# PRIMARY SIX BASIC SCIENCE AND HEALTH EDUCATION
# LESSON NOTES
# TERM 1-3

**THEME: THE WORLD OF LIVING THINGS**
**TOPIC: CLASSIFICATION OF LIVING THINGS**

**CONTENT**
**Characteristics of living things**

**THEY FEED**

- Various living things feed in different ways ie

| Organism | Mode of feeding | Types of nutrition |
|---|---|---|
| Fungi like yeast , moulds, mushrooms , puffballs etc | Saprophytically | Saprophytic nutrition |
| Parasites like tape worms, hook worms, ticks , lice , mites etc | Parasitically | Parasitic nutrition |
| Plants | Autotrophically | Autotrophic nutrition |

| | | |
|---|---|---|
| | They make their own food by the help of sunlight | |
| Animals | Hetetrophically<br>- Some Heterotrophicallyanimals feed directly on already made food by plants ie herbivores , omnivones , carnivores | Heterotrophic nutrition |

**DIFFERENCES IN FEEDING BETWEEN PLANTS AND ANIMALS**

| Plants | Animals |
|---|---|
| They make their own food by the help of sunlight ( Autotrophically ) | The feed on already made food by plants (Heterotrophically ) |

**THEY GROW.**

- What is growth?
- It refers to increase in height and size of an organism.

**DIFFERENCES IN GROWTH BETWEEN ANIMALS AND PLANTS**

| Animals | Plants |
|---|---|
| Growth occurs equally on all parts of the body | Growth occurs only at the tips of roots and shoots |

- Reproduction is the process by which living organisms multiply or increase in numbers as they give birth to youngones (offspring)

**MOVE**

Mainly living organisms like animals move (locomote) to different places for some reasons.
Reason why animals move from one place to another

- To look for food (pasture) and water.
- To look for shelter
- To run away from their enemies (protection)
- To look for mates (for mating)

- Looking for their young ones.

**THEY EXCRETE**

Excretion is the removal of waste products from the body.

**WHY DO LIVINGTHINGS EXCRETE?**

To get rid of waste products from their bodies.

**THEY RESPIRE**

Respiration is the process by which the body uses food and oxygen to release energy, carbondioxide and water vapour
How do organisms benefit from respiration?
They get energy

**TYPES OF RESPIRATION**

i) Aerobic respiration
is the type of respiration which involves use of oxygen
ii) Anaerobic respiration
is the types of respiration which doesn't involve use of oxygen

THEY RESPOND TO STIMULI

Animals and plant respond differently to circumstances in the environment for survival , examples of stimuli touch , heat, light , pain , gravity , water etc

Living things are divided into five kingdoms namely;

- Animal Kingdom
- Plant Kingdom
- Prokaryotal (Bacteria Kingdom)
- Protoctista ( single celled organisms)
- Fungi Kingdom

**Animal Kingdom**

**CLASSIFICATION OF ANIMALS**

why to classify animals?

Animals are classified for easy identification

For easy study.

Characteristics used for classifying animals

- External features such as colour , size , shape number of legs , hair on the body etc
- Their different modes of reproduction , respiration and movement

Animals are classified into two groups

- Vertebrates
- Invertebrates

Vertebrates

Vertebrates are animals with a back bone /vertebral column (spine)

- The back bone protects the spinal cord.
- All verterbrates have an endo skeleton

**Groups of vertebrates**

Vertebrates are classified into five groups;

- Mammals
- Birds
- Reptiles
- Fish
- Amphibians

Vertebrates are also grouped basing on the body temperature;

i. Warm blooded (homoeothermic)

ii. Cold blooded (poikilothermic)

Warm blooded
- i) Mammals
- ii) Birds

Cold blooded
- i) Fish
- ii) Reptiles
- iii) Amphibians

**MAMMALS**

Mammals are vertebrates which have mammary glands and suckle young ones on breast milk

**Characteristics of mammals**

- Mammals are warm blooded
- Most of them fur on their bodies
- Most of them give birth to living young ones.
- They feed their young ones on breast milk
- They breathe through the lungs.
- Their hearts are divided into four chambers

**Groups of mammals**

- Primates (most advanced /fingered mammals)
- Ungulates (hoofed mammals)
- Carnivorous mammals(flesh eaters)

- Rodents (gnawing mammals)
- Insectivorous(insect eaters)
- Pouched mammals (marsupials)
- Flying mammals (chiroptera)
- Egg laying mammals (monotremes)
- Sea mammals (cetaceans)

Primates (fingered mammals)
These are the most advanced group of mammals.

**Characteristics**

- They have well developed brain
- They use front limbs for holding and hind limbs for walking.
- They have five fingers on each hand and five toes on each foot.
- They are omnivorous i.e. they feed on both flesh and vegetables.
- They have well developed set of all the four types of teeth i.e. incisors, canines, premolars and molars (32 teeth)

**Examples of primates**

Man, monkeys, gorillas, baboon, bush baby, chimpanzee, etc.
The term to describe gorillas, baboons, bush babies, chimpanzees is apes

**Ungulates (hoofed mammals)**

All mammals in this group are herbivorous i.e. they feed on vegetation.
Ungulates are divided into two sub-groups

i) Even toed ungulates
ii) Odd toed ungulates

**Even toed ungulates**

They include; Okapi, deer, pigs, cattle, giraffe, sheep, antelopes, hippopotamus
Even toed ungulates are further subdivided into two;

i) Ruminants
ii) Non ruminants

**Ruminants**

These are ungulates with four stomachs and chew cuds. Most of them have horns which they use for protection.

Examples

- Cattle
- Goats
- Sheep
- Camel

Antelope etc

**Non ruminants**

- These are ungulates which do not chew cud but have a complete dentition.
- They have well developed canines which they use for protection

Examples include;
Pigs, hippopotamus, warthog.

**Odd toed ungulates**

The number of toes is always one or three toes e.g. one in horse, donkey, Zebra and three in elephant and Rhino.

**Carnivorous mammals**

Characteristics of carnivorous animals

- They are strong mammals
- They have well developed canine teeth for tearing flesh of their prey.
- They have sharp claws for holding, killing and tearing their prey.
- They have a very good speed, good sense of smell, keen eye sight and good hearing, so they even hunt at night
- Their feet have soft pads therefore they can run after their prey without making noise.

**Carnivorous mammals are divided into two families;**

a) Dog family – Face resembles that of a dog
b) Cat family – face resembles that of a cat.

Examples of the dog family include; Domestic dog, hyena, jackal, fox etc
Examples of the cat family include; lion, leopard, tiger, cheetah, mangoose, domestic cat.
Some carnivorous are scavengers e.g. hyena, jackal.

**Gnawing mammals (Rodents)**

- These are mammals which have well developed incisors used for biting and chewing powerfully and rapidly.
- They don't have canines.
- Most rodents are herbivores (vegetarians)

Examples include; Rats, squirrels, mice, rabbits, hares, porcupines, guinea pigs and moles.

**Insect eating mammals (insectivores)**

- These are mammals which feed on insects.
- They have a sensitive snout for smelling and strong claws for digging.
- They are nocturnal i.e. they move and hunt at night and sleep during day.
- Examples include; Hedgehog, elephant shrew, Aardvark, ant bear e.t.c
- A hedgehog is an animal with spines on its body. When threatened, it rolls itself up into a ball.

**Flying mammals (chiroptera)**

Bats are the only true flying mammals.
They have a fold skin attached to the fore limb which act as wings.
There are three main types of bats;

a) Insect eating bats: These are helpful to man because they eat many harmful insects like mosquitoes.
b) Fruit eating bats: - These are dangerous because they eat our fruits.

c) Blood sucking bats (vampires) they suck blood from large animals like horses, cows, buffaloes etc. bats are nocturnal i.e. they move and hunt at night and sleep during day. They can find their food at night in complete darkness by using echoes from the sound they produce.

**Pouched mammals (marsupials)**
Examples of these include; Kangaroo, Koala bear and Wallabies
Marsupials are found in Australia and south America.

**Egg laying mammals (monotremes)**
- These are the most primitive in the class of mammals because;
- They resemble birds and reptiles in that they lay eggs and also have beaks similar to those of birds.
- They have characteristics of birds, mammals and reptiles.
- Monotremes are regarded as mammals because they feed their young ones on milk from the mammary glands and for the care they give to their young ones after hatching.
- Examples include; the duck billed platypus and the spiny ant eater (echina) of Australia

**Sea mammals (cetaceans)**
- These are mammals which live in the sea.
- They don't have gills but they breathe by means of lungs
- They have a layer of fats under the skin called blubber to keep them warm.
- They have a high level of intelligence next to primates
- They have mammary glands
- They give birth to living young ones and suckle them on milk from the mammary glands.
- Most sea mammals have fur.

Examples include; Blue whale, Sperm whale, porpoises seals, dolphins e.t.c

**BIRDS**
Characteristics of birds
- Their bodies are streamlined i.e. pointed at the front and back.
- Their bodies are covered with feathers which they moult every year.

- Their bones are hollow i.e. do not have bone marrow.
- They have scales on their legs
- They are warm blooded
- They breathe by means of lungs
- Their front limbs are modified as wings
- They have no teeth but have horny beaks.
- Their eyes have three lids the lower, upper and nictating membrane.
- They lay shelled eggs which are fertilized internally
- They care for their young ones.
- Many of them can fly.

External features of a bird
Features, alimentary canal of a bird, reproduction in bird
Refers to P.5 (term work)

- Feeding habits in birds
- Birds have no teeth
- They have a horny beak
- The shape of the beak varies with the type of the food eaten.

**Classification of birds**

- Birds have a number of special adaptation features.
- They are grouped according to the type a beak and feet (claws) they have.
- Some birds are grouped according to the type of food they eat.

**Some of the groups are;**

- Birds of prey

- Perching birds
- Scratching birds
- Swimming birds
- Wading birds
- Flightless (walking) birds
- Climbing birds
- Scavenger birds

**1. Birds of prey**

- They are carnivorous birds that hunt and kill their prey. e.g. rats, fish, mice, lizard, chicken e.t.c
- They have strong eye sight to spot their prey even when they are flying
- They have strong sharp, hooked beaks for tearing the prey.
- They have strong sharp curved talons (claws) for gripping and killing the prey.

Examples include; Hawks, eagles, secretary birds, owls, kites, falcons , king fisher etc

Structure of the beak and claws

**Perching birds**

These are birds which have three toes pointed forward and one toe pointed backward. The nature of the toes they have are suitable for perching on tree branches

**Types of perching birds**

i) Seed eaters

These have short strong conical beaks suitable for breaking up seeds e.g. pigeon, doves, weaver birds finches etc

Structure of the beak and foot

ii) Insect eaters

They have stout narrow beaks for picking up the insects from the bark of trees.
Examples include; Sparrows, robbins, swallows, and swift, bee eaters etc.
Swallows and swifts have short and wide open beaks which help them to catch insects even when flying.

iii) Honey sucker/nectar eater

Those have thin long beaks which are slightly curved.
Example, The sun bird.

Structure of the beak

**Fruit eater**

Those have a long stout beak for collecting fruits
Example, Horn bill
Structure of the beak

**Scratching birds**

- These birds feed on seeds and insects which they find by scratching the earth.
- They have short, strong, firm pointed beaks for picking up things from the ground.
- They have strong feet with thick toes and blunt nails.
- They can walk easily
- Their body is heavy and wings are weak.

Examples include; domestic fowls i.e. chicken, turkey, guinea fowl.

Structure of the beak and foot

**Swimming birds**

- They have webbed feet which act like paddles
- They have broad breast bone.
- Their skin has many oil glands which produce oil to protect their body against water.
- They have beaks with small cross plates on the margins which help them to sieve food from the mud.
- Examples include; Ducks, swans, geese, penguins, seagulls, pelicans

Structure of the food and beak

**Flightless birds**

- These are birds which are unable to fly but can run very fast.
- They have weak and small wings compared to the body size.
- An ostrich is the largest and fastest flightless bird. It runs faster than a horse

Examples include; Kiwi, penguins, ostriches, emu, rhea, and cassowary.

**Climbing birds**

- They have two toes pointed forward and other two backwards.
- This arrangement helps them in climbing to look for seeds and insects.
- They live in trees and run about on branches of trees.
- Examples include; A parrot, a wood pecker.

The structure of the beak and foot

**Scavenger birds**

- These birds feed on rotten flesh killed by other animals, rotten meat and fish.
- They usually have beaks similar to those of birds prey.
- They are useful because they clear most of the dead decaying matter which may other wise be a source of many diseases.

Examples include; vulture, crow, and marabou stork etc

**The ways in which birds are adapted for flying**

- They are streamlined to reduce friction so that they can move through air easily.

- They have hollow bones which reduce weight and their back bones are fused (joined) to give them rigidity.
- They have strong attachment of their powerful and strong front muscles which are used for moving wings
- Their fore limbs are modified into wings
- They have no pinna to abstract the flow of air.
- They have good eye sight to see well from long distances and judge the distance accurately
- They have a nictitating membrane which cover the eye and protect them against moving air during flight.
- Their bodies are covered with flight feathers.
- They have a quick digestive system

NB: some domestic fowls are unable to fly high because they have a lot of bone marrow which make them heavy.

**Advantages of birds**

- They are sources of food
- The feathers are used for decorations like hats, suits, hand bags in staffing mattress
- Bones are used for making glue.
- Some birds kept for customary purpose like making sacrifices and paying dowry.
- They are source of income to farmers.
- They attract tourist
- Some birds pollinate flowers like the sunbirds, they pollinate when collecting nectar.
- Some help to clean our environment like the vultures, crows and marabou storks.

**Disadvantages of birds**

- Many birds damage our crops.
- Some birds cause accident to run ways at the airport.
- They make a lot of noise like weaver birds

**REPTILES**

Most reptiles are a viparous animals i.e. they lay eggs

**Characteristics of reptiles**

- The y are cold blooded animals
- They breathe by means of lungs
- Their skin is covered with scales
- Their teeth are similar
- They have a three chambered heart i.e. two a auricles and one ventricle
- They have four limbs with claws apart from a snake
- They have external ears. The tympanic membrane (ear drum) is usually situated below the surface of the body.
- They lay eggs which are fertilized internally. The shells of eggs are either leathery or quite hard made of calcium carbonate.
- They usually don't look after their young ones.

Classification of reptiles

Reptiles are divided into the following groups

i) Snakes
ii) Lizards
iii) Turtles, tortoises, and terrapins
iv) Crocodiles and Aligators

**Snakes**

- They have no limbs
- They are carnivorous animals
- Their eyes are without eye lids but each eye is protected by a immovable transparent membrane
- They have a forked tongue which acts as a sense organ for smell and taste.
- They have a large number of ribs and vertebrates.
- They shed (moult) their skin after a certain period.
- Their backward pointed teeth prevent the prey from escaping from the mouth.
- Some snake have poison fangs which have a deep canal through which poison passes.
- The ribs and large scales on the underside of their body also help them to move.
- They hide or move away when disturbed.

**Classification of snake**

Snakes are grouped into three main groups namely;

- Poisonous snakes
- Constrictors
- Non-poisonous snakes

**Poisonous snakes**

They have two long teeth called fangs near the front of the mouth to inject venom.
Example of poisonous snakes the Cobra (which bite /spit poison)

- Mamba (black /green)
- Puff udder /night udder
- Viper

**Non poisonous snakes**

- These do not have fangs and the snake venom poison.
- They have solid uniform teeth.

**Constrictors**

These type of snakes kill their prey by crushing and suffocating them using muscles.
Constrictors lick their prey to make their smooth and slippery.

**Examples of constrictors**

- The Python
- Anaconda
- Boa constrictor

First aid for the snake bite

- Apply black stone on the injured part to suck the poison after making cuts
- Stay quiet and rest the bitten part so that the venom does not spread.
- Tie a bandage /tourniquet between the heart and the bitten part to limit the flow of poisoned blood to the heart.
- Cut between the fang marks and suck out the venom if you do not have wounds in the mouth.
- Take the victim to the nearest health unit to receive anti venom injection.

How to tell that a person has been bitten by poisonous snake.
It leaves two fang marks on the bitten area through which some blood oozes out.

**LIZARDS**
They have four limbs and tail which can grow when its cut.
Examples of lizards
- Sinks
- Geckos
- Chameleons
- Agama lizards
- Monitor lizards
- Iguana lizards

Chameleons are slow moving reptiles which protect themselves by changing colour. (camouflaging)
They use their long sticky tongues to capture their prey.
They hatch their eggs inside the body and lay young ones

**Tortoises, turtles, terrapins**
- These are reptiles that have hard shells on their backs
- Turtles and terrapins have their feet modified into flippers for swimming in water.
- Tortoises move by walking using their strong legs.
- They all lay their eggs in sand on the bank of water.

Diagram showing tortoise and a turtle
NB: tortoise have raised shells while turtles have flat shells,

**Crocodiles and alligators**

- They are the largest of reptiles
- They live in water and come out to sleep in the sand of the river banks.
- They have strong tails for swimming and attacking their enemies /prey
- They have rows of teeth in their long jaws for gripping their prey
- They produce by laying eggs which are buried under sand at the bank of lakes or rivers.

Diagram

**Importance of reptiles to man**

- They have good skins which is for making drums, belts, and shoes.
- Their skins can be sold as trophies to get income/money.
- They are sources of food to man.
- Some reptiles like geckos and lizards help to eat insect vectors like mosquitoes in the houses.
- They are used for study and research
- Some like crocodiles act as tourist attraction.

**FISH**

Fish belongs to the group of vertebrates called pisces

Characteristics of fish

- They live in water
- They breathe through gills
- They lay eggs which hatch into fires
- Their eggs are fertilized by the male from out side the female's body. In water (external fertilization)
- Most have scales on their body except cattle fish.
- They have fins for swimming and protection
- They are cold blooded vertebrates
- They feed on plants and animals in water.

The structure of the fish

**Functions of parts of a fish**

Types of fish

There are three types of fish

- Bonny fish
- Cartilaginous fish
- Lung fish

**Bonny fish**

Examples of bonny fish are; Nile perch, Tilapia, herrings, trout, salmons.

- They have no eye lids.
- They have swim bladder which helps to keep them buoyant in water.
- Their gills are protected by gill cover or operculum
- Their bodies are covered by overlapping scales.

**Cartilaginous fish**

- Their skin is tough and shinny
- They have gills slits instead of gill cover.
- They have mostly cartilage instead of bones in their skeletons
- They do not have swim bladder.

Examples of cartilaginous fish

- Dog fish
- Skates
- Rays

**Lung fish**

- They breathe through gills in water and by swim bladder when gills cannot supply enough oxygen.
- They live in dirty pools, swamps or rivers.

- They have long and thin pelvic and pectoral fins.
- They hibernate in dry seasons.

