materials.

- Soil is used in decorating houses as it has different colours and texture.

Rocks and minerals

- The mineral may be of metallic or non – metallic substances
- Metallic minerals include gold, silver, platinum, copper, zinc and lead.
- Non metallic minerals may contain
    - Calcium carbonate
    - Sodium
    - Chloride
    - Silicate

Importance of rocks and minerals.

- Provide raw materials for making industrial and domestic equipment as well as tools
- Provide raw materials for building houses and roads
- Metallic minerals are used in the manufacturing of machines used in factories.

Fossil fuels

Fuel is anything that burns to produce energy eg heat and light energy

Fossils, are animal or plant remains that have turned into fuel resources. Fossil fuel include;

- Coal
- Petroleum
- Natural gas

Coal

- It's a product of plant remains
- It provides thermal electricity when burnt
- It is used to make dyes

Petroleum.

- It is a liquid fossil fuel from animal remains
- It is a common resource for power to run engines and electric generators

Products from petroleum.

- Petrol
- Diesel
- Paraffin
- Lubricating oils

- Grease
- Tar used on roads
- Plastics

Living things as resources

These include plants and animals in our environment

Plants (Importance of plants)

- Some plants give us plant fibres e.g cotton, sisal, jute and linen
- Cotton and linen are used to make clothes while sisal and jute are used to make ropes and sacks
- Some plants are used to make herbal medicine to cure certain diseases.
- Some plants are used as food

Note: synthetic fibre (artificial fibre) are:

- Rayon
- Nylon
- Terylene
- Acrilon
- Cashmilon
- Arlon

- Rayon is silk made from wood pulp or crushed wood and cellulose from cells of plants
- Nylon fibres are made from plastic
- Nylon can be used for making clothes, ropes, fishing nets and fishing lines

Animals.

- Some animals give us animals' fibres e.g wool mohair and silk.
- Merino sheep gives us wool used to make cloth, blankets, carpets, bed sheets etc
- Silk worms give us silk
- The skin and hide from domestic animals are for making bags, shoes, belts etc
- Horns from cattle are used to make glue and buttons
- Bees give us honey and wax.

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 resources

Conservation of resources means utilizing the limited resources sparingly with special consideration for future generation

- ✓ New technologies developed to preserve natural resources include

a) **Use of clean alternative sources of energy** e.g exploiting solar energy, running water, geothermal energy to generate electricity.
Wind can be used to run wind mills and biogas can be used as a source of heat and light. This supplements the use of coal and petroleum which also pollute the environment.

b) **Use of renewable sources of energy,** some refuse from plant material and animal waste have been exploited as resources to provide fuel, light and heat energy e.g sugarcane and cotton seeds residues are used as fuel. In this way, trees, oil or coal are preserved.

c) **Metal wastes, garbage and plastic materials can be recycled and used instead of new materials**. This saves volumes of new raw materials.

d) **Substituting plastics for metals**, using plastics in place of metals in manufacture of radios, television and some car parts cut down metal consumption.

e) **Soil conservation**. This is the maintaining of soil fertility by practicing good methods of farming.

f) **Controlling the destruction of wetlands**. Wetlands have been abused by establishment of industries, agricultural land and settlements due to population pressure.
The government should stop this immediately.

g) **Air conservation**. This means the way of reducing and avoiding air pollution. This can be done through,
   - ✓ Passing the industrial fumes and gases through a fine spray of line
   - ✓ Using catalytic converters to reduce fumes from petrol engines of cars.

h) **Water conservation**. Avoid dumping industrial wastes in water sources. Building of latrines near water sources should be stopped.
Avoid using poison to catch fish

Avoid reclaiming wetlands

Conservation of wild life;

- ✓ Banning of poaching
- ✓ Control over fishing
- ✓ Take care of animals in national game parks and game reserves
- ✓ Some rare animals should be caught and let to bleed in the wild life centre

THEME 4: THE HUMAN BODY

TOPIC: RESPIRATORY SYSTEM

Respiration is the process by which living cells break down food materials to release energy

Note: Respiration takes place in body cells.

Types of respiration:

a) Aerobic respiration
b) Anaerobic respiration

Waste products of respiration

a) Water vapour
b) Carbon dioxide

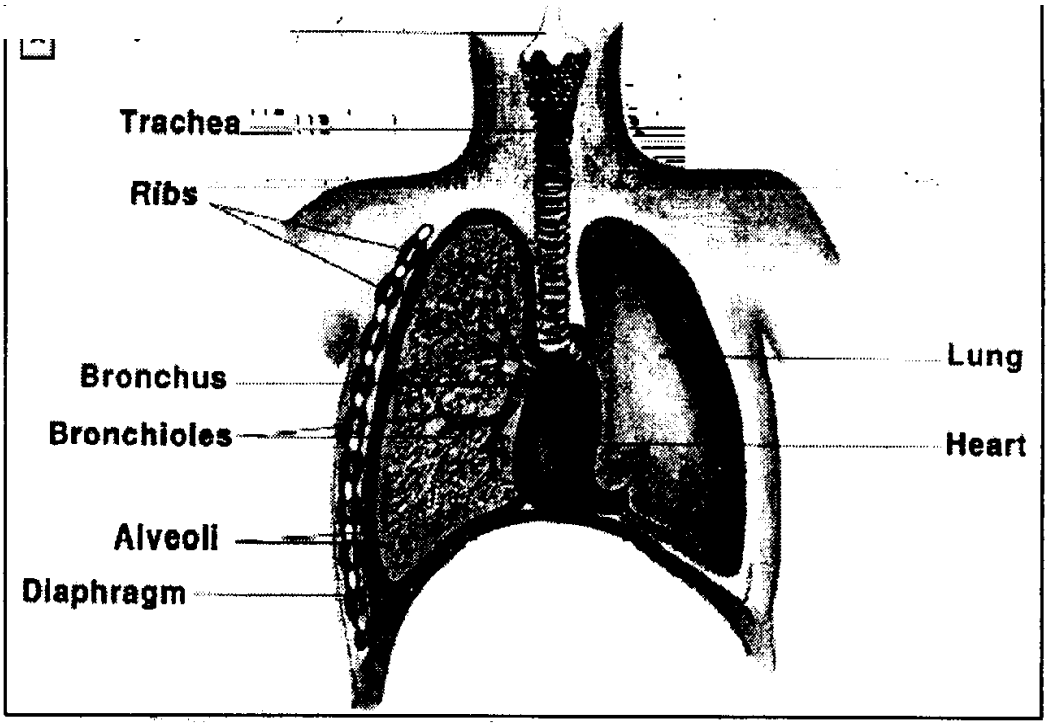
Major breathing organs

- ✓ Nose
- ✓ Trachea
- ✓ Lungs

Organs of respiration

- ✓ The lungs

The structure of the lungs.



Functions of the parts

Nose:

- ✓ The nose warms, cleans and moistens air
- ✓ The nose also traps dust and germs from air we breathe in

Note: The nose has mucus and cilia.

Reasons why it is not advisable to breathe through the mouth

- ✓ The mouth does not contain cilia which trap germs and dirt
- ✓ The air will not be warmed so it can make the lungs very cold

Trachea (Wind pipe)

The trachea is the passage of air in and out of the lungs.

Why is the trachea made of rings of cartilage?

The trachea is made of rings of the cartilage to prevent it from closing or collapsing

Note: Inside the trachea, there are very small hairs called cilia which help to trap foreign objects.

Lungs:

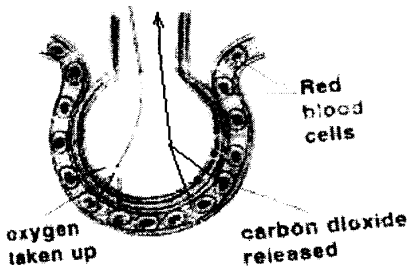
Lungs have air sacs which help in gaseous exchange

Air sacs (Alveoli)

It is where gaseous exchange takes place.

Carbon dioxide diffuses out while oxygen enters into blood.