**Examples of lung fish**

The common lung fish/mamba

- Epiceratodus
- Diponi

**Breathing in fish**

- Fish breathe in dissolved oxygen in water.
- Water containing oxygen moves through the mouth and passes out over the gills which absorb the oxygen in the water.
- Gill rackers trap solid particles or dirt to prevent damage to the gills.
- The gill bars are spread out the gills to prevent interlocking.
- Gill filaments are many in order to give large surface area to absorb a lot of oxygen dissolved in water for respiration.

Diagram

**How is fish adapted to living in water?**

- Its streamlined body helps it to move easily in water
- Fins help it to move in water and stop it from rolling.
- They have gills for breathing in water.
- They have lateral line to detect sound waves (hearing) or danger.
- Their scales and colour provide protection.
- Its slippery scale protects it from predators and helps in reducing viscosity (friction in water)
- Some have electric organs which give out high voltage of electric shock to its enemy.
- Some fish inject poison into their enemies.

**Uses of fish to man**

- They are kept as pets in aquarium for decoration
- Their bones are used to make glue

- They are sources of employment e.g. fish mongers.
- They can be used for research and learning.
- Some are used as medicine e.g. silver fish.

**AMPHIBIANS**

These are cold blooded vertebrates that can live both in water and on land

**Characteristics of amphibians**

- They are cold blooded vertebrates
- They reproduce by laying eggs
- They under go external fertilization i.e. the male sheds sperms on the eggs outside the female's body as they are being laid in water.
- They have no external ear lobes.
- Their eggs are usually laid in egg spawns.
- They have scaleless skin
- Their heart is three chambered.

Examples of amphibians

Frogs, toads, Newts, salamander, axolotis, efts e.t.c

**Differences between a frog and a toad**

- Frogs mostly live in water while toads mostly live on land.
- Frogs have smooth slippery skins while toads have warty rough skins.
- Toads lay eggs in long ribbon spawns while toads lay eggs in mass spawns.
- Frogs have fully webbed hind feet while toads have partly webbed feet.
- Frogs can breathe through their lungs and moist skin while toads breathe through their lungs.
- Tadpoles of frogs are brown while of toads are black.

**Feeding in frogs**

- They feed on small insects and worms

- They use their long sticky tongues to trap their prey.

**Reproduction in amphibians**

- The male and female mate.
- The female lays eggs and the male sheds sperms over them to fertilize them (external fertilization).
- The eggs develop and after about two weeks hatch into tadpoles.
- The tadpoles undergo several changes to fully develop into an adult.
- This takes about three months.

Diagram to show life cycle of an amphibian

**INVERTEBRATES**

These are animals with out a backbone.
They are multicellular animals.

**Classes of invertebrates**

- Coelenterates
- Echinoderms
- Sponges
- Worms
- Molluscs
- Arthropods

a) Coelenterates

- They have cylindrical bodies with only one opening which acts as the mouth and the anus.
- They have stinging cells on the tentacles surrounding the openings.
- They live in water.

Examples of coelenterates

- Corals
- Jelly fish
- Hydra
- Sea anemone.

**b) Echinoderms**

The have spiny skins and tube feet.
They pump liquid into their feet to make them expand.

Examples of Echinoderms

- Star fish
- Sea urchins
- Sea lilies
- Sea cucumbers

**c) Sponges**

- Sponges are a collection of individual cells organized into one body on the sea floor.
- They cannot move about but remain stuck on the sea floor.
- They suck in sea water and filter out tiny pieces of food.
- They breathe and feed through the holes in their bodies.

**d) Molluscs**

- These are invertebrates with soft and un segmented bodies covered by a protective shell or mantle.
- They live on land and in fresh water or salty water.
- Some mollusks do not have shells like octopus
- Molluses reproduce by laying eggs.

Examples of mollusks

- Octopus and squids (the largest and most intelligent) .They move by jet propulsion

- Snails and Slugs
- Oysters
- Cuttle fish
- Clams
- Mussel

Snails live on land and in water
They feed on plants, while others are carnivorous
Slugs are similar to snails but do not have shells.

Diagram showing snails and slugs

**E) WORMS**

- These are thin, long and soft bodied invertebrates.
- Some live in soil or water while others are parasites living inside other animals
- They breathe through their moist skins
- They lay eggs.

**Groups /types of worms**

- They are divided into three groups namely;
- Segmented worms (annelids)
- Round worms (nematodes)
- Flat worms (platy helminthes)

**a) Segmented worms**

These are worms whose bodies are divided into rings or segments.

They mostly live in soil and water.
Examples

- Leeches
- Bristle worms
- Earth worms
- They live in soil and eat soil or decayed vegetation.
- They are hermaphrodite i.e. has both male and female reproductive organs
- They help to aerate the soil by making tunnels which also help to improve soil drainage.
- They help in the formation of humus in the soil.

Diagram showing common segmented worms

**b) Flat worms**

They have flattened and segmented bodies.
Many of them are parasites of man and other animals.
Examples of flat worms

- Tape worms
- Pond flat worms
- Liver flukes

Tape worms feed on digested food in the small intestines
Liver flukes suck blood from animals.
Diagram showing common flat worms

**c) Round worms**

- These are groups of worms with cylindrical bodies.
- Some are parasites in man and other animals and plants while others live in water.
- They are pointed on both ends.

**Common examples of round worms**

- Hook worms
- Eel worms
- Pin worms
- Thread worms
- Ascaris

- Hook worms enter our bodies by penetrating through the skin of bare feet.
- They feed on blood.
- Bathing or drinking contaminated water.

**F) ANTHROPODS**

These are invertebrates with segmented bodies and jointed legs.

**Characteristics of arthropods**

- They have jointed legs
- They have hard external skeleton called exo-skeleton (cuticle)
- They can shed their cuticles through the process of moulting if growth is to occur.
- They have segmented bodies.

**Groups or classes of arthropods**

- Myriapods
- Arachnids
- Crustaceans
- Insects

**Myriapods**
These are arthropods with many jointed legs.
Their bodies are segmented with each segment having atleast a pair of legs.
There are two groups of myriapods

**1. Centipedes (chilopoda)**

- These have one pair of legs in each segment and a pair of antennae
- The front legs are modified to form poison claws.
- They are carnivorous.

**2. Millipedes (diplopoda)**
These have two pairs of legs in each segment.
They curl or coil to protect themselves or produces bad smell.

Diagram showing common myriapods

**b) Crustaceans**

- These are arthropods which have hard and crust like exo-skeleton.
- They have jointed legs
- Their bodies are divided into two main parts i.e. the cephalo thorax and the abdomen.
- They breathe through gills or their skin.

**Examples crustaceans**

- Crabs
- Cray fish
- Lobsters
- Prawns
- Sand hoppers

**Uses of crustaceans**

- They are eaten as food by man.

- Some are used as baits in fishing industry.

**c) Arachnids**
These are arthropods with two main body parts and four pairs of legs.
The two main body parts are cephalothorax and abdomen
**Examples of arachnids**
**Spiders**
They have special organ at the end of their abdomen called spinnerettes for spinning their webs.
They breathe through **lung books**
They use their webs for movement, building their nets, trapping their prey and finding their way back.
They reproduce by laying eggs.

**ii. Ticks and mites**
They live on the skin of animals
They feed on blood
They spread many diseases in domestic animals e.g. East coast fever, red water, heart water, and typhus fever in humans.
NB: spiders, ticks and mites undergo incomplete metamorphosis
**iii. Scorpions**
They have a large tail with a poisonous sting
Their front legs are modified into pincers
They do not lay eggs but give birth to young ones.

**Insects**
These are arthropods with 3 (three) main body parts or jointed legs.

Characteristics of insects
- They have three main body parts (Head, thorax, abdomen)
- The head contains; compound eyes, mouth parts and feelers.
- The thorax carries three pairs of legs, the wings.
- The abdomen contains the spiracles, ovipositors and stings in some insects

- They have three pairs of jointed legs.
- They have an exo-skeleton called Cuticles
- They have a pair of feelers or antennae
- They have a pair of compound eyes
- They reproduce by laying eggs
- They breathe through spiracles.

Diagram showing parts of an insect

Functions of parts of an insect

i. **Mouth parts**

Proboscis is a tube for sucking food in insects like mosquitoes, house flies, bees, tsetseflies etc.
Mandibles are used for chewing in insects like grasshoppers, locusts, cockroaches, beetles, etc

ii**. Antennae/ feelers**

These are used as sense organ for touch, smell detecting sound (hearing) and detecting changes in temperature, humidity and finding direction.

iii. Wings for flying
iv. Compound eyes for seeing
v. Halteres in housefly for balancing during flight.
vi. Spiracles for breathing

**Life cycle of insects**

**Metamorphosis**
This is a complete change in the life of an insect from an egg into an adult.
There are two types of life cycle in insects
Complete metamorphosis
Incomplete metamorphosis

**Complete metamorphosis**
This is a life cycle of some insects which go through four stages of development namely;
Eggs – Larva – Pupa – Adult

Examples of insects which under go complete metamorphosis
- Houseflies
- Mosquitoes
- Butterflies
- Bees
- Moth
- Wasps

**Life of a housefly**
Adults lay eggs in batches of 100-150 eggs in manure heap, rotting bodies, exposed food or feaces.
Reasons why houseflies lay eggs in manure heaps or rotting bodies
- To provide warmth to eggs so as to hatch into larvae
- A source of food to maggots (larvae) after hatching

The eggs hatch into larva called maggots after a day.

NB: Some flies such as blue bottle fly hatch the eggs from inside the body and lay maggots.
- Maggots feed on decaying matter, grow quickly and turn into pupa after 4-6 days.
- The pupa does not feed but grows from inside the pupa a case called Cocoon.
- The adult crawls out of the pupa after about 4-5 days.

Diagram showing the life cycle of a housefly

**Dangers/economic importance of houseflies**

- They carry germs on their body, saliva or mouth parts, which cause the following diseases; diarrhea, dysentery, cholera, typhoid, trachoma, red eyes.
- They help to reduce the volume of feaces in latrines which get filled up quickly.

**MOSQUITOES**

There are three main types of mosquitoes namely anopheles, mosquito, Culex mosquito, aedes/ tigers mosquito.

**i. Anopheles mosquitoes**

Female anopheles mosquitoes spread a protozoan called plasmodia which causes malaria in man.
Culex mosquitoes spread Filaria worms which causes elephantiasis
Aedes/ tiger mosquitoes spread a virus causes dengue fever and yellow fever in human beings.

**Life history of mosquitoes**

Adult mosquitoes lay eggs in stagnant water.
After 2-3 days the eggs hatch into larva called Wrigglers which breathe through a spiracle on the tail end called Siphon.
The larva develop into pupa which breathes through a pair of spiracles called breathing trumpets
After 2-3 weeks from eggs a fully grown adult comes out of the pupa.

Diagram showing life cycle of anopheles and culex mosquitoes

Difference between anopheles and culex mosquitoes

| Anopheles | Culex |
|---|---|
| Lays eggs with an air float | Lays eggs in rafts |
| The larva lies parallel to the water surface when breathing. | The larva lies at an angle to the water when breathing. |
| Adult lies in a sloppy position when at rest/. | Adult lies horizontally when at rest. |

**Ways of controlling mosquitoes**

- Drain stagnant water around homes.
- Bury old fins, broken pots, or bottles where mosquitoes can breed.
- Clear all bushes around homes where mosquitoes can hide
- Spray adult mosquitoes with insecticides
- Sleep under insecticide treated mosquito nets.
- Keep fish in dams or reserves of water to eat mosquitoes larvae
- Close doors and windows early in the evening
- Apply repellants on the body to drive away mosquitoes
- Burn mosquito coils to chase away mosquitoes
- Plant trees /flowers that can repel mosquitoes in the compound.

**Butterflies and moth**

- They undergo complete metamorphosis
- Female lays eggs mainly on the underside of the leaves
- Eggs hatch into larva / caterpillars which feed on leaves

- The larva spins a cocoon around itself and changes into pupa/chrysalis which does not move or eat i.e. it is dormant stage.
- When the adult is fully grown, it breaks the pupa case and comes out.

**Advantages of butterflies and moths**

- They help in pollinating flowers of farmer's crops.
- We get silk threads from the cocoons of some butterflies
- Caterpillars are eaten in some societies as food.

**Disadvantages of butterflies and moths**

- Their larvae /caterpillars feed on leaves of crops / (crop pests)
- Caterpillars have bristle hairs which can burn and cause irritation itching or wounds o the skin.

NB: Most caterpillars protect themselves by use of prickly hair.

**Incomplete metamorphosis**

This is a life cycle which involves three stages of development, i.e.
Eggs – Nymph – Adult (imago)

The adult female lays eggs in the soil in an egg sac (pouch)
After a few days the eggs hatch into Nymphs
After several changes / moulting, the nymph develops wings and becomes a fully grown adult.

Diagram showing incomplete metamorphosis

Examples of insects which undergo incomplete metamorphosis
i. Cockroaches
ii. Grasshoppers

iii.Damselflies
iv Bed bugs
v. Termites
vi. Praying mantis
vii. Walking sticks
viii. Kaytidis
ix. Dragon flies
x. Aunts
xi. Aphids
xii. Fleas

**Protoctista kingdom (single called organism)**

- These are groups of very simple living organism which are single (celled unicellular ).
- They have a nucleus enclosed in a membrane
- They are neither plants, fungi, nor animals.
- They live in fluids (liquids) or in other organisms because they do not have protection against drying.

**Examples of protoctista**

Algae
Euglena

**a) Algae**

- They have chlorophyll and make their own food
- They mostly reproduce by means of spores.
- They do not have roots, stems and leaves.
- They appear in different colours e.g. blue, green, red.
- They grow on and within the soil, wood, moist rocks.

**Examples of algae**

- Spirogyra
- Sea weeds
- Focus

**Uses of algae**

- It is used as food by man and other animals such as fish.
- They add oxygen to water which is breathed in by water animals.
- They are used in making fertilizers

**Protozoa**

- These are groups of single celled organisms which have a nucleus and the cytoplasm.
- They do not have chlorophyll but capture their food or engulfing using pseudopodia
- They are microscopic
- They are found in water and on land in damp places and in body of animals as parasites.
- They reproduce by means of pseudopodia e.g. amoeba while other by cilia e.g. paramecium

**Examples of protozoa**

- Amoeba
- Paramecium
- Plasmodium
- Trypanosome

Illustration of amoeba and paramecium

**c) Euglena**

- This is a unicellular organism which has both plants and animal features.
- It has chlorophyll and produces its own food.
- It can move from one place to another very quickly for protection like an animal using its flagellum.
- It is microscopic and lives in ditches and ponds.

**FUNGI KINGDOM**

These are simple organisms that lack chlorophyll and exist as a mass of threads called hyphae or mycellium.

**HOW DO FUNGI FEED?**

They feed saprophytically.

- They live as parasites on other living things or on dead and decaying body.

- They grow where there is moisture.
- They reproduce by means of spores except yeast which reproduce by budding.

Common examples of fungi

- Mushrooms
- Toadstools
- Yeast
- Moulds
- Puffballs

Illustration to show the structure of mushroom and functions of each part.

**Advantages of fungi**

- Some fungi cause decay and helps in formation of soil.
- Some fungi are eaten as food by man. Eg mushroom
- Some are used in making medicine eg penicillium moulds for making penciline.
- Yeast help in flavouring cheese , formation of beer and spirit making bread source of vitamin B and fermenting tobacco.

**Disadvantages of fungi**

- Some fungi are poisonous to man.
- Fungi cause a number of disease in animals ring worm , eczema, athletics foot , and finger / toe nail formation
- Fungi cause diseases in plants eg: potato blight .
- Some fungi cause food poisoning

**CARE FOR AND PROTECTION OF VERTEBRATES AND INVERTEBRATES**

- Animals like humans , birds need care and protection. They can be cared through the following ways.
- Train trainable animals
- Treat sick domestic animals and clean the house they stay in.
- Gazette areas for both domestic and wild animals as game parks and game reserves to prevent extinction and endangering animal species.
- Regular vaccination of animals
- Enforcing strict laws that grown pollution , poaching and destruction of bio diversity

**FORMS OF ENERGY**

**What is energy?**

Energy is the ability of the body to do work.

Energy exists in the following forms (types)

i. Sound energy
ii. Heat energy
iii. Light energy
iv. Mechanical energy
v. Nuclear (Atomic energy)
vi. Solar energy
vii. Chemical energy
viii. Electrical energy

N.B

Kinetic and physical energy are forms of mechanical energy.

**SOUND**

Sound is a form of energy that stimulates the sense of hearing (that enables us to hear)

Use of sound

- For communication
- Entertainment
- For protection
- For evidence in courts of law
- Helps to promote culture i.e. traditional folk songs and folk tales.

**TYPES OF SOUND**

i. Loud sound
ii. Soft sound
iii. High sound
iv. Low sound.

**Sources of sound**

**Natural sources**

- Animals
- Wind
- Storm
- Volcanic eruption
- Water falls
- Rainfall

**Artificial sources**

- Musical instruments
- Vehicles
- Aeroplanes

**How is sound produced?**

Sound is produced by vibration (when an object vibrates)

**What is a vibration?**

A vibration is a to and fro motion which is continuously repeated.

**Ways how living things produce sound**

- Human beings produce sound by the vibration of their vocal cords. Vocal cords are found in the voice box. When air passes over them, they vibrate and produce sound.
- Crickets produce sound by rubbing their wings against the hind legs.
- Birds sing by the help of their rings of cartilage that vibrate
- Bees and mosquitoes produce sound by vibration of wings when flapped rapidly.

**Transmission of sound**

**How does sound travel?**

Sound travels in sound waves. It travels through the following media:

- Air (gases)
- Water (liquids)
- Solid materials

N.B sound does not travel through vaccum.

**Reason**: The vaccum does not contain matter (molecules)

- The speed of sound in air is 330m/sec
- The speed of sound in water is 500m/s.
- The speed of sound in metals (solids) is 4800m/sec

Therefore

i. Sound travels fast in gases
ii. Sound travels faster in liquids.
iii. Sound travels fastest in solids.

**Factors affecting the speed of sound**

- Temperatures
- Wind
- Altitude
- Heat

**EFFECTS OF TEMPERATURE AND WIND ON SOUND**

- Sound travels more clearly during night waves move close to the ground.
- At night temperatures are lower (it is cool)
- When it is hot , sound waves rise higher above the ground.
- Wind carry sound further if it is blowing the same direction; but if it is blowing against the sound it obstructs

**Frequency**

This is the number of vibrations per second. / number of oscillations made by a particle per second.

**Pitch**

This is the highness or lowness of sound. / is the sharpness or mildness of sound.

An experiment on pitch.

**What determines the pitch of sound?**

- Size of a vibrating object.
- Length of a vibrating object.
- Thickness of the string producing sound.
- Tension
- Frequency

**CALCULATIONS ON SOUND**

NB: The speed of sound in air is 330 metres/sec

Examples

1. If a man heard a gun shot after four seconds. How far was he from the firing point?

Distance = speed x time taken

Distance = $\frac{\text{speed x time taken}}{2}$

= 330m/sec x 4 sec

$$330\text{m/sec} \times \frac{\cancel{2}}{\cancel{2}}\text{ sec}$$

1

330m x 2

= 660 metres

2. It took 3 seconds to hear echo of a man chopping wood. How far was the man from a chopping place?

$D = \frac{S \times T}{2}$

$D = \frac{(330 \times 3)}{2}$ metres

D = 990

D = 495m

NB : We divide by 2 because there are two sets of sound waves ie orginal waves and the reflected waves (Echo)

3. Amooti was standing across the valley , which was 660m away from the cliff if he shouts , how long will it take to hear the echo.

$T = \frac{D}{S} \times 2$

$T = \frac{660m \times 2}{330m/s}$

$\frac{2}{1}$

T = (2 x 2) second

= 4 seconds

4. Okello was standing 165m away from his father who called him by clapping. How long did it take him to hear the clapping?

$T = \frac{D}{S}$

$T = \frac{165m}{330m/s}$ T = 0.5 sec

**Volume**

It is the loudness or softness of sound. / Is the magnitude or intensity of a certain sound.

**Echo**

Is the reflected sound (the bouncing back of sound waves)

Echo is formed when sound is reflected by an object.

**Uses of echo in nature.**

- It helps bats to find their way and locate food.
- It helps sailors to detect the depth of the sea or ocean.
- Fisherman use echo to locate shoals of fish before letting down their nets.
- Pilots use echo surrounding from thick clouds, mountains etc to avoid accidents.

**DISADVANTAGES OF ECHOES IN NATURE**

Echoes are troublesome especially in empty halls
They cause irritating sounds and noise to the ears
Soft,porous surfaces absorb sound.
How do we prevent echoes
In cinema halls,broadcasting studios and conference or theatre halls the walls are covered using soft boards,thick and heavy curtains that absorb sound.

**MUSICAL INSTRUMENTS**

They are classified into three:
String instruments
Wind instruments
Percussion instruments

**String instruments (chordophones)**

These produce sound by vibration of their strings when plucked.
The pitch of sound in string instruments can be increased by loosening or tightening the strings
Examples

i. Cello
ii. Viola
iii. Violin
iv. Bow harp (Adungu)

v. Guitar
vi. Lyre
vii. Tube fiddle
viii. Harp

**Wind instruments ( Aerophones)**
These produce sound by vibration of air blown inside them.
Their pitch is determined (increased) by reducing the size the smaller the instrument the higher the pitch.
Examples

- Records
- Whistles
- Trumpet
- Panpipes
- Flute etc

**Diagrams**

**PERCUSSION INSTRUMENTS**
These are instruments that produce sound when bitten/hit.
Their pitch can be increased by reducing the size of the area struck or increasing the tightness

Examples
- Drums
- Thumb piano
- Shakers
- Xylophone
- Cymbals
- Shakers
- Rattles etc

Diagrams

**Methods of storing sound energy** .

Sound can stored:-
a) by writing music  (Solfa notation)
This is a form of writing music using syllables on staves
b) Recording
sound can be stored on record players discs , compact discs , computers etc

An illustration

**Devices used to store sound**

- Memory cards
- VCDs
- DVDs
- Magnetic tapes
- Projectors
- Tape recorders
- Mobile phones
- Flash cards
- Computer discs
- Ipods
- Film strips etc

**Devices used to reproduce sound**

- record players
- radio cassettes
- tape recorders
- video decks
- Film projectors.
- DVD players
- Computers
- Mobile phones
- Grammar phone

Ways of reproducing stored sound.

- Re-playing
- Singing
- Reading

**THE MAMMALIAN EAR**

The structure of the mammalian ear.

The ear is divided into three regions namely:

a) Outer ear
b) Middle ear
c) Inner ear

**The outer ear**

It consists of:

i. Pinna
ii. auditory canal

**The pinner**

It collects sound waves

**Auditory canal**

It directs sound waves to the eardrum

**The middle ear**

It consists of the:-

i. eardrum
ii. ossicles
iii. Eustachian tube

**Eardrum**
It vibrates and transmits sound waves to the ossicles

**Ossicles**
These are three small bones found in the ear namely; hammer incus and stapes

**The work of ossicles**
- They transmit sound vibration to the cochlea.
- They amplify sound waves in the ear

**Eustachian tube**
It equalizes air pressure in the ear.

**The inner ear**
It consists of:-
- Semi circular canal
- The Cochleas
- Auditory nerves

**Cochlea:**
This is a fluid –filled organ found in the ear.

**Function:**
it converts (changes) sound waves to sound signals

**Semi-circular canal:**
It helps in body balance and posture.

**Auditory nerves**
They send sound signals (messages) to the brain for interpretation

**Common diseases of the ear**

i. Otitis externus
ii. Otitis internus
iii. Ear cancer

**Common disorders of the ear**

- Deafness
- Ear aches
- Ear itching.

**Uses of wax found in the ear**

- It traps dust and some foreign bodies in the ear
- It cleans the ear canal
- It protects the ear against infections , wax contains chemicals that kill germs

Note: Too much ear wax can lead to partial (temporary) deafness

**CARE FOR THE EAR.**

i. Use soft material to clean the ear. Sharp objects break and damage the eardrum.
ii. Have regular health examination
iii. Remove excess wax from the external ear that can cause temporary deafness.
iv. Clean your ear with clear water and soap regularly.

NB. Partial deafness can be corrected by ear syringing (syringe filled with warm water)

**COMPARING THE HUMAN EAR WITH ORGANS OF HEARING IN OTHER ANIMALS**

**HEARING IN FISH**

Fish use lateral line to detect and pick up sound vibrations in water

**HEARING IN SNAKES**

Snakes do not have actual ears , but they have inner ear systems such as cochlea in mammals.
In snakes the cochlea is connected to jaw bones , this makes it sensitive to ground vibrations by the help of jaw bones connected to cochlea.

**HEARING IN BIRDS**

Birds have a ruff of feathers called **auriculars** which they use to detect sound in the environment .

**Hearing in insects**

- Some insects like mosquitoes collect sound vibrations using their antennae. (feelers)
- Others like caterpillars , butterflies and moths use small hairs called **setae** found on their body surfaces to pick sound vibrations

NB : Adult butterflies also detect sound vibrations through **veins on their wings**

Hearing in amphibians

There are three orders of the living amphibians. These are

- The apoda – the legless and worm like type such as caecilians
- The urodella – the tailed forms such as mud puppies , Newts and salamanders
- The Anura – the tailless form such as frogs and toads.

NB: All amphibians have ears

The hearing organ for amphibians is called the amphibians papilla

## THE CIRCULATORY SYSTEM

The term blood circulation refer to the movement of blood from the heart to all body parts

**Blood circulation is very important in the following ways**

- It supplies food and oxygen to all parts of the body
- It removes waste products such as carbondioxide out of the body to the excretory organs,

## TYPES OF BLOOD CIRCULATION

### SINGLE BLOOD CIRCULATION

- It is the types of circulation when blood moves through heart once eg. in fishes.

### DOUBLE BLOOD CIRCULATION

- It's a type of circulation when blood goes to the heart twice before it goes to all body parts eg in mammals.

## BLOOD

Blood is a tissue fluid with suspended cells that moves in and around the body.

Compositions of blood

- Red blood cells ( erythrocytes )
- White blood cells (leucocytes)
- Platelets ( thrombocytes)
- Plasma

### 1. RED BLOOD CELL

- There are about 30 million red blood cells in the human body.

- They contain a red pigment called haemoglobin that contains iron.
- They are made in red bone marrow of short bones like stemum, scapula, ribs , vertebra and pelvis.
- They don't have a nucleus.
- Their function is to transport oxygen in the body.

**ADAPTATIONS OF RED BLOOD CELLS TO THEIR FUNCTION**

- They have haemoglobin which enables them carry more oxygen molecules.
- They are produced in large number.
- They have no nucleus that provides a large surface area to carry more oxygen.

NB : When oxygen combines with heamoglobin it forms oxyhaemoglobin

**The structure of a red blood cell.**

Note : The red blood cells are destroyed by the plasmodia germs that causes malaria.
Sickle cell also deforms the normal shape of the red blood cells hence making them unable to carry their function.

**WHITE BLOOD CELLS**

- These are larger than red blood cells.
- They have a nucleus and no haemoglobin
- They are made in the bone marrow of long bones, lymph nodes and the spleen.
- Their main function is to fight against disease germs

**How do white blood cells defend the body against disease germs?**

- By engulfing and digesting germs
- Producing anti bodies against the germs.

Adaptation of white blood cells to their functions
It has a nucleus which controls cell activities
It has cytoplasm that helps it to engulf germs.

NOTE : The HIV / AIDS destroys the white blood cells.
The structure of a white blood cells

**PLATELETS**

- Are made in the red bone marrow. Their function is to help in clotting of blood.
- Blood clotting occurs in presence of vitamin K and Calcium

Structure of platelets

**PLASMA**

This is the liquid part of blood consisting of the following

- Water
- Blood protein
- Dissolved food
- Mineral salts
- Urea
- Carbondioxide
- Hormones

**FUNCTIONS OF BLOOD**

- It carries digested food and oxygen to all body parts
- It carries waste waste products from the body parts to excretory organs.
- It transports carbondioxide from the body tissues to the lungs
- It distributes heat to the body .
- It carries hormones to different body parts.

- Defends the body against infections.

**BLOOD GROUPS**

There are four blood group.

A

B

AB

O

NB : AB is a universal recipient while O is a universal donor

**BLOOD TRANSFUSION**

Is the transfer of tested and screened blood from one person to another. The scientist who discovered blood groups was Sir Karl Landsteiner.

**THE HEART**

The structure of the heart and functions of the each part

- The heart is divided in to four chambers
- The upper chambers are called atria (atrium) and the lower chambers called ventricles.
- The heart is made up special muscles called cardiac muscles
- The main function of the heart is pump blood to all body parts.

**OTHER ORGANS RELATED TO THE CIRCULATION OF BLOOD**

- The lungs – its where diffusion of gases takes place.
- The kidneys - filters blood to remove excretory products.
- The liver – regulates blood sugar

**THE DIAGRAM TO SHOW CIRCULATION OF BLOOD**

**BLOOD VESSELS**

This is a network of tubes transporting blood in the body.

There are three blood vessels

- Arteries
- Veins
- Capillaries

**ARTERIES**

- Arteries are blood vessels that carry blood away from the heart to the body.
- They have thick walls
- They have a narrow lumen
- They carry blood with a high pressure
- They don't have valves

Diagram showing the walls of the artery

**VEINS**

- These are blood vessels that carry blood towards the heart.
- They have thin walls
- They have a wider lumen.
- They have valves to prevent the back flow of blood.

**STRUCTURE OF A VEIN**

**CAPILLARIES**

- These are the smallest blood vessels
- They connect arteries and veins
- Exchange of body materials take place in the capillaries.
- They have so thin walls

**STRUCTURE OF THE CAPILLARY**

**DIFFERENCES BETWEEN ARTERIES , VEINS AND CAPILLARIES**

| Arteries | Veins | Capillaries |
|---|---|---|
| They carry oxygenated blood except the pulmonary artery | They carry de – oxygenated blood except the pulmonary vein | Exchange of materials between blood and body and body cells takes places |
| They have thick and muscular walls | They have thin and less muscular walls | They have a very thin wall which has tiny holes or pones in it. |
| They carry blood away from the heart | They carry blood towards the heart | They link arteries and veins |
| Blood flows under high pressure | Blows flows under low pressure | Blood flows under very low pressure |
| They have a narrow lumen | They have a wide lumen | They have a narrower lumen |
| They have no valves | They have valves | They have no valves |

Increasing the volume of blood in circulation

- Eating a balanced diet
- Blood transfusion
- Taking a lot of fluids and taking iron supplement tablets

Diseases and disorders of the circulatory system
They are classified into three groups namely.

- Diseases of blood
- Diseases of the heart
- Hereditary diseases

| Diseases of blood | Diseases of the heart | Hereditary disease |
|---|---|---|
| - Leukemia (blood cancer)<br>- Hypertension ( high blood pressure)<br>- Malaria<br>- AIDS<br>- Anaemia<br>- Sickle cell anemia<br>- Low blood pressure | - Coronary heart disease<br>- Heart attack (cardiac arrest)<br>- Heart stroke (cerebro vascular Accident , CVA)<br>- Heart failure | - Haemopholia<br>- Sickle cell anaemia |

Other disorders

**A) ARTIOSCLEROSOS**

This is the hardening and thickening of the walls of the arteries

**PREVENTION AND CONTROL OF THE CIRCULATORY DISEASES**

- Proper feeding ie eating food that make a balanced diet.
- Eating meals of low fat content
- Performing regular physical exercises
- Going for medical checkup.
- Avoid taking alcohol.

IMPORTANCE OF HAVING REGULAR BODY EXERCISES

- Help the heart to pump more blood to the body.
- They reduce the level of fats in the body.
- Help to strengthen the muscles of the heart.
- They reduce the risk of getting heart diseases
- Joints becomes more flexible .
- Digestion of food is carried out quickly and easily.
- Promotes proper functioning of body system
- It makes the body physically fit.

**HIV / AIDS AND BLOOD**

- AIDS is caused by HIV
- The Virus destroys the white blood cells in the body.
- The body becomes weak and cannot fight disease germs

HIV stand for
Human
Immuno – deficiency
Virus

AIDS stands for
A - Acquired - means get from
I - Immune – means protected against
D - Deficiency – Lack of
S - Syndrome - It means a combination of signs and symptoms.

**HOW HIV / AIDS IS SPREAD**

- Through unprotected sexual intercourse with an infected person.
- Through sharing unsterilized sharp objects with an infected person.
- From mother to child (MCT)

a) at birth
b) through breast feeding
c) from mother to unborn child

- Through unscreened blood transfusion

**Signs and symptoms of HIV / AIDS**

- Prolonged dry cough (chronic cough)
- Wide spread itching and skin rash
- Prolonged diarrhoea (chronic diarrhoea)
- Oral thrush - It is a white coating develops in the mouth
- Persistent fever.
- General body weakness
- Loss of appetite

- Excessive sweating at night
- Herpe zoster (kisipi)

**EFFECTS OF HIV / AIDS**

**INDIVIDUAL**

a) **Loss of immunity** as the virus destroys the white blood cells , the individual is attacked by several diseases. The disease germs take advantage of the weakened body.
These diseases which attack a weakened body are called secondary or opportunistic infections
b) Loss of income
c) AIDS leads to depression , frustration and worries to an individual.
d) An individual can be abandoned by the friends due to fear of the disease
e) The infections causes death.

**FAMILY**

- Some children in the family may be infected with HIV / AIDS
- Reduction on the labour force in the family
- Children become orphans when parents die.
- Loss of family property
- Family members are separated when different relatives take care of them.
- The family may experience shortage of basic needs in case the AID victims are parents

**COMMUNITY**

- Loss of skilled man power
- Causes child headed families
- Break down of social order / families.
- Shortage of productive population
- It leads to low economic development

**PREVENTION AND CONTROL OF HIV / AIDS**

- Abstinence from sex until marriage
- Having an HIV test before people get married
- Having only one long sexual partner
- Proper use of condoms
- Blood screening before transfusion
- Health words should wear protective gloves to avoid contact with blood
- Carrying out sex education in schools and homes

## ALCOHOL, SMOKING, AND DRUGS IN THE SOCIETY

## ALCOHOL IN SOCIETY

What is alcohol?

Alcohol is a colourless liquid substance that makes people drunk when they drink too much of it. It is contained in many drinks like beers, wines and spirits.

### Types of alcohol

There are two types of alcohol namely

- Methanol
- Ethanol

Methanol is found mostly in home distilled alcohol.

- It is very dangerous and poisonous and many cause blindness or death.
- It is mainly used as a fuel or for sterilizing medical instruments.
- Ethanol is contained in all alcoholic drinks that are consumed.
- It can also be used as fuel.

### Production of alcohol

Common alcoholic drinks are made from juices of bananas, pineapples, sugar cane, maize, millet, sorghum, rice, barley, cassava, potatoes.

Yeast is added to the mixture of water and these food substances to speed up fermentation.

**Methods of producing alcohol**

i. Fermentation
ii. Distillation

**Fermentation** is the process by which sugar in juice is turned into alcohol with the help of yeast.

- Fermented fruit juices make wine.
- Fermented starch mixture from grains or cereals make beer.

**Examples of drinks produced locally by fermentation**

- Mwenge bigere - from bananas
- Malwa (ajon) - from millet/ sorghum
- Kwete - from cassava / maize
- Munanansi - from pineapples
- Omurambi - from sorghum
- Beer - from oats, barley and sorghum

**Distillation**

- This is the process by which we get alcohol from fermentation.
- The alcohol in the fermented juice is heated and it evaporates.
- The alcohol vapour is then condensed and collected.

**How distillation of alcohol is done.**

- Crude alcohol is boiled to produce alcohol vapour.
- The vapour is condensed to get liquid alcohol with the help of cold water as a condenser.
- The liquid alcohol now called distillate is passed through a coiled delivery tube in to a clean container i.e. bottles or jerry cans.
- The delivery tube is usually coiled to increase the surface area for condensation of alcohol in the condenser. (cold water)

**Illustration on how distillation is done;**

**Uses of alcohol**

- For drinking
- Making medicines
- For disinfecting wounds
- For sale to get money
- Used during cultural functions

- Used in making cosmetics and perfumes
- Used to sterilize medical instruments in hospitals
- Used as a fuel
- Used in making nail vanish solutions

**Alcoholism** is a condition where an individual depends on alcohol for normal functioning of the body.

**Alcoholic** is a person who is addicted to alcohol.

**Addiction** is a condition in which a person has a very strong desire to take alcohol every day.

**Effects of alcohol on the community**

- May lead to job neglect causing low productivity.
- May cause traffic accidents at home, suicidal behavior.
- High crime rate in the society e.g rape, defilement, robbery etc.
- Can lead to increase of certain diseases in the community e.g AIDS.
- Alcoholics become public nuisance.
- Nation may lose very important people
- Loss of income tax base due to less production.

**Reasons why people drink alcohol**

- Idleness
- Frustration
- Peer pressure
- The desire to pass time, with friends.
- Family back ground and social environment
- To show that they are rich.
- People's culture in ceremonies/ celebrations
- Misleading adverts on T.V, radio, magazines
- To forget their problems.
- Influence by people one admires e.g. parents, teachers etc.

.