Diagram showing gaseous exchange in the air sacs



Adaptation of air sacs for gaseous exchange

- ✓ Air sacs have thin walls to allow gases to diffuse through easily
- ✓ Air sacs are surrounded by a network of blood capillaries which bring carbon-dioxide and take oxygen

Breathing;

Breathing is the taking in and out of air

Types of breathing

- ✓ Inspiration or inhalation, taking in of air
- ✓ Expiration or exhalation taking out of air

Composition of inspired and expired air

Type of air	Inspired air	Expired air
Oxygen O_2	21%	16%
Carbon dioxide CO_2	0.03%	4%
Nitrogen N_2	79%	79%
Water vapour	Less	more

What happens during inspiration?

- ✓ The lungs expand
- ✓ The volume of the chest increases
- ✓ The diaphragm and intercastals muscles contract
- ✓ The ribs go upwards and outwards.

What happens during expiration?

- ✓ The lungs go back to their original size
- ✓ The volume of the chest go back to its original size
- ✓ The diaphragm and inter coastal muscles relax
- ✓ The ribs go downwards and inwards

Diseases of the respiratory system

Communicable diseases/infectious

- ✓ Tuberculosis
- ✓ Diphtheria
- ✓ Whooping cough
- ✓ Pneumonia
- ✓ Influenza

Non – communicable disease/ non - infectious

- ✓ Asthma
- ✓ Lung cancer
- ✓ Emphysema
- ✓ Bronchitis

Disorders of the respiratory system

- ✓ Hiccups
- ✓ Yawning
- ✓ Choking
- ✓ Sneezing

Maintaining proper working of the respiratory system

- ✓ Performing regular physical exercises
- ✓ Eating food containing a balanced diet
- ✓ Immunizing children
- ✓ Avoid smoking of tobacco
- ✓ Avoid dusty places.

P.6 SCIENCE LESSON NOTES TERM 3, 2020.

THEME 1: SCIENCE IN HUMAN ACTIVITITES AND OCCUPATION

TOPIC: SCIENCE AT HOME AND IN OUR ENVIRONMENT

Water is a chemical substance made up of hydrogen and oxygen

Components of water

- ✓ Hydrogen
- ✓ Water

Sources of water

- ✓ Rain
- ✓ Lakes
- ✓ Rivers
- ✓ Seas
- ✓ Oceans
- ✓ Springs
- ✓ Ponds
- ✓ Swamps
- ✓ Artesian wells
- ✓ Valley dams
- ✓ Oasis
- ✓ Snow

Pure water

Pure water is water which contains no impurities

Properties or characteristics of pure water

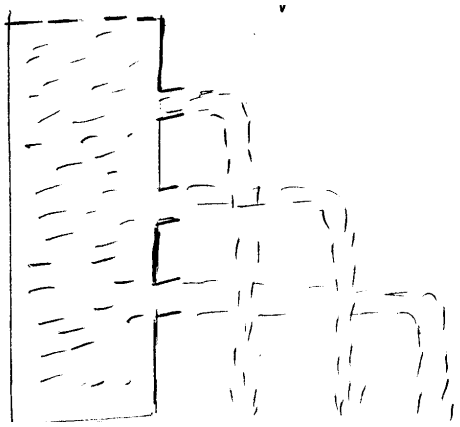
- ✓ It is colour less
- ✓ It is tasteless
- ✓ It is odourless (has no smell)
- ✓ It is free from bacteria and other living creatures like algae
- ✓ It is free from dissolved salts and gases

Properties of water

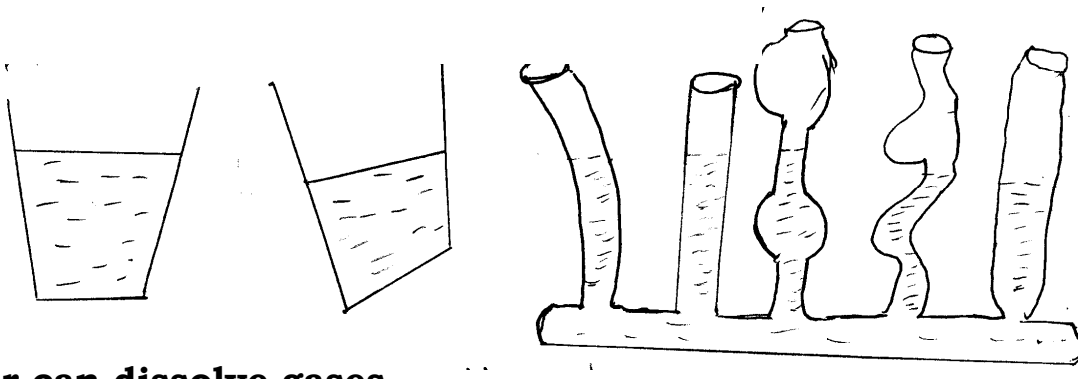
- ✓ Water exerts pressure
- ✓ Water finds its own level
- ✓ Water is a good solvent
- ✓ Water can dissolve gases

Diagrams showing the properties of water

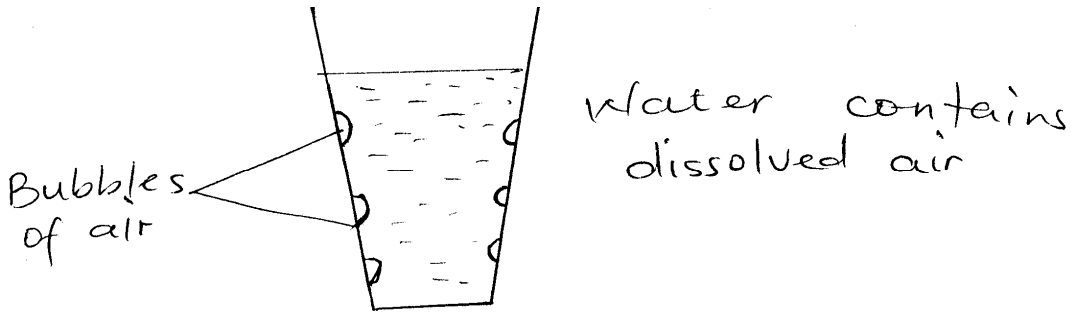
Water exerts pressure



Water finds its own level



Water can dissolve gases



Uses of water in the body

- ✓ Water makes up part of blood as plasma
- ✓ Water helps to dissolve digested food for easy digestion
- ✓ Water maintains the shape of the body cells
- ✓ Water takes part in changes that must occur in the body such as cooling as sweat.
- ✓ Water is a medium where chemical changes takes place in the body.

Domestic uses of water

- ✓ Water is used for cooking food
- ✓ It is used for washing clothes
- ✓ Water is used for bathing our bodies
- ✓ Water is used for washing utensils
- ✓ Water is provided to animals to drink

Industrial uses of water

- ✓ Water is used for generating electricity
- ✓ Water is used for recreation like swimming and boating
- ✓ Water is used for cooling machines in industries
- ✓ Water is used to clean machines in industries

Preparation of clean water

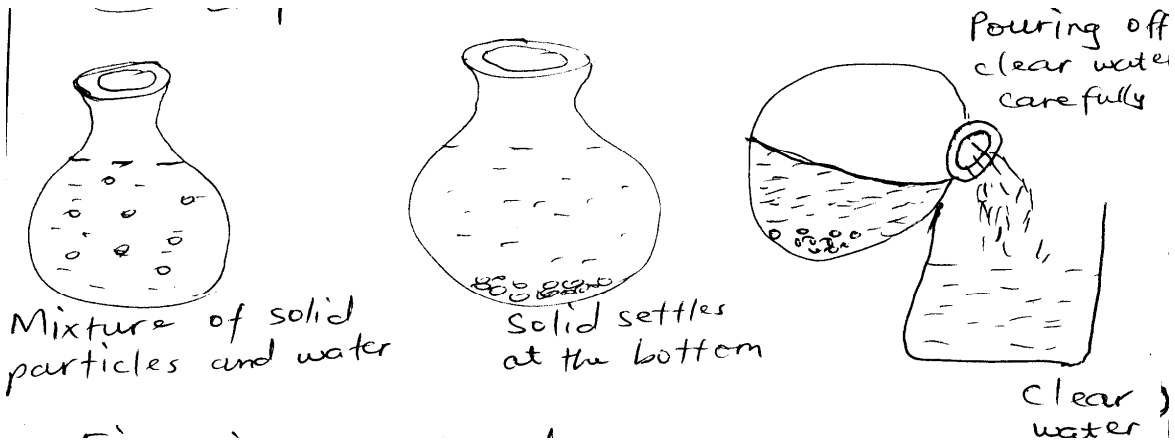
Methods of obtaining clean water from dirty water include:

- ✓ Decantation/Decanting method
- ✓ Filtration/Filtering method
- ✓ Distillation (clean water is water that does not contain germs)

Decantation

This is the method of removing solid particles from water

Experiment to show decantation

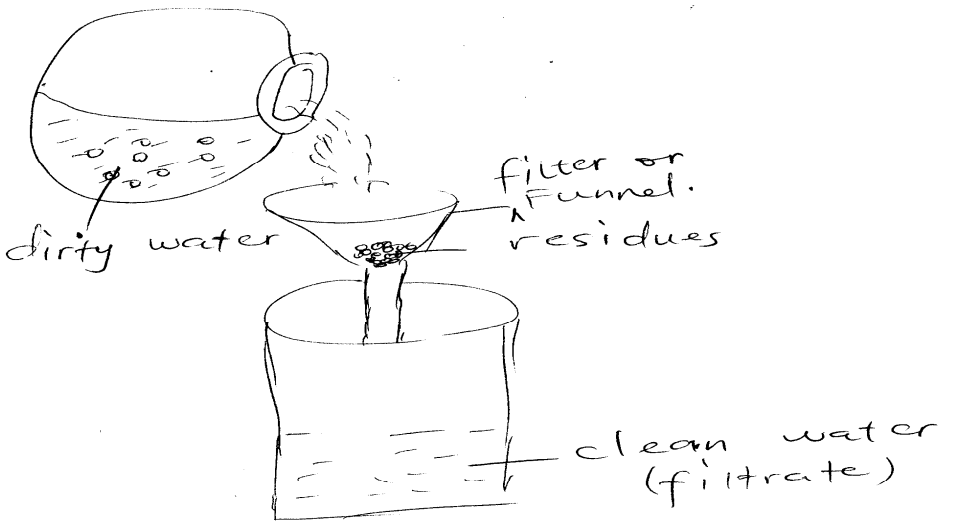


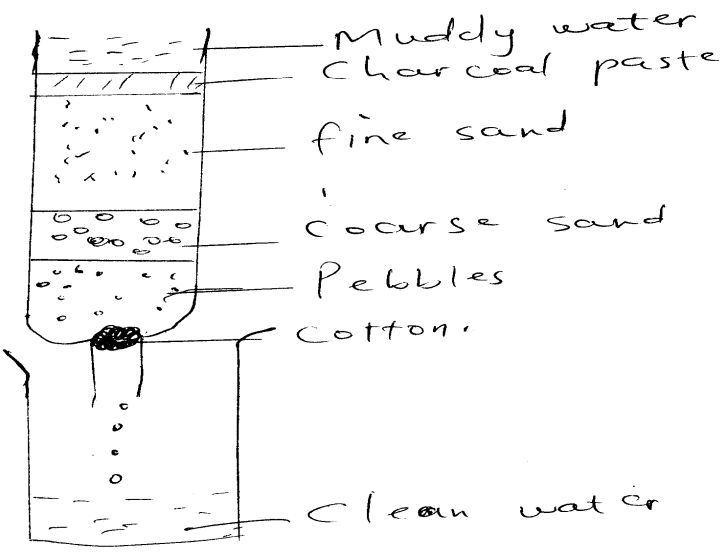
Filtration

This is the process of separating solid particles from water

The solid particles that remain on the filter are called the **<u>filtrate</u>**

Experiment to show filtration





Distillation

This is the process which involves evaporation of the liquids and then condensing the vapour to liquid form.

The water obtained through distillation is called **<u>distilled water</u>**

Note: Distilled water is used by doctors to mix drugs for injection.

Distilled water is not food for drinking because it does not contain mineral salts.

Experiment to show distillation method

Preparation of safe water

Safe water is water which is free from germs

Methods of preparing safe water

- ✓ Boiling water
- ✓ Distillation
- ✓ Treating water using chemicals like chlorine, water guard, florine, calcium chloride, potassium permanganate

Water pollution or water impurities

Water pollution is the process of making water contaminated.

Water impurities are substances added to water and change the nature of quality of water

Examples of water impurities

- ✓ Bacteria
- ✓ Viruses
- ✓ Microscopic plants and animals like amoeba and spirogyra
- ✓ Dead plant matter
- ✓ Fine particles of mud
- ✓ Sand

Ways of polluting water

- ✓ Urinating in water sources
- ✓ Deficating in water sources
- ✓ Dumping industrial wastes in water sources
- ✓ Dumping heavy metals in water sources
- ✓ Silting
- ✓ Leakages of petroleum products into water sources

Silting

This is the deposition of soil and other materials into the water bodies by erosion.

Examples of silts

- ✓ Soil
- ✓ Grass
- ✓ Metal scraps
- ✓ plastics
- ✓ polythene paper

Effects of silting to water bodies

- ✓ Silts reduces the depth of water bodies
- ✓ Silts leads to dryness of rivers, swamps and lakes
- ✓ Silting leads to flooding of surrounding areas
- ✓ Silts kill aquatic animals
- ✓ Silts cover the breeding ground for fish

Dangers of water

- ✓ Water carries harmful germs that cause diseases like cholera and typhoid
- ✓ Poisonous substances from factories, human wastes, detergents are often dumped into rivers and lakes by water.
- ✓ Flowing water causes soil erosion
- ✓ Heavy floods destroy man's crops and cause a lot of damage to property.

Hard and soft water

- ✓ Hard water is water that contains certain mineral salts dissolved in it.
- ✓ Hard water does not form scum with soap easily
- ✓ Soft water is water that forms scum easily with soap

Ways of removing hardness from water

- ✓ Adding chemicals to hard water e.g chlorine and water guard
- ✓ Boiling water

Cleaning clothes in a home

- ✓ **Sorting:** This is the practice of identifying dirty clothes which have been used.
- ✓ **Soaking:** This is the act of sinking clothes in water and soap for easy removal of dirt and other spots on a cloth
- ✓ **Washing:** This is the act of squeezing of the cloth together with soap
- ✓ **Rinsing**: Is the act of dipping soapy clothes in clean water to remove soap solution

Types of washing clothes

- ✓ Hand washing
- ✓ Machine washing

Activities after washing clothes

- ✓ Drying clothes
- ✓ Ironing clothes

Reasons for ironing clothes

- ✓ To kill parasites like lice, itch mites etc
- ✓ To kill germs

Items used to clean clothes

- ✓ Clean water
- ✓ Detergents
- ✓ Soap
- ✓ Basin

THEME 2: HUMAN HEALTH

TOPIC: ACCIDENTS AND FIRST AID:

What is an accident?

An accident is a sudden happening that causes harm to the body.

Mention some injuries to the body:

- ✓ Fainting
- ✓ Animal bites
- ✓ Nose bleeding
- ✓ Bruises
- ✓ Choking
- ✓ Food poisoning
- ✓ Burns
- ✓ Scalds
- ✓ Cuts
- ✓ Foreign bodies in natural opening

What is first aid?

First aid is the immediate help given to a casualty before he/she is taken to the nearest health centre.

Who is a casualty?

A casualty is a person who has been involved in an accident and needs assistance of first aid.

Mention five reasons for giving first aid

- ✓ First aid saves life
- ✓ First aid promotes quick recovery
- ✓ First aid stops bleeding
- ✓ It reduces pain
- ✓ It prevents further injuries

What is a first aid kit?

A first aid kit is a set of equipment used when giving first aid for a certain type of an accident

What items are found in a first aid kit

- ✓ Cotton wool
- ✓ Plaster

- ✓ Razor blade
- ✓ Bandage
- ✓ Pain killers
- ✓ A pair of scissors

Who is a first aider?

A first aider is any person who gives first help to a casualty.

Or

A first aider is any person who gives assistance to a casualty.

Mention four qualities of a good first aider

- ✓ He/she should be quick in giving first aid.
- ✓ He/she should be knowledgeable enough
- ✓ He/she should have skills
- ✓ He/she should be clean

BURNS:

What is a burn?

A burn is an injury on the skin caused by dry heat. Or

A burn is an injury caused by a hot object

Causes of burns include;

- ✓ Through body contact with hot plates, cookers, hot burning charcoal.
- ✓ Through body contact with un-insulated electric wires carrying current
- ✓ Through body contact with chemicals like acids
- ✓ Through body contacts with fire

Degree of burns

Degree of burns is a term used to describe how severe the burn is.