**Effects of alcohol on people ( immediate effects)**

- Slows down the action (function) of the brain.
- People who are not used to drinking a lot of alcohol vomit when they drink a lot of it.
- People get easily annoyed after drinking a lot of alcohol.
- People who are drunk become forgetful
- People who are drunk lose respect for laws.
- People who are drunk lose balance.

**Long term effects**

- Loss of appetite
- Peptic ulcers
- Liver diseases
- Leads to self neglect
- Loss of jobs
- The pancreas may swell.
- Too much and constant drinking may cause hand tremors

**Effects of alcohol to a family**

- Leads to family neglect
- Leads to poverty in a family.
- It causes spouse and child abuse.
- Leads to bad behavior among children
- It causes violence in homes.

**How to avoid alcoholism**

- Avoid bad peer groups
- Never believe in advertisements which praise alcohol as a good drink.
- Never drink alcohol to over come a problem.
- Join groups whose members do not take alcohol.
- Engage in activities which help you to append free time properly.
- Take your parents and other people's warning about the dangers of alcohol seriously.

**Uganda laws on alcohol**

- People under 18 years of age are not allowed to drink alcohol in public places.

- No one is allowed to drive a vehicle when he is drunk.
- Home distillation of alcohol is forbidden
- No one is allowed to transport or sell home distilled alcohol.
- Public places that use alcoholic drinks are allowed to operate up to a limited time.

**SMOKING**

Smoking is the drawing in smoke from burning tobacco through the mouth.

A smoker is a person who smokes tobacco frequently.

**Chemicals contained in tobacco**

- Nicotine
- Tar

Smoking is either active or passive

**Active smoking** is that one in which the smoker takes in smoke directly from cigarette or smoking pipe.

**Passive smoking** is the type of smoking in which a non smoker breathes in air containing tobacco smoke.

**Reasons why people smoke.**

- To pass time
- To concentrate on what they are doing
- To feel warm
- To fit in a peer group (peer influence)
- To feel confident

**Effects of smoking on the human body**

- Leads to respiratory diseases such as;
- Lung cancer
- Emphysema
- Heart attack (coronary heart disease)
- Peptic ulcers
- Cancer of the mouth and throat.

**How to avoid smoking**

- Do not believe in advertisements about cigarette smoking.
- Know that there is no good reason for smoking
- Avoid joining groups of smokers.
- Keep yourself busy for example by reading a novel, or doing any other meaningful activities such as playing games etc.

**Life skills to safeguard against smoking.**

- Keep away from people who smoke
- Never allow any body to convince you to smoke.
- Gather more information on dangers of smoking from health workers.
- Report your friends who smoke to the teachers or their parents for advise.
- Like games and sports during your free time.
- Never use your money to buy cigarettes.

# DRUGS

A drug is a chemical substance which affects the way one's mind and how the body works.

- It can either help or harm the body system.
- Drugs are either in manufactured form or raw form
- Raw drugs are either in the form of plants and animal parts or extracts from animal or plants.
- If drugs are manufactured and tested in laboratories they are called laboratory manufactured drugs.

**Characteristics of laboratory manufactured drugs**

- They are carefully made and tested.
- Their strength, stability and purity is known.
- They are the same for each quantity.
- Their effect on human health is known,
- They are packaged and properly protected
- They are well labeled
- They have expiry and manufactured dates.

**Examples of laboratory manufactured drugs**

- Aspirin
- Chloroquine

- Quinine
- Fansidar
- Panadol
- Coartem
- Mabendazole

**Characteristics of traditional drugs.**

- They are made of raw plants and animals
- Their strength, purity and stability changes.
- They are of different quantities
- Their effects on human health is not known.
- They are not well labeled
- They are not well packaged.

**Examples of traditional drugs**

- Mululunza
- Kigagi
- Bombo
- Eusuk
- Asimiri

**Essential drugs**

Essential drugs are drugs needed to care and prevent common diseases affecting the majority of people in an area or country.

**Qualities of essential drugs**

- They should be affordable to make the cost of treatment manageable.
- They should be accessible and available whenever needed.
- They should be effective to cure, prevent and control diseases.
- They should be safe when the correct dosage is used.
- They should have a satisfactory value for money.

**Examples of essential drugs**

- Cough mixture
- Chloroquine
- Paracetamol
- Piriton
- Penicillin
- ORS
- Tetracyline

**Drug prescription**
This refers to health workers written information on how a drug should be used.

If a drug is taken without a prescription, the patient will either take under or over dose.

**Over dose**
This is the taking in of more medicine than is required.

An overdose is dangerous to the body because it can lead to poisoning or death.
**Under dose**
This is when one takes fewer drugs than the required
The major disadvantage of an under dose is that it causes drug resistance.

**Advantages of drug prescriptions.**
- It helps the patient to know the correct drug.
- Its dosage relation to age, weight and duration of treatment
- Prevent over doe which is harmful and poisonous to the body
- Prevents and controls misuse of drugs

**Drugs of dependence**
These are drugs which cause addiction after prolonged use.
An addition to a drug is a strong disease that one feels uncomfortable when he / she does not use the drug.

**Drugs of dependency**
This is the continuous use of drugs on a regular basis after the body of the user. It can also be the illegal use of the drug.
**Common drugs of dependency**

- Marijuana
- Khart or miraa
- Cocaine
- Glue
- Aviation fuel
- Heroin
- Alcohol
- Tobacco
- Paint thinner.

**Drug mis-use**
This is the use of a drug without or against the health worker's instruction.

**Ways of Mis-using drugs**
- Sharing drugs
- Taking un prescribed drugs

Drug abuse
This is the use of a drug in a way which is harm (dangerous) to the body.

**Why people abuse drugs**
- Some people abuse drugs to over come fear
- Due to peer influence
- To keep a wake or sleep
- Due to good advertisement
- To pass time
- To feel warm
- To get energy
- To concentrate on what they are doing
- To gain more appetite.

**Common people who abuse drugs**
-

**Effects of drugs of dependence to an individual**

- Brain damage
- Loss of appetite
- Insomnia (inability to sleep)
- Job neglect
- Self neglect
  - Low immunity to disease

**Effects to the family**

- Family neglect
- Family aggression and violence
- Criminal acts like defilement and rape
- Poverty
- It sets a bad example to the children

**Effects to the community**

- It leads to increased accidents
- Criminal behavior
- Poor job performance

Life skills to safe guard against alcohol , smoking and drug dependency

What is a life skill?
It is personal and social skill that enables a person to function confidently and competently in order to fit in a community.

**Self awareness**

- Know yourself
- Care for your self to avoid drug abuse
- Make choices which you think are consistent and of value.

- Avoid associating with wrong groups
- Say No to people influencing you to use drugs

**Coping with stress**
- In this situation, try to be firm to a problem and be ready to contain it.
- Try to accept positive pieces of advices with patience
- Don't drink / smoke as means of reducing stress

**Self esteem**
- Accept your self as you and believe in your self
- Have good discipline
- Appreciate your self
- Peer resistance
- Avoid bad company

**Assertiveness**
- Be open and give reasons for all your decisions
- Insist on the fact that wrong things are wrong.
- Be straight forward and honest with your self.

**Decision making**
- Make a choice with good results
- Bad decision may affect your life in future

**Leisure time**
- Involving your self in meaningful activities during free time.

**Life skills that can help you to avoid drugs**
- Desist from bad peer groups
- Through counseling and guidance
- Follow good morals from elders.
- Spending leisure time constructively by engaging in productive activities.
- Reading good material which is useful to life.

# TERM II

**CLASSIFICATION OF FLOWERING AND NON FLOWERING PLANTS**

**PLANT KINGDOM**

Plants are divided into two groups viz:

i. Non flowering plants
ii. Flowering plants

NON – FLOWERING PLANTS

These are plants which don't bear flowers. Groups of non flowering plants

- Spore bearing plants
- Coniferous plants

**Spore bearing plants**

These are plants that reproduce by means of spores.

They include:

- Ferns
- Mosses
- Liverworts
- Horsetails

A spore is a single cell which is able to develop into a new plant. A spore is protected by a spore case.

**FERNS**

- Have chlorophyll and can make their own food.
- Have proper roots, stems and leaves.
- Reproduce by means of spores, spores are produced at the lower side of the leaves in spore cases.
- They grow in shady moist places.

**Diagram**

**MOSSES**

- These are small green plants grow on house roofs, verandah, tree trunks, logs, rocks, and soil in damp shady places.
- Reproduce by means of spores.
- Contain chlorophyll and makes its own food.

Diagram

**LIVERWORTS**

- Grow in wet moist places.
- Have chlorophyll and make their own food.
- Reproduce by means of spores.

**CONIFERS**

- These bear seeds in structures called cones.
- Have small needle shaped green leaves.
- Don't have flowers but produce pollen and ovules in cones.

Examples include;

- Pine
- Cedar
- Fir
- Cypress
- Cycades
- Podo
- Ginkgo

**Economic value of conifers**

- Give us soft wood timber.
- Act as wind breaks.
- Produce soft wood for making papers, match sticks, ceiling boards.
- Earns foreign exchange.

**FLOWERING PLANTS**
These are plants that bear flowers and reproduce by means of seeds.

Groups of flowering plants
- Monocotyledonous plants
- Dicotyledonous plants.

**Monocotyledonous plants**
These are plants that bear seeds with one cotyledon.
**Examples**

| | |
|---|---|
| Millet | maize |
| Sorghum | rice |
| Barley | wheat |
| Oats | |

**Characteristics of monocotyledonous plant**
- Produce seeds with one cotyledon
- They undergo hypogeal germination.
- Have fibrous roots.
- Have leaves with parallel leaf venation.

**Dicotyledonous plants**
These are plants which bear seeds with two cotyledons.
Examples:
Legumes e.g. beans, peas, groundnuts, bambara nuts e.t.c.

**Characteristics of dicotyledonous plants**
- Produce seeds with two cotyledons

- Undergo epigeal germination
- Have a network leaf venation
- Have a tap root system.

A flowering plant consists of two systems

i. Root systems
ii. Shoot system.

**Parts of a flowering plant.**
Diagram.
**Functions of parts of a flowering plant.**
**Terminal bud** – Growing tip of the plant.
**Auxiliary bud** – grows into branch, flower etc.
**Node** – Point on a stem where a leaf grows.
**Internode**:- The region between two nodes
**Root cap**:- Protects the tip of the tap root .(main root)

**ROOTS**
A part of a plant that grows in the soil. It develops from the radicle.

**Functions of roots**
- Absorb water and mineral salts from the soil.
- Hold the plant firmly in the soil.
- Some roots store food for the plant.
- Some roots help the plant to breathe.

**Uses of roots to man**
- Some are sold to get income.
- Some roots are sources of food.
- Some roots are used as herbal medicine.
- Some provide wood fuel.

**ROOT SYSTEMS**

These are two main root systems

i. Fibrous root system.
ii. Tap root system.

Diagrams

**Types of roots**

i. Prop roots

These give extra support to a plant such plants include;- maize, sorghum, etc.
Diagram

ii. Buttress roots
iii. Clasping roots
iv. Stilt roots
v. Breathing roots
vi. Storage roots e.g. carrots, cassava, sweet potatoes etc

With diagrams

**OSMOSIS**

This is a plant process where fluids (plant nutrients move from a region of low concentration through a semi-permeable membrane. Osmosis mainly takes place in the root hairs of plants.

An experiment to illustrate osmosis.

**STEMS**

**Functions of the stem to plants.**

- They hold leaves and branches in position to get sunlight.
- Hold the flower for pollination
- Help in transpiration
- Some stems make food for the plant.

**Functions to man.**

- Some are sources of food.
- Some are sources of income.
- Some provide herbal medicine.
- Some are used for propagation.
- Some provide timber.

**Types of stems**

- Upright stems.
- Creeping stems
- Underground stems.

**With diagrams**

**Reasons why plants climb others.**

- To get support
- To obtain sunlight.

**Ways how plants climb others**

- Use of tendrils
- Use of hooks
- By twining or clasping

**Underground stems**

Examples are:

- Bulbs
- Rhizomes
- Stem tubers
- Corms

**Bulbs**

Examples are;
Onions, garlic etc
diagram of onion

**Rhizomes**

Examples are: turmeric, ginger etc

**Stem tubers**

Examples are; Irish potato, white yams etc

**Corms**

Example is cocoyam

**Plant stem propagation**

This is the way plants can be grown using stems.

**Examples**

- Bulbs
- Rhizomes

- Corns
- Stem tubers
- Suckers

With diagrams

**LEAVES**

The structure of a leaf , parts and their functions.

**Types of leaves.**

- Simple leaves
- Simple serrated
- Simple divided
- Simple lobed.

With diagrams

Compound leaves

- Bipinnate
- Pinnate
- Digitate
- Trifoliate

With diagrams

Functions of leaves to both plants and man (animals)

**PHOTOSYNTHESIS**

The process by which green plants make their own food.

**Photo –** means light.

**Synthesis –** means to build up.

**Raw materials for photosynthesis**

- Water
- Carbondioxide.

**Conditions necessary for photosynthesis**

- Chlorophyll
- Water
- Sunlight
- Carbondioxide.

**Importance of Photosynthesis**
- It helps in food production
- It helps to purify the environment by using atmospheric carbondioxide

**Adaptations of leaves for photosynthesis**
- Have a broad flat shape to increase surface area for sunlight.
- Have thin walls to allow carbondioxide
- Have stomata for gaseous exchange.
- Have veins for translocation.

**TRANSPIRATION**
The process by which plants lose water as water vapour to the atmosphere though leaves.
An experiment to show transpiration.

**Importance of transpiration**
- To cool the plant.
- Helps plants to absorbs water and mineral salts.
- Helps in rain formation

**Factors affecting rate of transpiration**
- Temperature
- Light intensity
- Wind
- Nature of the leaf
- Humidity
- Stomata

**Ways of reducing transpiration**

- Plants shed their leaves
- Forming a layer of wax on the leaf surface.
- Reducing the size of leaves to thorns.

**REPRODUCTION IN FLOWERING PLANTS**

There are two types of reproduction in plants.
Asexual reproduction (Vegetative propagation)
Sexual reproduction.

**THE FLOWER**

The structure of a flower (Its parts and functions)

**POLLINATION**

The transfer of pollen grains from anthers to the stigma.

**Types of pollination**

- Cross pollination
- Self pollination

**SELF POLLINATION**

The transfer of pollen grains from anthers to the stigma of the same flower.

NB: A paw paw undergoes self pollination.
Diagram

**Cross pollination:**

The transfer of pollen grains from the anther of one flower to the stigma of another flower of the same kind..

NB: A maize plant undergoes cross pollination
Diagram

**Agents of pollination**

- Animals
- Wind
- Flowing water

**Characteristics of insect and wind pollinated flowers**

| Wind | Insects |
|---|---|
| Have no nectar | Have nectar |
| Dull coloured petals | Bright petals |
| A lot of pollen grains | Few pollen grains |
| Have no scent | Have scent |

**Importances of pollination**

- It allows fertilization to take place in crops
- Leads to high yields in farmers harvest.

**Uses of flowers**

- For decoration on various functions
- Making of insecticide
- Perfume making
- Used to get dyes
- Sources of income by growing / selling
- Sign of love.
- Sign of respect for the dead.

**FERTILISATION**

The union of a male and female gamates to form a zygote.

After pollination, pollen tubes develop reaching down the ovules.
After fertlisation in the ovary, ovules become seeds and an ovary develops into a fruit.

Diagram

**SEEDS**
A seed is a fertilised ovule that develops into a new plant.

**Classes of seeds**
- Monocotyledonous seeds
- Dicotyledonous seeds

**Monocotyledonous seeds**
These have one coytledon.
Examples
**Dicotyledonous seeds**
These are seeds with two cotyledons.
Examples

Structure of abean seed

**GERMINATION**
The development of a seed into a seedling.

**Types of germination**
- Epigeal germination
- Hypogeal germination

**EPIGEAL GERMINATION**
The type of germination where the cotyledons come above the ground level. It occurs in all legumes. E.g. beans, peas, G.nuts, etc.

**HYPOGEAL GERMINATION**

This is the type opf germination where the cootyedons remain below the ground level. It occurs in all monocotyledonous plants e.g wheat, maize, sorghum etc.

Diagrams

**Conditions necessary for germination**

- Air (oxygen)
- Water (moisture)
- Warmth

Difference between dicots and monot plants

| MONOCOT | DICOT |
|---|---|
| Have one cotyledon | Have two cotyledons |
| Have fibrous root system | Have taproot systems |
| Have parallel leaf venation | Have network leaf venation |
| Undergoes hypogeal germination | Undergoes epigeal germination |
| | Forms true wood. |

**FRUITS**

A fruit is a developed ovary containing seeds. Fruits have two scars. Style stalk and stalk scar. Fruits protect seeds and assist in dispersal.

**Types of fruits**

- Succuent fruits
- Dry fruits

**SUCCULENT FRUITS / JUICY FRUITS**

These are fruits whose pericarp and mesocarp become juicy and fleshy and can be eaten. They are divided into three groups.

- Berries
- Drupes
- Pomes.

**Berries**
These are fruits with many seeds. The soft pericarp is divided into three layers.

- Epicarp
- Mesocarp
- Endocarp

Examples

- Oranges
- Tomatoes
- Pawpaw

Diagram of an orange fruit.

**Drupes**
These are fruits wih one seed inside a hard endocarp. Drupes have three layers;

- Epicarp
- Mesocarp
- Endocarp

Examples

- Mangoes
- Avacadoes
- Coconuts
- Palm oil
- Cashew nuts.

etc

Diagrams

**Pomes**
These are fruits in which the receptacle becomes juicy and modified as a fruit while the inner core is the pericarp.
**Examples**
- Apples
- Figs
- Pears etc

Diagram

**FRUIT AND SEED DISPERSAL**
This is the scattering of seeds and fruits from parent plants to a new environment.

**Importance of seed dispersal**
- Prevents over crowding
- Reduces competition for light and nutrients.
- Enables plants to colonise new areas.
- The farmer gets new species of crops.

**Agents of seed dispersal**
- Water
- Animals
- Wind
- Explosive mechanism

Explain the characteristics of each and their diagrams.

**TROPISM**
Tropism is growth movement of plants in response to a stimulus
A stimulus is any change in the environment which the plant is sensitive to

**Kinds of tropism**
Phototropism

This is growth movement of plants towards light eg when a plant is placed in the dark box with a small opening towards the plant tends to grow

Diagram

**Geotropism**
This is a growth movement of a plant towards the direct of force of gravity plant root grow wards due to force of gravity.

Diagram for illustration

**Hydrotropism**
This is a growth movement of some parts of certain plant in response to touch one side. This stimulus helps twinning plants such as beans , passion fruits and yams climbs by use of tendrils , hooks

**Chemotropism**
This is the growth movement of plant parts towards the source of chemical eg pollen tubes grow the style to reach the ovules

**PLANT PROPAGATION**
Plant propagation refers methods used in growing crops
There are two basic methods of propagation

**i) Seed propagation**
**ii) Vegetative propagation**

**SEED PROPAGATION**

most flowering plants are propagated by means of seeds eg beans , maize, coffee , mango etc

vegetative propagation

in this method a part of a parent plant is planted to give rise to a new plant.

Parts if plants used in vegetative propagation are :-

- Stems
- Leaves
- Buds

**Types of vegetative propagation**

- Natural vegetative propagation
- Artificial vegetative propagation

Natural vegetative propagation

| Plants | Methods of propagation |
|---|---|
| Yams ( white yams ) | Stem tubers |
| Irish potatoes | Stem tubers |
| Ginger | Rhizomes |
| Banana , pineapple, sisal | Suckers |
| Pineapples | Crowns , slip |
| sisal | Bulbils |
| Onions | Bulbs |
| Straw berry | Runners |
| Pyrethrum | Split |

Artificial vegetative propagation

This involves use of special skill and techniques to produce high quality and high yielding crops which are resistant to diseases

Example of artificial vegetative propagation

a) Stem cutting

Description & Diagram

b) Layering
Description & Diagram

c) Grafting
Description & Diagram

d) Budding
Description & Diagram

e) Marcotting
Description & Diagram

**ECONOMIC VALUES OF PLANTS TO MAN**

- Plants provide food to man.
- Plants help in controlling soil erosion
- Plants are needed in construction and building industry.
- They provide raw materials for agro based industries
- Agricultural industry is a source of revenue for government

**ANIMAL HUSBANDRY**

Animal husbandry is the care and management of livestock (farm animals)
Examples of farm animals include; goats, rabbits, pigs, sheep, cattle, poultry.

**KEEPING CATTLE**

This is the rearing of cows, bulls, oxen, heifers and bullocks.

**Why farmers rear cattle**

- For meat and milk production
- To get income
- For provision of labour
- For payment of dowry and bride price

**Importance of keeping cattle**

- They provide us with meat and milk
- They are a source of employment to farmers
- Bulls and oxen are used for ploughing and transport
- Cow dung is a source of manure
- Hides from cattle are used to make leather
- Bones, horns and hooves are used to make glue and animal feeds.
- Cattle are used to pay dowry or bride price.

External parts of a cow

**Types of cattle**

A type of cattle means a class of cattle kept for a specific purpose.
The major types of cattle kept in Uganda include;

- Beef Cattle
- Dairy Cattle
- Dual purpose Cattle

**Types of breeds of cattle**

A breed is a family of cattle having specific characteristics. The type of breed of cattle are determined by; colour, size, milk yield, body conformation like shape etc.
There are three types of breeds of cattle , namely;

- Local breeds/indigenous breeds

- Exotic breeds
- Cross breeds

**Local or indigenous breeds**
These are breeds that have existed in East Africa for long. They are also called Native Breeds.
Examples
- Ankole cow
- Boran
- Zebu

**Advantages of local breeds of cattle**
- They are resistant to some diseases.
- They can survive on poor pasture and little water
- They require less care and management
- They produce high quality meat and milk
- Disadvantages of local breeds of cattle
- They mature slowly
- They produce less products (i.e. Milk and meat)

**Advantages of exotic breeds of cattle**
- They grow and mature faster
- They produce more meat and milk

**Disadvantages of exotic breeds of cattle**
- They are easily attacked by diseases
- They need good pasture and water all the time.
- They need a lot of care and attention.

**Types of cattle**
There are three types of cattle namely;
- Beef cattle
- Dairy cattle
- Dual purpose cattle

- Work type (draught cattle)

**Beef cattle**
These are cattle mainly kept for beef (meat) production.

**Characteristics of beef cattle**
- They grow fast
- They have a block (rectangular) shape
- They have small heads
- They have short legs with long broad backs.

**Examples of beef cattle**
- Short horn
- Galloway
- Hereford
- Aberdeen angus
- American Braham
- Charolais
- Santa Gertrudis

Diagram of a beef cattle as seen from above and aside.

Seen from aside Seen from above

**Dairy cattle**

These are cattle kept mainly for milk production

**Characteristics of dairy cattle**

- They are triangular in shape
- They produce a lot of milk
- They have well set legs to support their weight.
- They have plenty of space between their hind legs.
- They are usually docile (calm)
- They have small necks and wide hind quarters.

Examples of dairy cattle

a) Friesian b) Brown Swiss
c) Guernsey d) Ayrshire

Diagram of a dairy cow as seen from above and aside

Seen from above Seen from aside

**Dual purpose cattle**

These are cattle kept for both meat and milk production.

Examples

1.Red Poll 2. Milking Short horn

3. Sahiwal

**Work (draught) cattle**
These are cattle mainly kept for providing labour on a farm (ploughing, transport).
They are used to plough soil, pull carts, etc.

**Differences between local and exotic breeds of cattle**

| Local Breeds | Exotic Breeds |
|---|---|
| They have different colours | They have specific colours. |
| They mature slowly. | They mature quickly. |
| They produce less meat and milk. | They produce more meat and milk. |
| They need less care. | They need a lot of care. |
| They are more resistant to diseases. | The are less resistant to diseases. |
| They can survive on poor pasture and water. | They need good pasture and water all the time. |

**Breeding of cattle**
Breeding is the keeping (maintaining) of inherited characteristics in cattle. Such characteristics include; colour, growth, disease resistance, milking, longevity, (ability to love long).

Types of breeding
1.In Breeding
2. Line breeding
3. Out Breeding
4. Cross breeding
5. Up grading
6. Selective breeding

**In Breeding**
This is the mating of very closely related animals (such as brothers and sisters).

**Advantages of in breeding**
It makes good characteristics in the family of animals strong.

**Disadvantages**

It leads to production of poor quality.
It can lead to inheritance of bad traits.

**Line Breeding**
This is the mating of closely related animals (such as cousins).
Line breeding can lead to inheritance of bad traits.

**Out Breeding**
This is the mating of distantly related animals.
Out breeding  brings good qualities that may be disappearing in a breed.

**Cross Breeding**
This is the mating of unrelated animals of different pure breeds. (e.g. Mating exotic breeds with local breeds).
The off springs after cross breeding are called cross breeds.
Cross breeds have better performance than their parents or relatives.

**Up Grading**
This is the improvement of quality of one breed by using a breed of superior quality several times.

**Selective Breeding**
This is the mating of selected good breeds in a herd.
Bad or poor breeds in a herd are sold off for slaughter.

Types of service/insemination
There are two types of insemination;
a) Natural Insemination
b) Artificial Insemination

**Nature Insemination**
This is the depositing of sperms into the female reproductive system by a male animal.

Types of natural insemination
a) Hand mating
b) Pasture mating

**Hand mating**

This means bringing a bull to mate with a cow on heat.

**Pasture Mating**
This means allowing a bull to move with cows so that it mates easily with those on heat.

Advantages of natural insemination
- A farmer does not bother to look for an expert inseminator.
- It is cheap for a farmer since semen is not bought.
- The bull notices the cows on heat easily.
- Animals on heat enjoy the feeling of sex.

**Disadvantages of natural insemination**
- Controlling veneral diseases is difficult.
- Small cows can be injured by big bulls.
- Transporting a bull if non is around is expensive.
- Inbreeding is easily practiced.

**Reproduction in cattle**
Reproduction is the ability to produce off springs and increase in number.
There must be a male and a female to mate and produce young ones.

**Mating**
Mating is the sexual union of the male and female animals.
During mating, serving (insemination) takes place.
A heifer is ready for mating at the age of 18 months.
When a cow or heifer is ready for mating, it shows signs of heat.

**Heat period or oestrus period**
This is the time when a female animal is ready to mate with a male animal.

Oestrus cycle
This is a period when a female animal can conceive if it mates.

**Signs of heat**
- The cow mounts other cows.
- The cow allows other cows to mount it.

- The cow loses appetite to graze.
- Mucus discharge from the vulva.
- Slight rise in the body temperature of a cow.
- The vulva swells and changes from pink to red.
- The cow urinates frequently.
- The cow becomes restless and moos all the time.
- Milk production in lactating cow drops.
- Three weeks after the period of service, if the cow shows no more signs of heat, we say it has conceived.

**Artificial insemination**
This means depositing sperms into the female reproductive system of a cow using s syringe or an inseminating gun.

**Advantages of artificial insemination**
- It controls veneral diseases.
- It is cheaper to buy sperms than buying a bull.
- It prevents injury to small cows.
- Semen from a good dead bull can be used to improve breeds.
- In breeding is controlled.
- Wastages of semen is minimized

**Disadvantages of artificial insemination**
- It requires an expert to carry it out.
- Storing semen is difficult.
- It may not give good results.
- A farmer may not easily notice the cow on heat.

The reproductive system of a cow.
Diagram

**Uses of each part**
**Vulva**
It receives and guides the penis to the vagina.
It protects and covers the vagina.
**Vagina**
It receives sperms and passes them to the uterus.
It is a birth canal.

**Cervix**
It protects the foetus during pregnancy by closing the cervix.

**Ovary**
It produces mature ova (eggs)
It produces hormones which controls the sexual cycle.

**Ova**
These are female reproductive cells. They fuse with sperms to form a zygote.

**Uterus**
It is where implantation takes place.
It provides a suitable environment for implantation to take place.
**Oviduct (fallopian tube)**
It is where fertilization takes place.
It passes a fertilized egg to the uterus.

**The reproductive system of a bull**
Uses of each part
- Testes
- They produce sperms.
- They produce a hormone responsible for puberty and sexual desire. This hormone is called testosterone.

**Urethra**
It passes urine to the penis
It passes sperms to the penis.

**Sperm ducts**
They carry sperms to the urethra.

**Penis**
It deposits sperms to the vagina

**Testes**
They help to manufacture sperms

**Epididymis**
It stores sperms.

**Prostate glands and seminal vesicles**
They produce semen through which sperms swim.

**Scrotum**
This is the outer covering of the testicles.
It protects the testicles.
It regulates the temperature of the testicles.

**Fertilization in a cow**
Fertilization is the union of male and female gametes to form a zygote.
A gamete is a reproductive cell.
The female gamete is called Ovum
The male gamete is called a Sperm.

Diagram of a sperm and an Ovum

Sperm Ovum

After fertilization, the zygote develops into an embryo.
The embryo develops into a foetus and finally into a calf.

Zygote ⟶ Embryo ⟶ Foetus ⟶ Calf

The embryo is attached to the uterus wall through the placenta.

**Implantation**
This is the attachment of the foetus to the walls of the uterus.
Therefore, Implantation takes place in the uterus.

**Gestation period**
This is the time between conception and giving birth.
The gestation period of an in-calf is 270-280 days or nine months.
An in-calf is a cow that is pregnant.

**Signs of pregnancy**
A cow does not go on heat 21 days after service.

- The uterus enlarges in the second and third month after conception.
- The udder enlarges and fills with milk.
- The cervix closes during pregnancy.
- The movement of foetus can be seen or felt after 7 months.

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

**Steaming up**
This is the feeding of an in-calf on foods rich in protein. It is normally done during the last two months.

**Why steaming up/advantages of steaming up**

- It encourages the foetus to grow healthy.
- It builds a cow's body in preparation for calving (parturition)
- It increases the manufacture of colostrum.
- It prevents low birth weight.

- It prolongs milk let down.

**Calving or parturition**
This is the act of giving birth in cattle (cows).

Signs of calving
- The vulva swells and becomes red.
- The cow lies down most of the time.
- The udder and teats become swollen.
- The amnion (or water sac) comes out and it bursts.

**Colostrum**
This is the first yellowish milk got from a cow which has just given birth.

**Uses of colostrum**
- It has all food values.
- It opens up the digestive system of a calf.
- It boosts the immunity of a calf since it is rich in antibodies.
- It improves a calf's sight since it is rich in vitamin A.

**Cattle management on a farm**
There are various ways of cattle management on a farm. These include;

| | |
|---|---|
| 1. Numbering | 2. Dehorning/Disbudding |
| 3. Hoof trimming | 4. Castration |
| 5. Dehorning | 6. Spraying |
| 7. Dipping | 8. Dusting |

**Numbering**
This means putting a mark or label on the body of animals.
Numbering enables farmers to identify animals easily.

**Ways of numbering**
a) Branding b) Ear Notching

c) Ear tagging
d) Number lacing
e) Ear tattooing
f) Tail Bobbing
g) Grueling

**Ear notching**
This is the cutting of the edge of the ears of animals with marks.

Diagram

**Ear Tagging**
This means fixing tags with numbers on the ear of animals.

Diagram

Numbering lacing
This is the putting of a wooden o iron piece of plate around the neck of animals.

Diagram

**Ear tattooing**
This means putting permanent mark on the ears of animals using pliers carrying numbers on them.

Diagram

**Tail bobbing**
This means trimming long hair on the animals' tail (switch).

N:B Cows are not usually docked i.e. tails are not shortened.

**Grueling**
This means trimming long hair around the anus and genital parts.

**Dehorning /disbudding**
This is the removal of horn buds from the calf's head.

Materials used for dehorning
i) Dehorning iron
ii) Chemicals such as caustic sticks.

**Advantages of dehorning**
- It makes animals easy to handle.
- It reduces the risks of injuries among animals and people.
- It increases space in the Kraal/Many animals can be kept in a small space.
- Hoof trimming
- This means cutting off over grown hooves of animals.

**Advantages**
It reduces the risk of injuries among cattle.
It reduces the risk of transmission of diseases.

**Castration**
This is the removal of testicles from a male animal.

Methods of castration
There are three methods of castration;

i) Open Operation (open castration or Surgery)
ii) Closed operation (closed castration)
iii) Use of a loop (Rubber ring)

**Open operation**
This is the removal of testicle from a male animal by using a sharp knife or blade to slit the scrotum.

Diagram

**Closed operation**
This is the crushing of sperm ducts by using a burdizzo which has blunt pincers.

Diagram of a burndizzo

**Uses of a loop**
- This means squeezing sperm ducts using an elastic rubber band.
- When the sperm ducts, (spermatic cords) and blood vessels are broken, the testes shrink and die.

Diagram

**Advantages of castration**

- It prevents the spread of STDs among cattle.
- Castrated animals become humble (docile) and easy to handle.
- Castrated animals fattens for more beef.
- Castrated animals graze with females without disturbing them.
- It prevents inbreeding
- It prevents poor breeds since bulls with poor breeds are castrated..

**Disadvantages of castration**

Castrated animals may lose a lot of blood and die.
Wounds may become septic and cause pain and death.
Animals are denied the right of mating.

**Deworming**

This means giving drugs to domestic animals and birds.

**Why deworm?**

To remove endo parasites from the body.
Methods of deworming

1. Drenching
2. Dozing

**Drenching**

This means giving liquid medicine to animals.
Drenching can be done using a drenching gun or a bottle.

Diagram of a drenching gun

**Dozing**

This means giving solid medicine to cattle (animals)
The solid medicine is in form of tablets or capsules.

**Spraying**
This is the removal of ecto parasites on the body of an animal by sprinkling acaricides using a knapsack sprayer or spray race.

**Dusting**
This means applying the body of animals with powdered chemicals to kill ecto parasites.

**Deticking**
This is the picking of ticks from the skin of animals using hands.

**Dipping**
This means making animals to swim through water mixed with acaricides in a dip tank/pool.

Diagram of a dip tank

**Removal of extra teats**
This means cutting extra teats from the udder of a cow. There should be only four teats.

**MILKING**
This is the removal of milk from the udder of a cow through teats.

**Milk let down**
Milk let down is the flow of milk from the udder of a cow.

**Types of milking**
There are two types of milking namely;

a) hand milking
b) Machine Milking

**Hand milking**
Hand milking is the drawing of milk from the udder of a cow by squeezing teats using hands.
Hand milking is also called full hand milking.

**Machine milking**
This is the use of a machine to draw milk from the udder of a cow.
The parts of a milking machine must be washed to avoid milk contamination.

Diagram illustrating machine milking

**Preparation for milking**
- Assemble the milking equipment.
- Clean all the milking equipment to make them in good working order.
- Put the cow in a milking place and tie the hind legs with a rope.
- Give the cow some feeds to keep it busy and relaxed during milking.
- Wash the udder and teats to encourage milk let down.
- Wash your hands clean.
- From each teat, draw one or two streams of milk through a strip cup to detect the presence of mastitis in milk.
- If the cow has mastitis, blood stains will be seen in milk drawn through a strip cup.
- A cow with mastitis should be milked last.
- After milking, wash the milking place and equipment using disinfectants.

**STRIP CUP**
This is an instrument used to detect the presence of mastitis in milk.

Diagram of a strip cup

**LACTOMETER**

This is an equipment used to;

a) detect the presence of water if added in milk
b) detect the presence of fats in milk.

A lactometer is a closed weighed tube graduated to make the level of normal milk.

**How a lactometer works**

- A lactometer is dipped in a container having milk.
- If water has been added to milk or fats have been removed, it will not get enough support to float and therefore it will sink deeper.

Diagram of a lactometer.

**Preserving milk**

Milk is a good environment for bacteria to multiply.
It should therefore be preserved for future use otherwise it will go bad.

**Methods of preserving milk**

1. Sterilization
2. Refrigeration
3. Boiling
4.

**Sterilization /pasteurization**

- This means killing germs in milk by maximum boiling followed by cooling and boiling.
- It is also called pasteurization.
- The heating kills germs and quick cooling prevents bacteria from entering milk and multiplying in it.
- This method was named after Louis Pasteur, a French Scientist who discovered that milk goes bad because of bacteria.

**Refrigeration**

This means putting milk in a refrigerator where germs can't easily and quickly multiply because of very low temperature.

**Boiling**
This means killing germs by boiling milk from time to time.

**Homogenizing**
This is a way of treating milk so that fats are broken and then cream is mixed with the rest.
Homogenizing is not a way of preserving milk.

**Products from milk**

| | | |
|---|---|---|
| Butter | Cheese | cream |
| Ghee | Yoghurt | |

**CASEIN AND WHEY**
This is the part left after butter has been removed from milk.
Casein can be used as a raw material for making shinny paper.

**Whey**
This is the liquid part left after sour milk has formed curd.
Whey can be used as a source to accompany food.

**Examples of processed milk**

| | |
|---|---|
| Whole milk | Skimmed Milk |
| Pasteurized Milk | Fortified Milk |
| Condensed Milk | |

**HOUSING ON A FARM**
Uses of housing on a farm

- Houses keep farm produce
- Houses keep farm records.
- Houses store animal feeds, utensils and farm tools farm (equipment)
- Houses are used as milking shades for animals.
- Houses are used as treating places for animals.

**Types of houses on a farm**

There are two types of houses on a farm. These are;

a) Semi-Permanent houses
b) Permanent houses

**Semi-Permanent houses**

These are houses made from simple local materials, (mud, reeds, cow dung, grass, poles, nails)
Examples include; Kraals and byres.