Degrees of burns include;

- ✓ First degree burn
- ✓ Second degree burn
- ✓ Third degree burn

First degree burn.

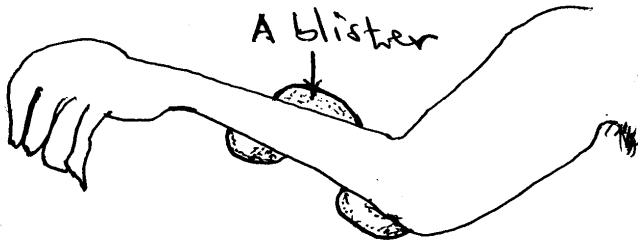
A first degree burn is a minor burn in which there are no blisters formed.

What is a blister?

A blister is a raised skin with some liquid underneath.

Second degree burn.

A second degree burn is a severe burn in which blisters are formed on the skin at the site of the injury.



Third degree burn

This is the most severe burn in which the skin is burnt deeply and appears shinny white.

First aid for second degree burn

- ✓ If the blister is not broken, leave it to prevent infection of the wound.
- ✓ If the blister is broken, wash the area with soap and clean water and then cover the skin with cloth to prevent flies bringing germs

First aid for a third degree burn

- ✓ First put the burnt area in cold water then cover with a clean cloth.
- ✓ Encourage the burnt casualty to drink a lot of fluids like ORS because victims of second and third degree buns lose a lot of water from their bodies through the burnt skin by evaporation.

SCALDS

What is a scald?

A scald is an injury caused by wet heat.

Or

A scald is an injury caused by hot liquids.

Causes of scalds

- ✓ Through body contact with hot water
- ✓ Through body contact with hot water, hot tea, hot milk, hot soup, hot porridge etc.

First aid of scalds

- ✓ Put the injured part in cold water for at least 10 – 15 minutes

Reasons for putting injured part in cold water

- ✓ To cool the temperature of injured part
- ✓ To prevent further damage of the underlying body cells

NOTE: If the injured part cannot be put in cold water, pour cold water on the injured part

Prevention of scalds and burns

- ✓ Keep hot objects far from children's reach.
- ✓ Cook food in raised fire places
- ✓ Prevent children from playing near fire places
- ✓ Avoid children from playing with hot liquids and metals
- ✓ Keep away inflammable liquids such as petrol from the living house.
- ✓ Construct fire guards around places where cooking is done
- ✓ People should use poor conductors of heat when lifting hot objects from the fire
- ✓ People should avoid using appliances with un – insulated electric wires.

Fever and convulsions

Fever: Is a condition of the body when the temperature goes beyond the normal.

Note: Fever is not a disease but a symptom of many diseases.

Convulsions: Are sudden violent body movements which cannot be controlled

Or

Convulsions: Is when the body shakes or jerks involuntarily.

Causes of fever and convulsions

- ✓ Diseases/illness like malaria, measles, meningitis, typhoid etc
- ✓ Epilepsy (Fits)
- ✓ Exposure of the body to high temperature
- ✓ Poisoning

Note: high fever causes convulsions

First aid for fever

- ✓ Remove most of the persons clothes
- ✓ Perform tepid sponging
- ✓ Encourage the person to drink more cold fluids than normal

First aid for convulsions

- ✓ Make the person get enough air supply

- ✓ Remove all the tight clothes and loosen others
- ✓ Clear the space where the victim is convulsing from
- ✓ Put an object between the teeth to prevent the victim from biting the tongue.

Near drowning and drowning.

Near drowning: Is a condition when a person stops breathing due to having a lot of water in lungs but not yet dead.

Drowning: Means dying as a result of the lungs being filled with water.

Causes of near drowning and drowning

- ✓ Swimming pools
- ✓ Bathe tubs
- ✓ Ponds
- ✓ Basins full of water
- ✓ Ditches
- ✓ Lakes and rivers
- ✓ Seas and oceans

Prevention of near drowning

- ✓ People should not swim in deep waters without life savers
- ✓ People sailing on water should wear life jackets
- ✓ People should acquire swimming skills.
- ✓ Swimming pools should be fenced
- ✓ Septic tanks and other sewerage systems should be covered
- ✓ Children should not go near big water sources without grown up people
- ✓ Bath tabs should not be left with water
- ✓ Containers filled with water should be kept out of reach of children.

First aid for near drowning

- ✓ Yell for help
- ✓ Remove the person from water as soon as possible
- ✓ If the person is not breathing lie the casualty on his back with the head tilted
- ✓ Perform mouth to mouth breathing (kiss of life)

Fainting.

Fainting is the brief loss of consciousness.

Causes of fainting

- ✓ Shortage of enough oxygenated blood flowing to the brain
- ✓ Prolonged hunger
- ✓ Standing in sunshine for a long period of time
- ✓ Extreme sorrow or anger
- ✓ Extreme pain
- ✓ Shocking news
- ✓ Too much excitement
- ✓ Vigorous/strenuous exercises
- ✓ Illness

First aid for fainting

- ✓ Remove tight clothes around the neck, chest and waist
- ✓ Put the casualty in an open space with fresh air
- ✓ Make the casualty lie on the back facing up while raising the legs to encourage enough flow of blood containing oxygen to the brain
- ✓ Fanning the casualty if the day is hot

Foreign bodies

A foreign body is any external matter that enters the body either through a natural opening or wound.

Examples of natural openings

- ✓ Mouth
- ✓ Eye
- ✓ Ears
- ✓ Nose
- ✓ Rectum
- ✓ Vagina

Examples of foreign bodies

- ✓ Seeds
- ✓ Grains
- ✓ Small stones
- ✓ Dirt/dust
- ✓ Insects
- ✓ Soil

- ✓ Coffee berries
- ✓ Pins
- ✓ Broken glasses
- ✓ Thorns
- ✓ Small bones
- ✓ Tear gas
- ✓ Nib of a pen

First aid of foreign bodies in the eyes

- ✓ Wash the eyes with plenty of clean water
- ✓ Use a clean corner of a soft piece of cloth to wipe the foreign body out of the eye.

Note: Never use sharp objects because they can damage the eye and cause more pain.

If the foreign body remains in the eye, take the casualty to hospital.

First aid for foreign body in the ear

- ✓ If it is an insect, tell the victim to sit and bend the head to one side and pour clean water.

Note: If it is not an insect, do not attempt to remove it because you can push if further and injure the ear drum.

First aid of foreign body in the nose

- ✓ Blow the nose if it is an insect, dirt, dust or small stones.

First aid of foreign body in the throat

- ✓ Observe good eating habits

Prevention of accidents caused by foreign bodies

- ✓ Keep away objects like seeds buttons, beads, coins, bottle tops etc from children
- ✓ Food must always be chewed properly before swallowing
- ✓ Observe good eating habits
- ✓ Advising children not to put objects in their ears, eyes and nose

Poisoning

Poisoning: Is the act of taking any harmful substance which can affect our health.

Poison is any substance either solid, gas or liquid which when taken into the body may damage our health or cause death.

Common poisonous substances.

- ✓ Rat poison
- ✓ Insecticides
- ✓ Agro chemicals
- ✓ Paraffin
- ✓ Petrol etc

Signs of a poisoned person

- ✓ Vomiting
- ✓ Rapid breathing
- ✓ Diarrhoea
- ✓ Loss of body balance
- ✓ The person feels thirsty
- ✓ Fever and sweating
- ✓ Bleeding internally/externally
- ✓ Mental confusion

First aid for poisoning

- ✓ Give the casualty plenty of fluids like water, juice, milk to dilute the poison

Note: A person who has taken paraffin/jik should not be made to vomit because it causes more damage to the lungs, throat and stomach.

Nose bleeding

Fractures

A fracture is a broken or cracked bone in the body.

Types of fractures.

- ✓ **Simple fracture:** This is a type of fracture where the broken or cracked bone remains inside the flesh
- ✓ **Compound fracture**: This is a type fracture where the broken bone or cracked bone comes out of the body.
- ✓ **Green stick fracture:** This is a type of fracture which occurs in young children where the bone tears like a twig.

Causes of fracture

- ✓ Accidents

- ✓ Rough play/games
- ✓ Vigorous exercises

First aid of fractures

- ✓ Tie splints around the injured part.