Permanent Houses

These are made from strong durable materials such as timber, bricks, concrete, iron sheets.

**Roofing houses on a farm**

Roofing farm houses depends on available materials.
The cheapest form of roofing is using grass, banana fibres, bamboo or straws.

**Advantages of thatching**

- It protects animals from bad weather.
- It prevents water from entering the house.
- It is cheap in construction.

**Disadvantages of thatching using grass**

- Thatching materials can easily catch fire and burn animals.
- Materials can easily rot.
- Thatch can easily leak if not well done.

**FENCING**

A fence is a barrier of live or dead materials used to divide land into plots or paddocks.
Fencing means putting a barrier of live or dead materials on land to divide or separate it into sizeable pieces.

**Types of fences**

- Natural fences (live Fences)
- Artificial fences (dead fences)

**Natural Fences**

These are planted plants along boarders (margins) of land to be fenced.
Examples of plants used to make natural fences include; bamboo, sisal, cypress, conifers, hedges, thorny plants, tatropa, cedar (x-mas tree)

**Artificial fences**
These are fences made out of dead materials
Examples of materials used include; chain links, barbed wire, wire nets, concrete, bricks, treated poles, nails.

**Importance of fencing**
- Natural fences act as wind breaks.
- Natural fences maintain soil fertility by adding humus.
- Fencing controls the spread of diseases by controlling animal movements.
- Fencing allows proper use of pasture.
- Fences keep off intruders such as thieves and wild animals.
- Fences prevent the straying of animals.
- Fences make culling easy.
- Fences make separation of animals according to age, sex, type, size and health easy.

**PASTURE**
Pasture is an open grassland on which animals graze.

Types of pasture
There are mainly two types of pasture, namely;
a) Natural pasture
b) Prepared Pasture

**Natural pasture**
This is pasture that grows by itself. It is eaten by animals in its raw form.

**Examples of natural pasture.**
a) Kikuyu grass
b) Guinea grass
c) Nandi grass
d) Elephant grass
e) Guatamala grass
f) Alfa alfa

**Prepared pasture**
This is pasture made out of fodder crops.
Fodder crops are crops grown for feeding animals.

**Examples of prepared pasture**
- Silage
- Hay
- Cloves
- Millet crops
- Desmodium

**Importance of pasture**
- Pasture is used for feeding animals
- Pasture adds humus to the soil.
- It provides bedding materials for animals
- It provides thatching materials for houses
- Leguminous pastures fix nitrogen in the soil.

The digestive system of a cow
**Uses of each part**
**Mouth**
For chewing food by the action of the teeth.
It passes food to the gullet.

**Gullet**
It passes food to the rumen

**Rumen (pouch)**
To store food temporarily before it is returned to the mouth for chewing.
It is where food is fermented

It is the largest of the four stomachs

**Reticulum (honey comb)**

Bacterial action continues here. Foreign bodies are retained here.

**Omasum**

It churns and grinds food into fine particles

Water is absorbed here also.

**Abomasum (true stomach)**

Digestion by enzymes takes place here.

NB; from abomasum to the rectum, digestion is the same as in non ruminants.

**Types of food stuffs**

Roughages

Concentrates

Additives

**Roughages**

They include hay (dried grass), silages (preserved green pasture), green grass, pasture, legumes, straws, maize stalks.

**Concentrates**

These include cereals, oily seeds and legumes.

**Supplements**

These include proteins and vitamins added to feeds.

**Additives**

These are drugs, flavours and hormones added to feeds.

**Note:**

Maintenance rations

These are feeds given to animals to sustain their usual feeds.

**Production rations**

These are extra feeds given to animals for production of either beef or milk.

**Salt supply**
Animals are given salt in order to;
a) stimulate milk production
b) control some diseases such as milk fever.

**Intake**
This is the amount of food eaten by an animal.

**CATTLE PRODUCTS**
- Meat
- Fats
- Hides
- Bones
- Cattle dung and urine
- Milk
- Horns and hooves

**GRAZING**
Grazing is the proper use of grass land by animals
- Systems of grazing
- Herding/free range/open grazing
- Rotational grazing
- Zero grazing

**HERDING**
This means looking after animals as they graze by a herdsman. The herdsman guides animals to good pasture and water.

**Advantages of herding**
- Animals eat a variety of feeds.
- Manure is evenly distributed on the farm.
- Animals are not easily stolen because they are easily and closely watched by a herdsman.

**Disadvantages**
- Animals can easily get diseases and parasites

- Animals may stray and destroy crops.
- Animals are likely to starve if the land is small.
- Animals are likely to overgraze the pasture.

**ROTATIONAL GRAZING**

This is a method of grazing in which animals graze on one portion of pasture at a time. There are three methods of rotational grazing;

i) Paddocking
ii) Strip grazing
iii) Tethering

**Paddock grazing**

- This means grazing animals on small fenced plots.
- The small fenced plots are called paddocks.
- The animals are allowed to graze in one paddock for a few weeks before they are moved to another paddock.

Illustration of paddock grazing

Drinking water for animals is found in paddocks.

**Advantages of paddock grazing**

- Paddock grazing allows proper use of pasture.
- It gives the farmer time to do other activities.
- Manure is evenly distributed on the farm.
- Paddocks break the life cycle of ticks.
- It gives grass time to grow back.
- It controls over grazing.

**Disadvantages**

Fencing paddocks is expensive
Paddocking requires a big piece of land.

**STRIP GRAZING**
This means grazing animals on small plots separated by a temporary wire.
The wire sometimes carries small(low) current (electricity) that controls the movement of animals in selected pasture areas (strips).
Animals graze in one strip at a time until they have gone through the pasture and back to the first strip.

Illustration of strip grazing

**Advantages of strip grazing**
- Pasture is well used.
- Parasites and diseases are easily controlled
- It requires less labour

**Disadvantages**
Maintaining strips is expensive (costly)
It is only suitable for few animals.

**TETHERING**
This is the tying of animals to a peg or tree using a rope.
The animals tethered can be moved to a new place when necessary.

**Advantages of tethering**
- It is cheap to maintain
- It does not require much attention
- Animals do not easily destroy corps
- Animals do not get astray.

**Disadvantages**
- Animals lack body exercises
- Animals may be restricted on one type of grass.

- Ropes may easily strangle animals
- Replacing ropes during the rainy season is costly.
- It is suitable for few animals.
- Animals may be easily stolen
- Animals may be easily killed by wild animals.

**ZERO GRAZING**

This means keeping animals in a special built structure.
Water and food are provided to animals.

**Requirements for zero grazing**

- A well constructed shade
- A store
- A feeding trough
- A water trough
- Workers
- Garden where fodders is grown
- Chaff cutter for cutting fodder crops.

Illustration showing zero grazing

**Advantages of zero grazing**

- Feeds are well used.
- Collecting manure is easy
- Sick animals are easily identified and culled
- Many animals are kept in a small area.
- Animals have less chances of getting diseases.
- Animals grow fat and produce more meat and milk.

**Disadvantages of zero grazing**

- Constructing the structure is costly.
- Feeds have to be grown or bought.

- Cleaning the built structure daily is tiresome.
- Spread of diseases is easy in case of out break.

**CATTLE DISEASES AND PARASITES**

Cattle diseases are classified according to their causative agents (germ) and method of spread.
There are three main causative agents (germs) namely;

- Bacteria
- Viruses
- Protozoa

**Signs of sickness in animals (cattle)**

- The animal is dull and has rough hair on the body.
- The animal coughs and sneezes
- There is diarrhoea.
- The animal has difficulty in passing out urine and dung (faeces)
- There is rise in body temperature and pulse rate.
- The animal loses appetite for food (pasture)

**Causes of sickness of diseases in animals**

- Diseases in animals can be caused by lack of some nutrients in the animal's diet.
- Dirty environment and dirty food.
- Physical injuries like cuts and wounds
- Infectious by germs.

**Signs of goods health in animals (cattle)**

- The animal feeds well i.e. have good appetite.
- The eyes are clean and bright.
- The animal walks steadily
- The nose is cold and wet.
- The hair is smooth and shining
- The animal's ears are warm and alert.
- Urine and dung (feaces) is passed out without difficulty.

**Ways routes of disease infection in animals**

- Direct contact with sick animals
- Direct contact through food and water.

**Types of cattle diseases**

- Bacterial diseases
- Theses are diseases caused by bacteria

**ANTHRAX**

- This is caused by bacillus anthracis bacterium.
- It is an acute infectious disease which attacks cattle, sheep, goats, pigs and humans.

**Signs and symptoms**

- Oozing out of dark blood from natural opening
- Death within 24 hours
- Blown up stomach when animal dies

**Prevention and control**

- Treat early cases with antibiotics
- Carcass of the animal should be completely burnt or buried.
- Do not open the carcass of animals that are suspected to have died of anthrax.
- Never eat meat of animals suspected to have died of anthrax.
- Vaccinate animals every year.
- Report suspected cases of anthrax.

**MASTITIS**

It is an infectious bacterial disease that affects the mammary glands (teats and udder) of cattle, sheep, goats, bitches and humans.

**Signs and symptoms**

- Milk turns watery or thick clots with blood and pus in it.
- The udder and teats swell.
- The cow rejects milking and sucking by the calf.
- The affected udder gets dead and gives no milk.
- Death of the animal may result.

**Prevention and control**

- Treat early cases with antibiotics
- Milk out teats and massage with warm water.
- Ensure good hygiene when milking
- Use disinfectants when milking
- Use the right milking techniques

**Calf scour**

It is an infectious disease caused by bacteria.
Attacks piglets, calves, kids, and humans.

**Signs and symptoms**

- Profuse sharp smelling diarrhoea
- Dullness and loss of appetite.
- Slight rise in temperature
- Sudden death in calves and piglets with blown up and hard stomachs

**Prevention and control**

- Strict cleanliness must be observed in calf pens, kraals, pig stys etc.
- Avoid damp wet conditions
- Treat infected cases with antibodies.

**Black quarter**

It is an acute infectious disease caused by bacteria.
It attacks ruminants such as cattle, goats, and sheep.

**Signs and symptoms**

- High fever
- Shivering
- Loss of appetite
- Lameness
- Muscles are swollen and painful

**Prevention and control**

- Vaccinate animals early
- Never open carcass of animal that shows signs of black quarter
- Burn or bury dead animals

**PNEUMONIA**

It is an infectious disease of the lungs
It is caused by various types of bacteria and viruses.

**Signs and symptoms**

- Difficult breathing and coughing due to congestion of bronchioles
- Nasal discharge
- Loss of body weight
- The animal is reluctant to move dull and sleepy.
- Loss of appetite
- The animal's temperature may be high or low.

**Prevention and control**

- Treat early cases of pneumonia with antibiotics
- Keep building well ventilated, warm, and clean
- Provide soft feeds and water.

**Foot rot**

- It is caused by bacteria of fusiformis group.
- It attacks hooves of all hoofed animals. This disease is usually common during wet weather.

**Signs and symptoms**

Hooves of animals swell making them lame.
Parts of hooves may contain pus and smell.

**Prevention and control**

- Treat early cases of foot rot with antibiotics.

- Trim affected hooves properly and isolate the animal
- Provide animals with foot bath every week.
- Routine trimming and examination of the feet.

**BRUCELLOSIS**

- It is an infectious disease caused by brucella abortus bacteria. It affects cattle, goats, sheep, and man.
- It is spread through food contaminated with discharge from infected animals.

**Signs and symptoms**

Abortion in animals followed by brownish discharge from the vagina
The testicles swell
There is still births in cows
The placenta remains in the uterus (womb)

**Prevention and control**

- Cull and slaughter the infected animal.
- Vaccinate all young females especially cattle.
- Don't touch aborted foetus with bare hands.
- Milk from infected animals should be boiled first.

**Contagious bovine pleuro-pneumonia**

It is caused by bacteria discharge from the noses of infected animals

**Prevention and control**

Cull and slaughter all infected animals
Impose quarantine in case of an out break.
Early vaccination of the herd.
The disease has no treatment yet.

**TUBERCULOSIS**

- It is a chronic infectious disease caused by micro-bacterium Tuberculosis.
- It is spread through inhalation of the bacteria.

**Signs and symptoms of tuberculosis**

- Loss of appetite at advanced stages
- Coughing and decrease in milk production

**Prevention and control**

Practicing good hygiene
Cull and slaughter infected animals.

**VIRAL DISEASES**

These are diseases caused viruses, most viral diseases are;

**Rinder pest (Capital letters)**

- It is a highly infectious disease caused by virus.
- It attacks the membranes of the alimentary canal.
- It can kill large number of animals.

**Signs and symptoms**

- High fever
- Severe dullness and loss of appetite
- Serious diarrhea with blood stained cow dung.
- The muzzles, nose and muscle become hot with fast breathing.
- Rapid dehydration resulting in emaciation with sunken eyes.

**FOOT AND MOUTH DISEASE**

This is an acute contagious disease of ruminants such as cattle, sheep, goats etc. it attacks the membranes of mouth and coronet.

**Signs and symptoms**

- Fever, dullness and loss of appetite for pasture.
- Serious salivation in the mouth
- Lameness due to wounds on the cornet.
- Painful blisters around the mouth, udder and between the hooves.

- Emaciation
- Reduced milk yield.

**Prevention and control**
- Vaccinate animals
- Affected animals should be slaughtered
- Application of quarantine.

**Nairobi sheep disease**
This is an active viral disease of sheep and goats.
It is transmitted by the brown ear and bont ticks.

**Signs and symptoms**
- High temperature.
- Diarrhea
- Nasal discharge
- Rapid breathing
- Abortion in ewes.

**Prevention and control**
- No treatment
- Control ticks to prevent the disease.

**PROTOZOAN DISEASES**
These are diseases which are mostly associated with blood sucking insects and ticks examples; Nagana (trypanosomiasis), East coast fever, Red water, Heart water.

**RED WATER**
It is caused by a protozoa transmitted by brown ear tick. It attacks cattle, goats and sheep.

**Prevention and control**
- Isolate sick animals
- cull and slaughter the sick animals

- Add coccidiostat in feeds and water.

**Signs and symptoms**
- High temperature
- Constipation and dullness
- Animal becomes anaemic
- Animal licks soil
- Presence of red blood pigments in the urine.
- Swollen lymph nodes.

**Prevention and control**
- Tick control by spraying and dipping
- Inject animals with ant-babesia drugs.
- Some respond with tetracycline antibiotics.

**EAST COAST FEVER**
It is a serious protozoan disease spread by both the red-legged and brown ear ticks. It attacks cattle only especially the calves are vulnerable.

**Signs and symptoms**
- There is rapid rise in temperature
- Swollen lymph nodes especially along the delap.
- There is general body weakness.
- Difficulty in breathing.

**Prevention and control**
- Burning areas affected with ticks.
- Fencing farms to prevent stray animals.
- Spraying and dipping animals regularly.
- Controlled grazing
- Smearing animals with a carcides
- Deticking by hands
- Antibiotics and sulphur drugs are used to control secondary infections.

**ANAPLASMOSIS (GALL SICKNESS)**

- It is caused by a protozoan
- It is transmitted by the blue ticks.

**Signs and symptoms**

- The animal gets constipation.
- Blood in urine and dung (feaces)
- The animal becomes anaemic
- The temperature may fall.

**NAGANA (TRYPANOSOMIASIS)**

- It is an infectious protozoan disease of animals such as cattle, goats, dogs and horses.
- In man, the disease is called sleeping sickness. It is transmitted by a tsetsefly and caused by a germ called Trypanosoma (e.g. t. Virax, t.congolese, t. bruscei)

**Signs and symptoms**

- Fever, dullness and loss of appetite
- Anaemia and emaciation
- Licking of soil by Animals
- Swollen lymph nodes
- Running eyes which leads to blindness.
- Death may occur after several weeks.

**Prevention and control**

- Clear bushes to control tsetse flies
- Spray with insecticides to kill tsetse flies
- Using tsetse fly traps to kill adult tsetse flies
- Treat using drugs such as ethidium.

NB; Tsetse flies breed in swampy and frosted areas. They do not lay eggs but hatch the young ones in the body and deposit them.

**HEART WATER**

It is a protozoan disease spread by ticks (it is a tick borne disease) it attacks cattle, sheep and goats.

**Signs and symptoms**
- High fever and loss of appetite
- Animal moves in circles
- Animals become restless and places the head against hard objects.
- When it falls, the legs keep peddling in the air.

**RED WATER**

**Cattle parasites**
- A parasite is a living organism that lives on another living organism and obtains its food from it. Or
- A parasite is a living organism that depends on another living organism for food.
- The organism on which a parasite depends for food is called a host.
- A parasite eats food made for the growth and development of the host.

**Types of parasites**
Parasites are grouped into two namely;
i) External Parasites/Ecto parasites
ii) Internal Parasites/Endo parasites

**External Parasites**
External parasites are parasites that live outside body of the host. Examples are; ticks, tsetse flies, mites, lice, jiggers etc.

**Internal Parasites**
Internal parasites are parasites that live inside the body of the host. They live in muscles, intestines, liver etc examples of internal parasites are; tape worms, round worms and liver flukes.

**Effects of parasites of cattle**
- Pests like ticks, tsetse flies, mites and fleas suck blood from the host leading to emaciation.
- Some pests spread diseases to animals e.g. Nagana, East coast fever, red water. Etc.
- Some pests cause damage to the skin of the host making it of low quality.
- Some pests cause discomfort and irritation to the host

- Some parasites suck food and blood from host making it malnourished and unhealthy.

**Prevention and control of cattle parasites.**

- Some of them can be controlled by dipping and spraying cattle with acqricides
- Clear bushes and use tsetse fly traps to control tsetse flies.
- Drain grazing areas to control liver flukes.
- De-worm animals with de-worming drugs.
- Keep animals away from pastures which are frequently covered by floods.
- Use double fencing of grazing areas and kraals to control ticks.
- Burn all the old pasture.
- Practice rotational grazing

Requirements for starting a livestock farm

To start a farm, a farmer requires the following;

**a) Land**

This is the place where the farm is located. it is used for growing pasture, building houses etc, the land may be bought, inherited from parents, rented or hired.

**b) Capital**

This refers to the money and all the buildings equipments and materials and to start a farm. Capital may be a donation, borrowed from a bank inherited from sales of property or monthly earnings.

**c) Labour**

Refers to all the people who perform the different tasks on the a farm. The farmer does not have all the skills and time for everything on the farm. He may employ workers, hire labourers, or use family members.

**d) Management**

This refers to organizing, planning and guiding the rest of the workers to carry out their duties in a more organizing way and make the farm profitable. The farmer may manage him/herself or employ others.

**e) Market**

Before starting a farm, one should ensure that there is market for the farm products such as meat, milk, eggs, hides etc.

**f) Farm**

These are written account/documents of the activities of the farm.

**IMPORTANCE OF KEEPING FARM RECORDS**

- To help the farmer know whether he is making profits or losses.
- For fair assessment of taxes

- To enable the farmer to make decisions
- In case a farmer dies with out writing will, it helps the family members to share property equally.
- To enable the farmer know the history of the farmer.
- Helps the farmer to plan and budget for the farm.

**TYPES OF FARM RECORDS**

- **Breeding records**: These include reproduction, birth or death rates.
- **Production records:** These show yields of various farm produce e.g. eggs, milk, meat etc.

**Health records:** These include when and which animals were sick, what treatment they got or which ones to cull.

- **Labour records:** These include the number of farm labourers, type of work they do and their wages.
- **Field operations records:** These are records of all different activities carried out on the farm ploughing, harrowing, planting etc.
- **Marketing records:** These include where, when and what prices various products were sold.
- **Inventory records:** This is a record of all the things a farmer owns and the cash values of each item.
- **Income and expenditures**: These are records of all the sales and purchases of the farm business.
- **Feeding records:** These show the amount of feeds bought, consumed and methods of feeding.

**PRACTICES WHICH HARM CATTLE AND OTHER DOMESTIC ANIMALS**
**AT HOME**

- Beating animals
- Over working animals
- Not treating sick animals
- Dehorning
- Castration
- Branding

**IN THE FIELD**

- Over beating animals
- Overworking animals
- Not giving animals adequate feeds
- Improper disposal of polythene bags

**IN TRANSIT**

- Over loading animals
- Transporting animals when some legs are hanging out of vehicles
- Over tying animals during transportation.

**IN THE ABATTOIR**

- Slaughter animals brutally
- Killing animals by banging their heads with hammer, axe or iron bars
- Handling animals rudely when going to slaughter

**RESOURCES IN THE ENVIRONMENT**

A resource is something or object which is used for certain purpose.
Some resources are got from non-living things while others are got from living things.

**Types of resources**

1. Non renewable resources
   These are resources which can't be replaced naturally once they are used up.

**Examples are:**

i) Minerals ores
ii) Crude oil (petroleum)
iii) Coal

2. Renewable resources
   These are resources which can be replaced naturally before they get exhausted (used up)

Examples are:

i) Soil
ii) Water
iii) The sun
iv) Air (wind)
v) Plants
vi) Animals

**Resources from non living things**
A non living thing is one without life.

**Example**
- Soil
- Water
- Air and wind
- Rocks and minerals

**a) Soil**
Soil is a natural layer which covers the earth's surface.
Soil is a renewable resource.

**How is soil used as a resource?**
It is used for growing crops
Soil is used for building houses in our societies

**b) Water**
Water is a renewable resource when used carefully.

**How water is used as a resource?**
- Water helps plants to grow
- Water is used to turn turbines for hydro-electric power generation.
- Water helps to dissolve food for easy absorption in the body of animals.

**c) Air and Wind**
Both are renewable resources
Air is a mixture of gases
Wind is moving air.

**How wind is useful**
- Wind turns wind mills to produce electricity
- Wind drives wind mills to draw water from the underground

- Wind helps in winnowing of harvested crops.

**d) Sun**

It is a renewable resource

**How the sun is used as a resource**

- The sun provides sunlight energy to green plants to make starch.
- The sun provides solar energy that gives out heat and light energy to man.
- The sun helps our bodies to make vitamin D
- The sun helps in generation of solar electricity.

**Rocks and minerals**

A mineral is any thing that occurs naturally like a rock in the earth.
They are non-renewable resources.

**Examples of minerals**

- Crude oil (petroleum)
- Chalk
- Clay
- Copper
- Gold
- Tin etc

**Minerals are non-renewable resources.**

N.B: Minerals from which metals are got are called ores.
Rocks
A rock is a substance made up of minerals tightly packed together to form a solid.

**Types of rocks**

i) Igneous rocks
ii) Metamorphic rocks
iii) Sedimentary rocks

**Igneous Rocks**
These are rocks formed when magma pours outside the earth as lava and solidifies
They are generally hard and impervious.
Examples
- Basalt
- Granite
- Quartz

**Sedimentary Rocks**
These are rocks formed from broken particles of sand clay and mud setting in different layers. (strata) at the beds of water bodies like seas, lakes, rivers etc.
Sedimentary rocks are soft and porous.
Examples
- Sandy rocks
- Limestone etc

**FOSSILS**
- Fossils are remains of plants and animals buried underground many thousands of years ago.
- They are found deep inside the earth in sedimentary rocks.
- These remains are usually of bones or teeth of animals and roots, leaves or stems of plants.
- Some times the remains are of mould of a whole body e.g. of a fish.

**Uses of fossils**
- Fossils help geologists to determine the age of a place or rock.
- Fossils help geologists to know how different plants and animals have existed and changed.
- Fossils help to tell how land looked before.
- Fossils show us how and where the different sedimentary rocks were formed.
- Fossils help to tell what the animal or plant looked like, what it ate, where it lived etc.

**Importance of rocks**
- Rocks form soil, which is important to our survival
- Rocks make good materials for building and roads.

- They tell us about the earth's history.
- They contain many valuable minerals

**ALLOYS**

An alloy is a mixture of two or more metals

| Alloy | Combination | Uses |
|---|---|---|
| Brass | Copper and Zinc | - Decorating ornaments<br>- Making wires, tubing cases for bullets. |
| Dentist Amalgam | Gold and Copper, gold, copper and mercury | - Making coins. |
| Solder | Lead and Tin | - Joining metals |
| Bronze | Copper and Tin | - Used for ornaments , bells , statues |

**STEEL**

Steel consists of Carbon dissolved in iron.
Different alloys are made from steel

Examples of alloys made from steel

i) Manganese steel

It is a mixture of steel and manganese
This is a very tough alloy.
It is used where friction may cause wear e.g. in railway points.

**ii) Nickel steel**

It is a mixture of nickel and steel
This alloy does not rust. It is used for making cooking and kitchen utensils and cutlery.

**iii) Stainless steel**

It is a mixture of cobalt and steel
This alloy is used to make permanent magnets because they retain their magnetism over a long period.

**Why are alloys made?**

- To make the metal harder
- To lower the melting point of the metal.

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

**FUELS**
A fuel is anything that burns to produce heat and light energy.

**Examples of fuels**
- Fire wood
- Charcoal
- Crude Oil (Petroleum)
- Coal

- Fire wood and charcoal are renewable resources while crude oil and coal are non-renewable resources.
- Coal was formed from marshy vegetables and plants which lived long ago and were buried under ground but due to heat and pressure they changed to coal.
- Coal is burnt to get thermal electricity.
- Crude Oil (petroleum) is refined through the process of fractional distillation.
- The products after refining crude oil (petroleum) are; Petrol, diesel and kerosene.
- These products are burnt to produce heat and light.
- Petrol and diesel are used to run engines.
- Oil was formed from animals remains which buried underground long ago and were changed to crude oil due to heat and pressure

**Resources from living things.**
- A living thing is one which has life.
- Living things include plants and animals.
- Most of the resources from living things are renewable resources once they are looked after properly.

**How are plants used as resources?**
- Some plants give us natural plant fibres like cotton, sisal, jute and linen.
- Cotton and linen are used to make clothes while sisal and jute are used to make ropes.
- Some plants are used as herbal medicine to cure certain diseases.

- Some plants are eaten as food by man and other animals.

**How are animals used as resources?**

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

**Conservation of resources**

- Conservation is the protection and proper management of resources in our environment.
- Both renewable and non-renewable resources need to be conserved.
- Resources like forests, wild life, water, soil, rocks, minerals need to be conserved.
- Conservation of resources is done to keep them doer future use.

**Conserving renewable resources**

**i) Conserving renewable resources**

- Wild life refers to animals and plants in our environment.
- Many kinds of animals have disappeared from earth and they are extinct.
- Other animals are about to disappear and we say they are endangered.
- Animals may become endangered or extinct because they are killed for their skins, horns, tusks.
- Some plants have also become endangered or extinct due to the increasing demand for wood and local medicine.

**Advantages (importance) of conserving wildlife**

- Some mammals, plants and birds are a source of food for man.
- Some animals and birds are valued as cultural heritage by some countries and clans.
- Plants are homes of many animals, birds and insects.
- Trees or forests help in the formation of rainfall.
- Mammals, birds and trees species earn foreign exchange for the government through tourists.
- Plants improve the atmosphere by balancing the amount of carbon dioxide and nitrogen.

- Plants provide shade to man and other animals.

**How to conserve and protect wild life.**

- Animals are protected by law in their habitat through the Uganda Wildlife Authority (UWA).
- A habitat is a natural environment or home of a plant or animal.
- Uganda wildlife Authority is a department which is responsible for wildlife in Uganda.
- The animals are being taken care of in national game parks and game reserves.
- Banning the selling and buying of wildlife trophies helps to reduce their being killed.
- Fishes can be conserved by controlled fishing.
- Some rare animals should be caught and let to breed in wildlife educational centre.

**Conserving non renewable resources**

- Soil erosion should be controlled.
- Soil should be kept fertile by using manure and fertilizers.
- Plastic wastes like broken Jerrycans, polythene papers should be recycled.
- Vehicles in dangerous mechanical conditions should be repaired to conserve fuel.
- Petroleum products should be used wisely to prevent further exploitation of oil.

**Conserving the natural vegetation**

- Over grazing should be discouraged because it causes soil erosion.
- Bush burning should be restricted to certain areas.
- Over stocking is dangerous because it leads to over grazing.
- The government should limit population growth because more people means more land to be destroyed for housing and agriculture.
- Cattle farmers should practice rotational grazing which later causes soil erosion.
- Afforestation should be practiced.
- Swamps and wetlands should be declared restricted areas.

**HARVESTING RESOURCES**

This is the collection of materials from the environment for the purpose of using them

**a) Harvesting non – living resources**

- Obtaining sand from dry river beds: scooping it with spades and machinery
- Mining sand from the ground

Harvesting minerals

- By mining
- Fossil fueling like oil
- By drilling

Harvesting energy from the sun

Energy from the sun is known as solar energy

- It can be harvested in the following ways
- Uses of solar panels
- Use of solar cookers
- Use of solar driers
- Use of solar heaters

NB : Solar panels trap sunlight and convert it into solar electricity

Solar heaters + cookers trap rays from the sun and changes into heat energy

**Harvesting water**

Ways of harvesting water

- It can be collected from roofs using tanks and big drums
- Rain water flowing on the ground is directed into dams .
- Water can be drawn from wells and brought to the surface using wind loss and electric pumps.

**Harvesting energy from air**

- Wind can be trapped and used to drive wind mills
- It can be tapped using sail to drive sail boat + dhows

**Harvesting living resources**

Plants resource

- Hand picking ripe coffee berries , cotton balls
- Plucking tea leaves from tea plants
- Ready maize cobs are harvested by hands
- By cutting sisal leaves

**Harvesting wood**

- By pollarding
- By coppicing
- By lopping
- By selective felling

**Pollarding**

It is the cutting off of the top part of a tree for use.

Diagram

Coppicing

It is the cutting off of the main part of the main part of the tree stem leaving the stump to give rise to new shoot.

Diagram

Lopping

This is the cutting of the side branch for use

Diagram

Harvesting animal resources

**a) Meat**

Animals are slaughtered , skinned and meat cut off from the carcass.

**b) Skins and hides**

Animals are slaughtered and skins carefully removed from the carcass.

**c) Horns**

The horns are cut or sawn off with the saw from the head of the slaughtered animals

**d) Milk**

it is obtained by milking using either hands or machines

**d) Honey :**

it is extracted from honey combs.

**THE ENVIRONMENT**

What is environment?

Environment refers to all things that surround man. These things can be air water , plants temperature , fuel , people building etc.

**COMPONENTS OF ENVIRONMENT**

The environment is composed of the following

- Water
- Land (soil)
- Air (wind)
- Plants
- Animals
- Temperature
- Mountains (hills)
- Minerals
- Sun

**TYPES OF ENVIRONMENT**

Environment is divided into two types:-

**Biological environment (Abiotic / non physical environment )**

This is the type of environment which consists if living things eg plants and animals

**Physical environment (a biotic environment )**

This is the type of environment which consists of non – living things eg mountains , lakes , rivers , temperature , wind (air ) vapour.

**FOOD CHAIN**

A food chain is the way how organisms in an environment get their food. In the environment , plants make their own food and are called producers .

The organisms which depend on food made by plants (producers ) are called consumers are consumers

Consumers are divided into the following groups

**Primary consumers**

These are organisms which feed directly on producers eg goats , cattle , rabbits, sheep etc

**Secondary consumers**
These are organism which feed on primary consumers eg foxes , dogs , lions

**Tertiary consumers**
Tertiary consumers which feed on secondary consumers eg. leopards , man birds of prey etc.
NB: In a food chain , organism like fungi and bacteria help in reducing food to its component parts ( decay / rot) are called decomposers
The sun is the main source of sunlight energy in a food chain from which energy flows to other organism in the environment

Illustration of a food chain
Producer – primary consumer – secondary consumers – Tertiary consumers – plants grasshoopers – lizard – Hawks

**A FOOD WEB**
A food web is a more complicated interrelationship of how organism in an environment obtain their food.
A food web involves many organism in an ecosystem how they get food from many other living things
Illustration of a food web

**Ecosystem**
An ecosystem is the community of livingthings (organisms) in a habitat plus the non living part in the environment .

**A habitat**
A habitat is a home of a living organism in the environment

**DEGRADATION**
Degradation is the way of lowering (spoiling ) the quality , stability and usefulness of a resource.

**Environment degradation**
Is the lowering the quality , stability and usefulness of resources in the environment

**Types of environment degradation**
- Soil / land degradation
- Degradation / deforestation

- Wetland drainage
- Air / atmospheric pollution
- Water pollution
- Wild life destruction ( degradation )

**Causes of environmental degradation**

There are two main causes of environmental degradation

a) Human activities

b) Natural causes

**HUMAN ACTIVITIES THAT CAUSES ENVIRONMENTAL DEGRADATION**

a) Mining / quarrying

b) Construction and road work

c) Poor waste disposal

d) Bad agricultural practices eg bush burning , over grazing etc

**NATURAL CAUSES ENVIRONMENTAL DEGRADATION**

- Soil erosion / leaching
- Silting
- Hurricanes
- Tornados
- Whirl wind / whil pools
- Earth quakes
- Hailstones
- Land slides
- Floods
- Tsunamis
- Volcanic eruptions
- Global warning

a) Soil / land degradation

This is the destruction / lowering the quality or usefulness of land by human activities or natural causes.

**Leaching**

Is a process through which mineral salts or nutrients sink deeper into the soil layers where they can not be reached by plants

It is caused by too much rain.

**Soil erosion** : Is the washing / blowing away of top soil by agents of erosion.

Silting
Is the process by which fine sand , mud or other things are carried into the water body.

Causes of silting
- Soil erosion
- Cultivation near water sources
- Allowing animals to drink from water bodies
- Swamp drainage
- Burning / destroying vegetation in the swamp

Effect of silting
- It destroys habitat for animals that live live in water
- Lower water level and so dries out water bodies
- Destroys source of food for fish and other aquatic animals
- Kills fish of other animals and plants in water
- Destroys eggs of fish and other aquatic animals.

Deforestation
Deforestation is also called devegetaion ie cutting down large number of trees / plant with out replacing them.

Causes of deforestation
- Population growth leading to need for land for settlement , farming and recreation
- Industrialization (development of industries in an area)
- Wild fires / bush burning
- Clearing forests for fire wood , charcoal , building poles timber etc

Effects of deforestation
- It leads to reduction of rain fall causing drought / desertification
- Loss of habitat for different plants and animal species
- Soil erosion leaving infertile soils

- Silting of water bodies.

**Wet land**
A wet land is any area which has water and growing vegetation through out the year

Examples of wet lands
- Swamps
- Marshes
- Bogs
- Lakes and rivers

Importance of wet lands
- They are habitats to many plant and animals speces
- They control floods by sucking the water
- They filter muddy water by trapping the impurities
- They regulate the climate by influencing the temperature and humidity
- They provide water
- They provide water for domestic and industrial use.
- They are sources of food e.g. fish
- They provide raw materials for arland crafts e.g. clay, papyrus etc
- They are sources of building materials

**POLLUTION**
Pollution is the addition of harmful (dangerous ) chemicals into the environment
Pollution takes place naturally or through human activities.

**CAUSES OF POLLUTION**
- Waste gases from industries
- Industrial waste / chemical
- Exhaust fumes from vehicles
- Oil spills from ships in the ocean
- Chemical sprays

- Non bio-degradable wastes eg polythene , glass plastics etc
- Smoke from burning tyres , oil or bushes
- Dust

**TYPES OF POLLUTION**

a) Air pollution - caused by smoke and fumes / poisonous gases.
b) Soil pollution – caused by agricultural sprays, industrial waste , refuse etc
c) Water pollution - By silt , oil spills , refuse , human waste and industrial waste washed into it.
d) Noise pollution – Due to too many vehicles or industries in the environment loud music etc

**EFFECTS POLLUTION**

- Poisoning of soil and water by chemical wastes dumped on them.
- Death and disappearance of biodiversity (variety of plants and animals living things )
- Out break of disease in the environment
- Loss of soil fertility leading to poor yields
- Formation of acidrains due to gases from industries and vehicles as they dissolve in rain.
- Destruction of habitats for many plants and animals
- Less production of plants such as fibers , timbers fruits and other construction materials

**CONTROL AND PREVENTION OF POLLUTION IN THE ENVIRONMENT**

- Uses of alternative energy source eg. bio gas , natural gas , solar energy , wind power , hydro electricity
- Ensure proper disposal of domestics and industrial wastes
- Educating people about the dangers of pollution
- Using good method of farming

**RESPIRATORY SYSTEM**

**What is respiration?**

Respiration is the process by which the body uses food and oxygen to produce energy, carbon dioxide and water vapour. Respiration takes place in body cells.

The by-products of respiration are;

i) Carbon dioxide
ii) Water vapour

**BREATHING**
Breathing is the taking in and out of air.
Or it means the constant exchange of gases between an organism and the surroundings. The respiratory organs in man are the lungs.

**The respiratory system**
- This deals with the use of oxygen in the body.
- Lungs are the respiratory organs situated in either sides of the chest cavity.
- Lungs are covered in a membrane called pleural membrane.
- Fluid that lubricates the lungs and ribs and so reduce friction.
- Lungs are protected by the part of the brain called Rib cage.
- The ribs are held in position by the intercostal muscles.
- In the lower side of the lungs is a diaphragm that separates the chest cavity from the abdomen;

The structure of the lungs, parts and their functions.