Note: Splints are used to keep the broken bones in their normal position

Splints also control further injuries.

Note the following:

When considering first aid for a fracture, you should consider the 3Bs.

B Breathing
B Bleeding
B Broken bone

Prevention of burns and scalds:

- ✓ Keep hot objects far from children's reach.
- ✓ Cook food in raised places.
- ✓ Prevent children from playing near fire places.
- ✓ Avoid children from playing with hot liquids and metals.
- ✓ Keep away inflammable liquids such as petrol from the living house.
- ✓ Construct fire guards around places where cooking is done.
- ✓ People should use poor conductors of heat when lifting hot objects from the fire.
- ✓ People should avoid using appliances with insulated electric wires.

THEME 3: HUMAN HEALTH:

TOPIC: SANITATION;

- ✓ Sanitation: is the general cleanliness of an area.

Or

- ✓ Sanitation are the steps taken to promote public cleanliness involving community effort to disease prevention.

Or

- ✓ Sanitation means steps taken to promote cleanliness of the places where we stay and live.

Or

- ✓ Sanitation is the general cleanliness of the environment.

Elements of sanitation;

- ✓ Provision of good housing
- ✓ Proper disposal of human wastes
- ✓ Supply and use of safe water
- ✓ Vector control
- ✓ Safe guarding of food
- ✓ Prevention of pollution of air and water.

Ways of keeping the environment clean.

- ✓ Draining away all stagnant water to deny mosquitoes breeding grounds.
- ✓ Digging rubbish pits and provision of dustbins for proper disposal of rubbish.
- ✓ Having a latrine or toilet for proper disposal of faeces and urine.
- ✓ Spraying vectors with insecticides.

Reasons for practising good sanitation

- ✓ Good sanitation prevents spread of diseases.
- ✓ It prevents accidents like cuts from broken bottles.
- ✓ It prevents water and air pollution.
- ✓ Good sanitation prevents food contamination.

Latrines:

A latrine is a place for urination and defecation.

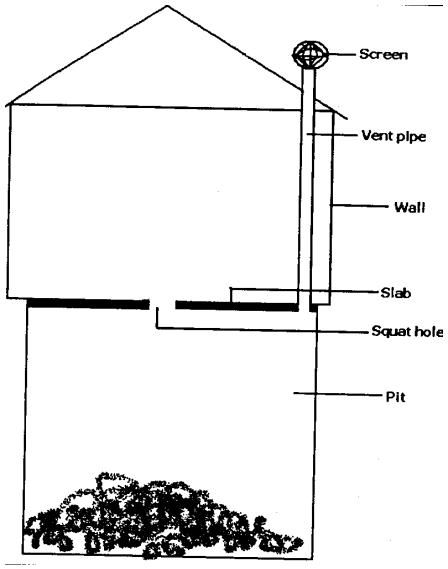
Types of latrines;

- ✓ Ordinary pit latrines
- ✓ VIP latrines
- ✓ Toilets
- ✓ Potties

Characteristics of pit latrines;

- ✓ They are deep to hold faeces of the users for so many years. (5 – 7 metres deep)
- ✓ They have strong floors to stand on and smooth enough to sweep and clean easily.
- ✓ They have enough hole to allow in faeces and urine but small enough to prevent children from falling in.
- ✓ They have a lid to cover the hole completely and keep houseflies out of it.
- ✓ They have walls and doors for privacy.
- ✓ They have a roof which protects people from rain and sunshine.

Structures of VI P latrines.



Differences between a VIP latrine and an ordinary pit latrine;

- ✓ A VIP latrine has a vent pipe where as an ordinary pit latrine doesn't have a vent pipe.

- ✓ A VIP latrine doesn't have a lid where as an ordinary pit latrine has a lid.
- ✓ A VIP latrine has a screen whereas an ordinary pit latrine doesn't have a screen.

Similarities between a VIP latrine and an ordinary pit latrine;

- ✓ Both latrines can be smoked.
- ✓ Both latrines have a hole
- ✓ Both latrines have a slab.

Advantages of VIP latrine over an ordinary pit latrine;

- ✓ A VIP latrine does not smell badly.
- ✓ A VIP latrine has a screen which traps houseflies.

Ways of keeping pit latrines clean.

- ✓ Regular sweeping to push faeces and urine into the hole.
- ✓ Slash tall grass around it to prevent dangerous insects and animals.
- ✓ Regular smoking with dry plant materials.

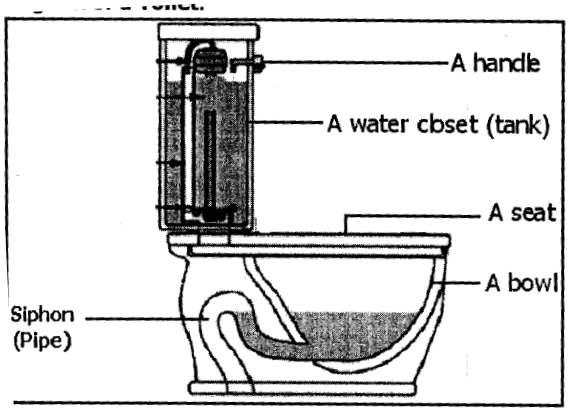
Site for latrines;

- ✓ All latrines should be below or down hill the water source. This prevents faeces from mixing with water to contaminate it.
- ✓ All latrines should be 30 metres away from water sources to allow wa ter which comes into contact with faeces to filter out into the soil.
- ✓ All latrines should be at least 10 metres away from school, home, hotel to prevent bad odour from reaching people.

Toilets;

- ✓ Toilets are commonly found inside modern houses in cities and towns.
- ✓ Toilets unlike latrines use water to flush waste matter into septic tanks or into the sewage pipes.

Structure of a water closet toilet;



Functions of the parts of a water closet toilet.

A seat

It is where a person sits to deposit human waste.

A bowel

It is a basin containing water where faeces and urine are deposited.

Lid

It covers the bowel to prevent vectors from coming into contact with faeces and urine.

Water closet/tank

It holds water for flushing.

Handle

It is pulled or pushed to flush faeces and urine away.

Sewage pipes

They carry faeces and urine to the septic tank or sewage system.

Ways of containing toilets clean;

- ✓ Flush the toilet away after use.
- ✓ Wash hands with clean water and soap after use.
- ✓ Avoid using any other hard material like clothes, sticks, stones because they block the pipe to the septic tank.
- ✓ Do not put any other thing in the toilet apart faeces, urine and toilet tissue.

Potties;

Potties are small containers used by young children for depositing faeces and urine

Uses of potties;

- ✓ It collects faeces and urine of young children.

Ecosan toilets

Ecosan means ecosystem sanitation conveniences.

Problems faced by urban toilets;

- ✓ Blockage due to use of hard things.
- ✓ Lack of water for flushing
- ✓ In case of leakage of sewage from pipes, contamination of water occurs this may lead to easy spread of water borne diseases.

Importance of using toilets and latrines;

- ✓ They prevent houseflies from spreading germs
- ✓ They prevent contamination of water sources if properly used.
- ✓ They promote sanitation
- ✓ They control air pollution.

Diseases spread due to poor sanitation;

- ✓ Cholera
- ✓ Typhoid
- ✓ Dysentery
- ✓ Diarrhoea
- ✓ Hepatitis
- ✓ Malaria
- ✓ Elephantiasis
- ✓ Yellow fever
- ✓ Dengue fever
- ✓ Worm infection
- ✓ Sleeping sickness.

THEME 4: THE HUMAN BODY

TOPIC: THE REPRODUCTIVE SYTEM:

Growth. This is an increase in size of an organism.

Development: Is an increase in maturity.

Puberty: Is a period of time when a boy or a girl becomes sexually mature.

Adolescence: Is a transitional stage between childhood and adulthood.

An adolescent: Is a boy or girl who is between childhood and adulthood.

Stages of adolescence;

There are four stages of adolescence/changes in adolescents. These include;

- ✓ Primary sex characteristics
- ✓ Secondary sex characteristics
- ✓ Social and emotional changes
- ✓ Out of step adolescent changes

1. Primary sex characteristics

- ✓ These are changes involving the sexual organs to prepare them for their function in reproduction.
- ✓ They can also be called basic sex characteristics.

Examples of primary sex characteristics in boys;

- ✓ The penis increases in size.
- ✓ The testes start producing sperms
- ✓ Wet dreams start.

In girls

- ✓ The uterus and the ovaries develop
- ✓ Production of ova begins (Ovulation).
- ✓ Menstruation period begins.

2. Secondary sex characteristics

- ✓ These are changes that are related to physical features that distinguish a grown up man from a mature woman.
- ✓ They can also be called physical sex characteristics.

Examples of secondary sex characteristics in boys (males);

In males, changes are as a result of the production of a hormone called testosterone.

- ✓ The voice breaks and deepens as the larynx enlarges
- ✓ Growth of hair under the armpits on the face, chest and around the sexual organs.
- ✓ The sweat glands become more active.
- ✓ The body becomes more muscular showing masculine structures.
- ✓ Pimples develop on the face

In girls (Females)

- ✓ The ovaries produce two hormones which coordinate the ovaries to control the body reactions. These include;
  - o Oestrogen and progesterone

Characteristics include;

- ✓ Development of the breasts and stimulation of the mammary glands
- ✓ Enlargement of the hips and lining of the uterus
- ✓ The sweat glands become more active
- ✓ There is growth of hair under the arms on the pubes and around the sexual organs
- ✓ Heavier development of the skeleton and muscular structures showing feminine structures
- ✓ The face becomes smooth and good looking
- ✓ The voice becomes soft and attractive.

3. Social and emotional changes.

These are changes that take place in mind and not seen and may not be realized by the adolescent.

N.B: They occur the same way in boys and girls. These changes include;

- ✓ The adolescent becomes interested in the member of the opposite sex.
- ✓ The adolescent reacts quickly to different situations i.e a boy or a girl who was docile, humble and cooperative becomes resistant, irritable and disobedient.
- ✓ The adolescent wants a lot of freedom.
- ✓ The adolescent becomes angry and disappointed quickly.
- ✓ The adolescent rejects the rules of his/her parents
- ✓ The adolescent wants to be looked and be recognized as mature.

- ✓ The adolescents move in groups with boys and girls of the same age and interest.

N.B: This group is` called **peer group**

4. Out of step adolescent changes;

These are changes which occur differently to different people in the same age group.

Some of these changes occur earlier or individuals. They include;

- ✓ The boy who was previously short may find himself taller compared to his age mates
- ✓ A girl who was once considered small may find herself too fat compared to her age mates.
- ✓ Anxiety may be created on those who mature later and left behind by their age mates.

Problems of adolescence;

- ✓ This stage brings conflict between adolescents and their culture and religions
- ✓ Adolescents are never satisfied with their demands
- ✓ This stage also brings conflicts among adolescents.
- ✓ This stage leads to development of antisocial behaviours such as sex offences.
- ✓ Some adolescents can end up being imprisoned
- ✓ Some adolescent girls may drop out of school due to early pregnancies.

Reproduction in humans;

Reproduction: Is a process where living things increase in number.

Or:

Reproduction: Is the process by which living things multiply themselves to produce young ones of their own kind.

Or:

Reproduction: Is the process by which living organisms produce young ones similar to them.

Forms of reproduction;

- ✓ Sexual reproduction

- ✓ Asexual reproduction.

Asexual reproduction;

This is a type/form of reproduction where reproductive cells are not involved.

Examples include:

- ✓ Binary fission in bacteria and protozoa
- ✓ Spore formation in fungi
- ✓ Budding in yeast and coelenterates
- ✓ Vegetative propagation
- ✓ Seed propagation

Sexual reproduction

This is a type/form of reproduction where reproductive cells are involved.

Terms used in sexual reproduction

Gametes; These are reproductive cells.

Sperm cells: These are male reproductive cells in animals.

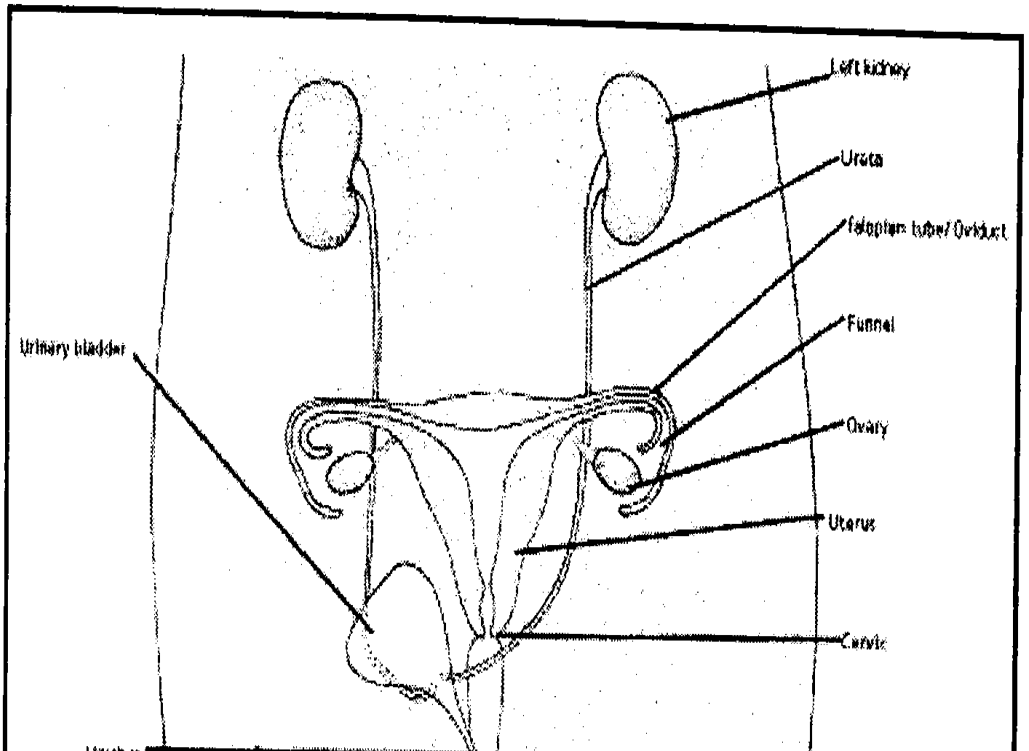
Ova/eggs; Female reproductive cells in animals.

Pollen grains: They are male reproductive cells in flowering plants.

Ovules: They are female reproductive cells in flowering plants.

Gonads: These are specialized parts which produce reproductive cells.

Diagram of the female reproductive organ;



Functions of the parts;

Vulva: It directs the penis into the vagina.

Vagina: This is where the sperm cells are deposited. It also allows the baby to pass through at the time of birth (Birth canal)

Cervix: It is a ring of muscular which closes the lower end of the uterus during pregnancy

Uterus/womb: It is a point where conception takes place. It is also the part where foetus develops from.

Uterus wall; It is where implantation takes place.

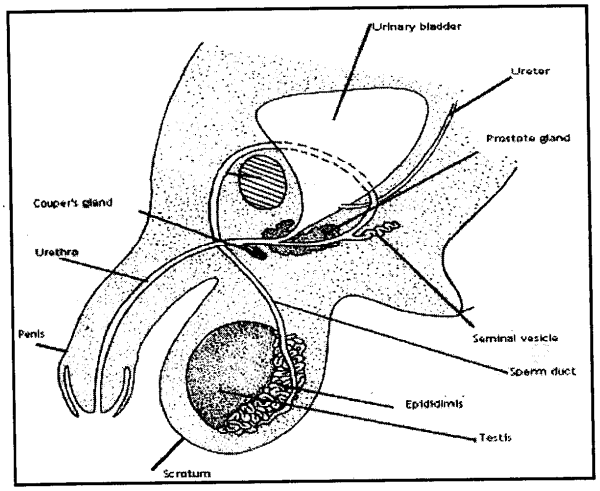
Oviduct/fallopian tube: this is the part where fertilization takes place

Ovaries:

Ovaries produces ova/eggs

Ovaries produce several hormones called oestrogen and progesterone which control the development of secondary sex characteristics

Diagram showing the male reproductive organs; (Cross section)



Functions of the different parts;

Scrotum;

- ✓ It protects the testis from harm
- ✓ It regulates the temperature around the testes.

Testes;

- ✓ Testes produce sperms
- ✓ Testes also produce a hormone called testosterone which determine the secondary sex characteristics.

Epididymis;

- ✓ It stores sperm cells.

Penis

- ✓ The penis is used to deposit sperms into the vagina.

N.B: Most sensitive part of the penis is the glans found at the tip of the penis.

Fore skin

- ✓ It covers the head of the penis (glans]
- ✓ It can be cut off or circumcised for hygiene reasons.

Urethra:

- ✓ This is the passage for both urine and sperm cells.

Sperm duct;

- ✓ This is a tube which passes the sperms to the urethra.

Prostate gland[cowpers gland].

- ✓ These produce the seminal fluid called semen which assists the sperm in movement.

Ovulation

- ✓ This is a process by which the ovary releases a mature ovum into the oviduct.

N.B:

- ✓ Ovulation takes place every after 12 – 14 days from the day of menstruation.
- ✓ The time when ovulation stops is called menopause, probably at the age of about 45 years.

Menstruation/menstrual cycle

- ✓ Menstruation is the monthly shedding of blood by the uterus wall when fertilization fails to take place.
- ✓ This happens because a hormone called oestrogen is released by the ovary which causes the uterus wall to thicken with layers of cells into which the ovum will sink if fertilized.
- ✓ If the ovum is not fertilized the uterus wall breaks, the unwanted cellcsontain certain amount of blood are lost through the cervix and vagina.

N.B:

- ✓ Menstruation occurs once every four weeks or 28 days and usually lasts for 3 – 5 days in normal cases.

Fertilization;

This is the fussion or union of the nuclei of the male and female gametes to form a zygote from which an individual develops.

Types of fertilization;

- ✓ External fertilization
- ✓ Internal fertilization

External fertilization;

This is the type of fertilization which involves fussion of gametes but outside the body of females

Examples of animals which have this type of fertilization include;

- ✓ Frogs
- ✓ Fish
- ✓ Toads

Internal fertilization;

This is the type of fertilization which takes place inside the body of the female.

Examples of animals which undergo internal fertilization include;

- ✓ Birds
- ✓ Reptiles
- ✓ Mammals

Implantation

- ✓ This is the process where a fertilized ovum attaches itself onto the uterus wall.

- ✓ After implantation, we say conception has taken place and that confirms pregnancy

Pregnancy/gestation period;

This is the period from fertilization to birth.

In man, it lasts for 9 months.

N.B: Implantation takes place in the uterus while conception takes place in the uterus.

Signs of pregnancy (Dangers)

- ✓ Monthly menstrual periods stops.
- ✓ Breasts enlarge
- ✓ Morning sickness especially in the 2nd and 3rd month of pregnancy.
- ✓ Enlargement of the belly.
- ✓ Cervix closes
- ✓ Movement of the baby can be felt
- ✓ Vomiting a lot and often.
- ✓ Bleeding or coloured discharge from the vagina.
- ✓ Prolonged anaemia
- ✓ Severe swelling of the legs, face and hands.

Problems of frequent pregnancy or birth

- ✓ Premature births
- ✓ Maternal anaemia
- ✓ Miscarriage
- ✓ Local birth weight
- ✓ Proneness to diseases
- ✓ High maternal mortality rate

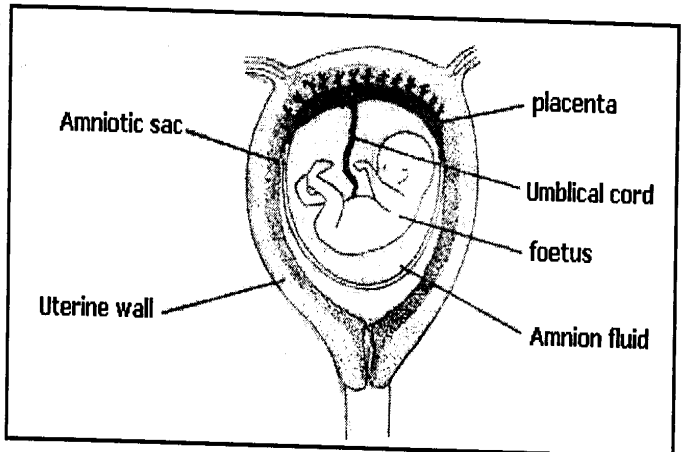
Development of the foetus in the uterus;

Stages in pregnancy

- ✓ The fertilized ovum develops villi into the uterus.
- ✓ The part with the villi develops into a specialized organ called a placenta.
- ✓ The uterus wall under the influence of oestrogen and progesterone develop rich supply of blood vessels to facilitate exchange of materials between the mothers and foetus's blood.

- ✓ Developed oxygen, glucose, amino acids and salts from the mothers blood pass to the embryo while carbon-dioxide and other nitrogenous wastes pass in the opposite direction through the umbilical cord.
- ✓ A water sack called damage amnion which cushions it from damage surrounds the embryo.

Diagram showing the human foetus in the uterus.



Functions of different parts;

Umbilical cord: Contains an artery and a vein through which materials are conducted to and from the foetus.

Amnion: It holds the amniotic fluid.

Amniotic fluid: It protects the foetus from damage or external harm.

Placenta: Stores digested food and oxygenated blood used by the foetus.

- ✓ It does not allow toxic substances to reach the foetus
- ✓ It is where waste materials from the foetus are first stored before they diffuse in the mother's womb.

Cervix: It helps to separate the uterus from the vagina and closes the uterus during pregnancy.

Requirements needed by females during pregnancy;

- ✓ Ante-natal care
- ✓ Good nutrition (balanced diet)
- ✓ Regular physical exercises
- ✓ Adequate sleep and rest. However, oversleeping is not good.
- ✓ She should observe proper personal hygiene.

- ✓ She needs appropriate clothing like maternity dresses, brassiers.

N.B: Ante – natal care is sub – divided into three stages. Namely;

- ✓ Pre – natal care
- ✓ Ante – natal care
- ✓ Post – natal care

Teenage pregnancy

This is a type of pregnancy in a young woman who has not reached her 20th birth day when the pregnancy ends.

Teenage pregnancy may occur in married women.

Problems associated with teenage pregnancy;

- ✓ Dropping out of school.
- ✓ Parental and family rejection.
- ✓ Complications during pregnancy
- ✓ The cervix is so weak to hold the foetus.
- ✓ Difficulty in delivering.
- ✓ The young mother may not take care of the baby properly.
- ✓ Community discrimination
- ✓ She may fail to get marriage in future they are considered to be secondhand.

Common diseases and disorders of the reproductive system

Sexual transmitted diseases

- ✓ These are diseases transmitted (STDs) through having unprotected sex with an infected person.

Note: Such diseases accumulate in the victim's body as a result of the destruction of the white blood cells by the HIV virus.

Examples of STD's

- ✓ HIV/AIDS
- ✓ Gonorrhoea
- ✓ Syphilis
- ✓ Lymphogranuloma
- ✓ Candidiasis
- ✓ Chancroid
- ✓ Genital herpes
- ✓ Genital warts
- ✓ Trichomoniasis

HIV/AIDS

- ✓ HIV in full is human Immuno Deficiency Virus
- ✓ AIDS in full is Acquired Immune Deficiency Syndrome
- ✓ This is the most infection of all the STDs.
- ✓ It is caused by the HIV virus

Ways through which HIV virus is spread

- ✓ Through playing unprotected sex with an infected person
- ✓ Through mother to child transmission
- ✓ Through blood transfusion with infected blood
- ✓ Through sharing sharp objects with an infected person.

Practices that may lead to HIV infection.

- ✓ Circumcision
- ✓ Skin tattooing
- ✓ Sharing wires in some communities especially in Eastern Uganda.

Signs and symptoms of HIV/AIDS infection

- ✓ Loss of body weight within a short period of time
- ✓ Prolonged fever
- ✓ Itchy skin rash
- ✓ Prolonged dry cough
- ✓ General body weakness
- ✓ Oral thrush (White coating in the mouth)
- ✓ Herpers zoster

Effects of HIV/AIDS infection

- ✓ AIDS lead to death of many people because it has no cure
- ✓ AIDS has led to loss of productive class of people in the community
- ✓ AIDS has caused a lot of worries, misery and hatred especially to the infected and affected ones. (Stigmatization)
- ✓ AIDS infection has caused some working groups to lose jobs and poor performance at work

Prevention of HIV/AIDS

- ✓ Having one life longer partner
- ✓ Avoid sharing skin piercing instruments
- ✓ Blood to be used for transfusions should be tested for HIV.
- ✓ Having an AIDS test with one partner before marriage
- ✓ Correct use of condoms during sexual intercourse

Note: Condoms do not give 100%safety but offer higher chances of safety against STDs

Gonorrhoea:

It is caused by a bacterium called gonococci or neisseria gonorrhoea

Signs and symptoms in males

- ✓ Pain when urinating
- ✓ Smelly discharge of pus from the penis

In females

- ✓ Discharge of pus from the vagina
- ✓ Pain in the lower belly
- ✓ If not treated earlier, in pregnant women germs can easily affect the foetus's eyes hence blind babies.

Prevention and control of gonorrhoea

- ✓ Abstain from sex at early stages (Premature sex)
- ✓ Have regular medical check ups
- ✓ Married couples should avoid extra marital sex
- ✓ Get early treatment in case of discovered signs.

Syphilis

Syphilis is caused by a germ called spirocharete treponema pallidum

Syphilis develops in the body into three stages. Namely;

- ✓ Primary stage
- ✓ Secondary stage
- ✓ Tertiary stage

Primary stage

This stage occurs after 2 – 5 days after sexual intercourse.

Signs and symptoms

- ✓ Painless sores around the sexual organs
- ✓ In case they are not treated, they spread to the heart and brain.

Secondary stage

This shows up after 5 weeks and beyond.

Signs and symptoms

- ✓ Painful rushers all over the body
- ✓ Shores in the throat
- ✓ Swollen joints and pain in the bones
- ✓ The body becomes anaemic

- ✓ Mild fever.

Tertiary stage

This happens between 5 – 20 years of the infection and difficult to heal.

Signs and symptoms

- ✓ Big painful sores all over the body
- ✓ Severe abdominal pain
- ✓ Development of heart, brain and liver disorders
- ✓ The victim may even become mad or insane
- ✓ A lot of damage is done on the body system at this stage.

Note: if a pregnant woman has untreated syphilis, she can easily pass it to the un born baby.
This type of syphilis is called congenital syphilis

Prevention of syphilis infection

- ✓ Get early treatment with antibiotics
- ✓ Go for regular medical check ups
- ✓ Abstain, use condoms for un trusted partners or be faithful to our sexual partners. (ABC)

Care for the reproductive organs

- ✓ Always maintain personal hygiene i.e regular cleaning of the sexual organs
- ✓ Avoid wearing dirty and wet clothing's especially around the sexual organs
- ✓ Abstain from sex to avoid contraction of the STDs
- ✓ Avoid sharing sharp skin piercing objects that may transmit STDs
- ✓ Married people should avoid extra marital sex to prevent the transmission of STDs
- ✓ Couples should go for HIV test before having sex in order not to get HIV/AIDS
- ✓ Practise ABC measures.

Note: **A** - Abstain
B - Be faithful to your partner
C - Condom usage

Family planning and child spacing

Family planning is the use of birth control methods to plan when to have a child or not in a family.

Child spacing is the provision of adequate space between the births of a family's children

Importance of child spacing

- ✓ It promotes healthy growth of the children
- ✓ It promotes relaxation of the mothers body

Methods of family planning

Family planning methods are practices that help to prevent conception among women.

Categories of family planning methods

1. Artificial methods

These are methods that involve the use of man made devices to control or prevent conception.

Examples

- ✓ Use of a condom
- ✓ Use of a diaphragm, use of intra – uterine devices
- ✓ Use of foams and jellies (Spermicides)
- ✓ Use of birth control pills and injections.

Note: All the above are said to be temporary birth control methods.

Permanent methods

Tuballigation: This is a surgical method which involves cutting of the oviducts and tying them through a surgical operation

Vasectomy: This is a method which involves cutting of the spermducts and tying them through a surgical operation.

Advantages of using artificial methods of family planning:

- ✓ They are effective and well conducted
- ✓ They are convenient and time saving
- ✓ They are helpful in the control of some STDs such as use of a condom
- ✓ HIV infected mothers can easily live longer without child bearing.

Disadvantages

- ✓ Some, if not practiced well may destroy the ovaries and cause barrenness
- ✓ Some result into complete serility in one`s life time
- ✓ They are expensive to many families.

2. Natural methods

- ✓ Abstaining from sex (Good for school going children)
- ✓ Withdrawal/coitus interruption methol gametes with the female gametes

- ✓ Use of a calendar and rhythms. This involves studying ones menstrual cycle and having sex only when ovulation is likely not to take place.
- ✓ Prolonged breast feeding. This helps to delay the ovulation but it varies in women.

Advantages

- ✓ They are easy, cheap and convenient.
- ✓ They do not have complications.

Disadvantages

- ✓ They are not effective as the artificial methods.
- ✓ They require complete cooperation for both husband and wife.
- ✓ They require great amount of teaching and supervision.

Importance of family planning.

- ✓ It enables the mother to regain her health in preparation for the next pregnancy.
- ✓ It enables parents to have a manageable number of children in a family.
- ✓ It enables children to have enough basic needs.
- ✓ It checks on the population of a country.
- ✓ It helps in the control of unwanted pregnancies.

Reasons why some parents produce many children

- ✓ Ignorance about family planning methods.
- ✓ High infant mortality rate.
- ✓ Desire for a particular sex of a child.
- ✓ Cultural benefits and the need to show that one is sexually strong.

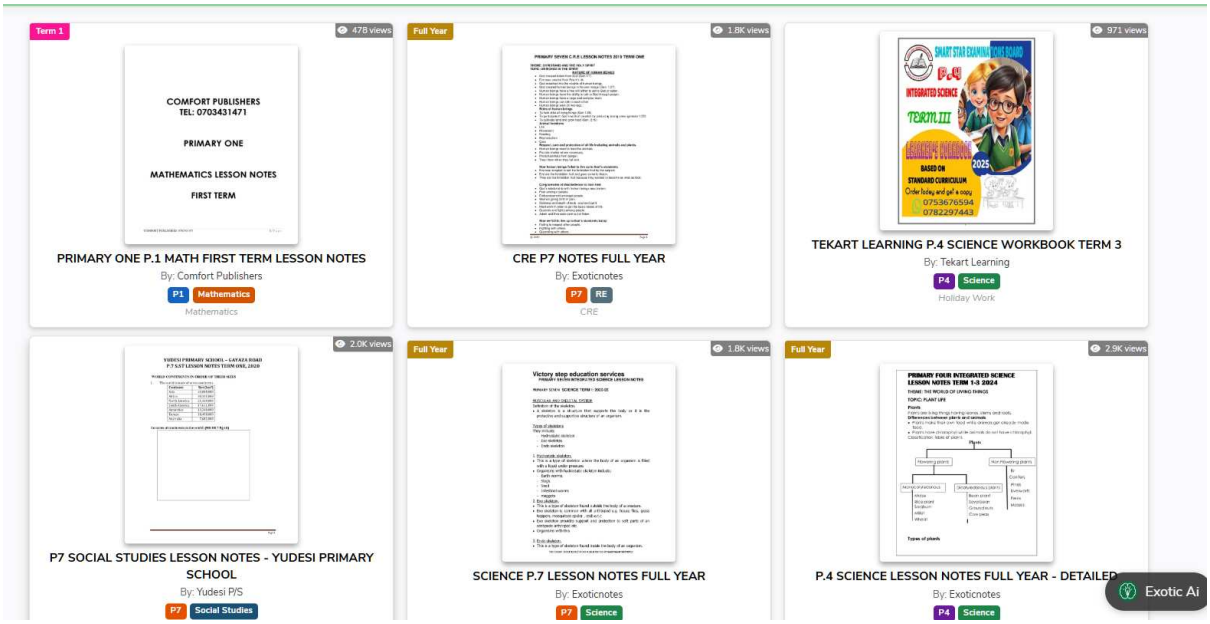
Myths and misconceptions about family planning

- ✓ People think family planning methods lead to barrenness.

PIASCY MESSAGES

- ✓ AIDS has no cure.
- ✓ Abstain from sex
- ✓ Pre-marital sex is bad
- ✓ Boys and girls should see each other as friends but not sexual partners.
- ✓ Follow your religion to stay healthy.
- ✓ Stay in school until marriage.

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