**Types of breathing**
i) Expiration (breathing out) exhalation.
ii) Inspiration (breathing in) inhalation.

Functions of parts of the breathing system
**i. The nose**
It contains mucus which /that warms and moistens air before reaching the lungs.
It contains hair like structures called Cilia that trap germs and dirt that may enter the nose.

**What happens to the air in the nose?**
Air is filtered (cleaned) warmed and moistened.

**What happens to the air in the mouth?**
No mucus to moisten and warm air.
No cilia to filter air by trapping germs and dirt.

**ii. The trachea (wind pipe)**

It has an epiglottis that protects the opening of the trachea when swallowing food.
Epiglottis prevents choking.
Air enters into lungs which contains the voice box. Inside voice box are vocal cords which help in producing sound.
Trachea contains rings of cartilage that prevents it from closing and prevents suffocation.
The exchange of gases take place in the air sacs.

**iii. The air sacs**

This is where the exchange of gases takes place by diffusion.

Adaptations of air sacs to their function
They have walls to all diffusion take place.
They are surrounded by a net work of capillaries which bring carbon dioxide and take oxygen.
They are many in number.

The structure of the villus

**Composition of air breathed in and out.**

| **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 (inhalation)**

- The volume of the chest and lungs increases.

- Diaphragm and intercostals muscles contracts.
- Ribs move upwards and outwards.
- The lungs increase in volume

**What happens during expiration /exhalation?**
- The volume of the chest and lungs decreases.
- The diaphragm and intercostals muscles relax.
- Ribs move downwards and inwards.
- The lungs decreases in volume.

**Diseases that attack the breathing/respiratory system.**

| | |
|---|---|
| Tuberculosis | Bronchitis |
| Influenza | Asthma |
| Diphtheria | Pneumonia |
| Emphysema | Whooping Cough |

**Habits that improve the working of the respiratory system**
- Avoiding smoking
- Having regular physical exercises.
- Good feeding/nutrition
- Eat food with low and fat
- Keep away from dusty places etc.

**Disorders of the respiratory system**

Choking
Hiccup
Sneezing etc

**RESPIRATION IN RELATION TO FOOD AND OXYGEN**
- Respiration is the chemical burning of food in the presence of oxygen in order to release ( produce ) energy
- Water and carbondioxide are released as by products.
- Respiration takes place in the body cells
- Food + oxygen $\longrightarrow$ carbondioxide + water + energy (ATP)

(Starch )
Types of respiration
Aerobic respiration
Is respiration which uses oxygen.
Anaerobic respiration
It is a type of respiration which takes place in absence of oxygen and in which food substances are only partly broken down. It produces lactic acid in animals and alcohol in parts. It occurs in muscles during exercise.

# SCIENCE PRIMARY SIX TERM III-2019

**SCIENCE AT HOME AND COMMUNITY**

**WATER**

Water is a colourless liquid substance made up of hydrogen and oxygen gases. These gases are in the ratio of 2:1 ($H_2O$)

**Sources of water**

- Rain water
- Artesian wells
- Hot springs
- Streams, lakes, rivers, swamps, ponds, oceans, and seas.

**Properties of pure water**

- It is colourless
- It is without suspended matter like germs.
- It has no smell
- Pure water is tasteless
- Pure water boils at 100$^o$C (212$^o$F) and freezes at 0$^o$C (32$^o$F) at sea level.
- Pure water forms lather (foam) very easily) with soap.

**Uses of water to the body**

- Water makes up part of blood as plasma

- Helps to dissolve the digested food for easy absorption in the body.
- Maintains the shape of body cells.
- Cools the body in form of sweat when it evaporates.
- Helps in formation of body fluids such as tears, saliva, urine, sweat etc.

**Other uses of water**
- For domestic use e.g. cooking, washing etc
- For drinking by man, mammals, and birds
- For irrigation in agriculture
- Used in industries for cooling, washing machines and raw materials.
- Used to generate hydro-electricity
- Used by plants for photosynthesis

**Preparation of safe water for drinking**

**i. Boiling**

When water is heated, it boils, to a temperature of 100$^{o}$C (212$^{o}$F) this temperature kills germs.

**ii. Filtering**

This is the process by which a clean or sterilized piece of cloth or local water filter.

Examples of solid impurities filtered are dirt, soil, stones, leaves, animals wastes etc.

NB: Filtered water is not safe for drinking because it may be containing some germs.

**iii. Treatment of water**

Treatment of water is when chemicals are added to kill germs in it.
Examples of chemicals used to treat water are; chlorine, water guard and aquasafe.

**Advantages of chemicals used in water treatment**

The chemicals kill germs in water

**Disadvantages of using chemicals**
- They are expensive
- They do not make water clear

- They add some smell and taste to water.

**DECANTING**
Decanting is a method of removing large particles of objects from water.
Decanting is done by pouring water slowly from one container to another so that heavily particles are left behind. In this method, the three pot system is used to purify the water.

**WATER IMPURITIES**
Impurities are contaminants or foreign objects in water. Water impurities make it unsafe for use. Impurities may be soluble or insoluble organic.

**Inorganic impurities**
It consists of dissolved mineral salts which make water unsafe to use.

**Organic impurities**
These include bacteria , fungi and protozoa others may be dead plant materials such as leaves and grass.
**Examples of water impurities**
- Human wastes
- Animal wastes like urine , dung
- Herbicides
- Insecticides
- Silt from erosion

**CLEANING CLOTHES AT HOME**
One main use of water at home is to wash clothes. This also called laundry
Step used in cleaning clothes at home
**Sorting**
- It involves selecting and putting clothes together according to colour , intensity of dirt, nature of the fabric , use of clothes etc.

**Soaking**
It is the putting clothes in soapy water for some time.
Importance of soaking clothes
- It helps to loosen dirt and dissolve stains
- It saves time during washing as it a little effort to remove it.

- It saves against tear and wear due to constant rubbing while washings.

**Washing**
It is the removal of dirt using water and detergent
**Rinsing**
Clothes are put in clean water. It helps to remove all soapy water from the clothes.
**Wringing**
It involves squeezing excess water out of the clothes
**NOTE** : Woolen clothes should be dried without wringing because it may loosen the fabric and makes them to lose their shape.

**Drying**
Some clothes can be dried out completely under the sun.
**Ironing**
It helps to remove creases from the washed clothes and bring them to their original form

## ACCIDENTS AND FIRST AID

**What is an accident?**
An accident is a sudden happening that cause harm to the body.
Accidents can take place anywhere.
They may happen at home, school, place of work, where we go for prayers, on the pitch etc.

**First aid**
This is the first help given to a casuality before he/she is taken to hospital. a casuality is a person who has got an accident.

**Burns**
These are body injuries caused by heat.

Types of burns
1. Burns
2. Scalds

**Burns and scalds**
Burns are injuries caused by dry heat.

Causes of burns

a. Hot metals
b. Hot flat iron
c. Acids
d. Glowing charcoal
e. Hot charcoal stove
f. Fire

**Degree of burns**
Burns and scalds are described using the word degree to tell how severe they are;
There are three types of degrees of burns. These are;

a) First degree burns
b) Second degree burns
c) Third degree burns

**First degree burns**
These are minor burns which do not form blisters.
A blister is a raised skin with a liquid under neath.
The skin is tender for several days
The skin is unbroken.

**First aid**
Put the burnt area in cool water immediately after the accident.

Why?
To reduce the temperature of the burnt part.
N.B; First degree burns need no dressing.

**Second degree burns**
These are burns which form blisters.
They are severe than first degree burns.

Signs of second degree burns

a) Blister are formed

b) Unbroken blisters

**FIRST AID**
If the blister is broken, wash the area with clean water and soap.
Cover the skin with a bandage or clean cloth.

NB; It is not good to break the blister because it may lead to infection of the wound by germs. Fats, oil, coffee, herbs or dung should never be put on the burn because they can cause infection.

Sugar should not be put on the burn because it attracts houseflies which bring germs to the wound.
The victim of the second degree burns should be given plenty of fluids to drink.

**Third degree burns**
There are burns which cause deep burning of the skin.
The skin is burnt deeply and it appears shinny white.
a) The skin is burnt deeply

**FIRST AID**
Put the burn areas in cool water.
Encourage the casuality to drink a lot of fluids.
NB: Patients of second and third degree burns should be given a lot of fluids to drink.

**Why?**
They lose a lot of fluids through the burnt skin by evaporation

**Prevention of burns and scalds**
- Use heat insulators to handle hot objects.
- Cooking from raised places
- Keep petroleum products out of reach of children.
- Do not allow young children to cook.

- Refill lanterns or lamps after putting them off.
- Teach children the dangers of burns
- Tell children to play away from fire places.

**Fever and convulsions**
Fever is the condition of the body when its temperature goes beyond the normal.
The normal body temperature is 37ºC or 98.4ºF.
Fever is not an illness but a symptom of many illnesses such as malaria, typhoid, measles, etc

**Effect of fever**
It can lead to convulsions

**Convulsions**
These are uncontrollable jerky movements of the body.
Convulsions can be stopped if the disease causing them is treated.

**First aid for convulsions**
- Remove all tight clothes from the body of the victim.
- Put an object in the mouth of the victim to stop him from biting the tongue.
- Give the victim plenty of cold drinks after recovery.
- Take the patient to hospital

**First aid for fever**
Carry out tepid sponging (cold compress).
A wet cloth is put on the forehead or chest of a victim.

**Caution**
Do not use very cold water because it leads to convulsions.

**Fainting**
It is the loss of consciousness for a short time

**Main cause of fainting**
Reduced supply of blood rich in oxygen and food to the brain.

**Conditions that can lead to fainting**

- Anxiety
- Heavy body exercises
- Extreme sorrow (sad news)
  fear
- Prolonged hunger

**FIRST AID**

- Put the victim in open air.
- Remove tight clothings around the neck and chest to enable the victim get enough oxygen.
- Raise the legs of the victim higher than the head.

**Why?**

To allow blood flow faster to the brain.
Don't allow the victim to be over crowded

**DROWNING**

This means dying as a result of having lungs filled water.
Drowning has no first aid since the victim dies.

**Near drowning**

It is temporary loss of breath due to having one's lungs filled with water.
A person who has nearly drowned has only four minutes to live therefore a first aider must be very fast to save his life.

**First Aid**

Remove the victim quickly from water
Shout for help
Lie the person on his back.
Carry out mouth to mouth breathing (kiss of life)

**How to carry out mouth to mouth respiration**

- Make the victim to lie on his back
- Tilt the head backwards and keep his mouth opened

- Remove any object stuck in the mouth
- Press the victim's nostrils with your fingers to close them
- Put your mouth directly into the mouth so that the chest rises.
- Stop a bit to let the air out and blow again
- Repeat this many times (about 15 times in a minute)
- Continue the steps until the victim can breathe again by himself.
- Place the heels of your hands between the navel and the ribs of the victim
- Make a quick strong push forward into the ribcage.

**How to prevent near drowning**
- Acquire swimming skills
- Always empty bath tubs
- Covering all septic tanks
- Putting on a life jacket when traveling on water.
- Fencing pits that builders used to trap water
- Do not allow children to go near water sources without adults
- Do not allow babies to play in basins full of water.

**Common drowning places**
- Swimming pool
- Ponds
- Streams
- Lakes
- Wells
- Seas and oceans
- Bath tubs

**Nose bleeding**
This is the flow of blood from the nose.

**Causes**
- Over inhalation of dry air
- Over blowing or one's nose with cold

- Taking foods one's body is allergic to.
- Taking medications for a long time (aspirin, garlic, ginger)
- Over inhalation of dry air dries the blood vessels in the nostrils and they break.
- Over blowing the nose over strains the blood vessels in the nostrils and they break.
- Taking aspirin, garlic, and ginger prevents normal blood clotting and instead thin the blood.

**First Aid**
- Let the causality sit and bend forward.
- Squeeze the upper side of the nostrils.
- Encourage the causality to breathe through the mouth to prevent over straining the blood vessels.
- Keep the head of the victim higher than the level of the heart.
- Put the ice wrapped in a towel on the nose and check

**Why?**
To make the lining of blood vessels in the nostrils moist.
NB: do not make the causality to lean back because it allows blood to flow back to the throat which may cause vomiting or irritation.

**Prevention**
- Keeping the nostrils moist
- Taking citrus fruits such as oranges and lemons to strengthen the lining of blood vessels.
- Taking foods one is not allergic to.

**Foreign bodies**
A foreign body is any unwanted matter that enters the body.
**A foreign body may enter the body through the;**
- Nose
- Mouth
- Anus
- Eye
- Ears
- Vagina

**Examples of foreign bodies**
Insects

Small stones
Seeds (coffee, berries, beans, g.nuts)
Dirty or dust
Soil

**Foreign body in the eye**
Objects that enter in the eye include; dust, small insects, soil.

**First Aid**
Wash the eye with plenty of clean water.
Use the corner of a soft piece of cloth to remove the foreign body.
Take the victim to the oculist.

**Foreign body in the ear**
Examples
Small insects
Small seeds
Small stones

**First Aid**
- Make the victim sit and bend the head to one side.
- If it is an insect, pour clean water in the ear for the insect to float and come out.
- Flash light at the entrance of the ear if the foreign body is an insect.
- Take the victim to the hospital

**Foreign body in the nose**
Foreign bodies in the nose include;
- Small insects
- Small seeds
- Small stones

**First Aid**
Tell the victim to blow his nose hard and fast.
Take the casuality to the health worker.

**Foreign body in the throat**
Foreign body in the throat are mainly large pieces of food or small bone.
Foreign body in the throat lead to choking and death.

**First aid**
- Give the victim a number of sharp blows in the back
- Wrap your arms around his waist and press the belly upwards strongly.
- If the victim is unconscious, lie him on his back and make several sudden pushes on the belly using heels of your hands.
- It the person does not breathe, try mouth to mouth breathing.
- Take the victim to hospital
- If the victim is smaller than you, turn him over your folded leg and give sharp blows at the back.

**Preventing accidents caused by foreign bodies**
- Chew food properly
- Do not talk or laugh when eating
- Keep beads, button, coins, and seeds out of reach of children
- Putting on glasses while moving on motorcycles and bicycles
- Teach children not to put seeds, coins, stones, and soil in their eyes, nose, ears, and mouth.

**Poisoning**
Poison is any substance once taken into the body damages body organs or causes death.

**Ways poison can be introduced into the body**
- Through food
- Through air
- Through animal bites (snakes, rapid dogs)
- Through injections
- Through swallowing (orally)

**Common house hold poisons**

| | |
|---|---|
| Paraffin | herbicides |
| Root poison | Jik |
| Petrol | Insecticides |

| | |
|---|---|
| Wormcides | Diesel |
| Acaricides | Drugs (Aspirin/ chloriqune) |

**Signs of poisoning**
- Rapid breathing
- Fever and sweating
- Feeling thirsty
- Mental confusion
- Comma
- Vomiting
- Loss of balance

**First Aid**
Give the casuality a lot of fluids (fresh milk).

Why?
To dilute poison in the stomach
Make the person vomit in case its non-corrosive poison.

**How to make the person to vomit**
- Placing the finger in the mouth or throat.
- Give the victim water mixed with soap
- Rush the victim to the hospital

NB: If the causality has taken paraffin, petrol, or bleach (Jik), do not make him vomit.

Why?
It causes more damage to the stomach and gullet.

**Preventing poisoning**
- Keep petrol, paraffin out of reach of children
- Keep drugs out of reach of children
- Follow the doctor's prescription

- Buy drugs from recommended pharmacies
- Dispose expired drugs.
- Avoid drugs misuse

The ABC technique followed before giving first AID

A- Air way
B- Breathing
C- Circulation

**TOPICAL QUESTIONS**

1. Mention the main reason for giving first aid

2. Distinguish burns and scald.

3. How is the cause of burns similar to that of scalds?

4. Why should a burnt hand of a victim be dipped in cool running water?

5. Why is it not advisable to break blisters on the skin?

6. How do heat insulators prevent burns and scalds?

7. Define fever.

8. List down the main effect of fever.

9. Explain the first aid you can give a person who has fever.

10. How would you help a person who has convulsion?

11. What is fainting?

12. State the main cause of fainting?

13. How does drowning differ from near drowning?

14. Why should patients of second and third degree burns be given a lot of drinks?

15. Give one difference between first degree burns and third degree burns.

16. Why is it not good to make the victim who is nose bleeding to face up.

17. How does a foreign body in the throat cause choking?

18. Why would you give plenty of drinks to a person who has taken poison?

19. Why is it dangerous to make a person who has drunk paraffin to vomit?

20. Mention one way of preventing poisoning at home.

**SANITATION**
**Definition:**
Sanitation is the general cleanliness of a place where we live.

**Ways of maintaining sanitation**
- Construction of latrines or toilets for proper disposal of wastes.
- Digging rubbish pits and providing dust bins for proper disposal of house hold refuse.
- Slashing bushes around the homes.
- Draining away all stagnant water to deny mosquitoes breeding and protecting water sources.

**Constructing a latrine or toilet**
A latrine is pit dug in the ground where human excreta is deposited.

**Uses of latrines**
They keep faeces and urine where vectors cannot bring them to our food.

Types of latrines

i) Pit latrine
ii) Toilets
iii) Potties

**Pit Latrines**

**Qualities of a well built latrine**

- It should be 5 to 7 metres deep
- The floor should be strong enough to stand on and smooth to sweep and clean.
- It should have a hole big enough to allow faeces and urine to pass and small enough to prevent children from falling inside.
- It should have spiral walls and doors to provide privacy to the user.
- It should have a lid to cover the hole.

NB: Covering controls bad smell and the movement of flies is controlled.

- It should be constructed 10 metres away from the main house and 30 metres from the water source.
- It should be built below the water table or source to avoid contamination.

**Site of a pit latrine**

- It should be atleast 10 metres from a living house to prevent flies from carrying germs on to food.
- It should be atleast 30 metres away from a water source (water table) to prevent feaces and urine seeping in to water source and contaminate it.
- It sinking rainy seasons
- Should not be built above the water table to prevent the feaces and urine going into and contaminate.

**Types of Pit latrine**

i) Ordinary pit latrine
ii) VIP latrines

**Ordinary pit latrine**

It is common in villages
It should have a lid to cover the hole.

**The VIP latrine**

It is a special type of a latrine with a vent pipe to take out smell and a screen on top to trap flies.

**Important features of a VIP latrine**

- Vent pipe: it lets out bad smell.
- Screen on top: traps flies
- Spiral shaped walls no doors for free circulation of air.
- It has no lid to let in air

**How to construct a VIP latrine**

- It should be at least 10 metres away from any school, house, kitchen, and other buildings
- It should be 30 metres away from any water source.
- It should be built on solid ground and not in valleys or swamps.
- Dig a pit of about 5-10 metres deep

**Cover the pit in any of the following ways;**

i. Use strong poles of hard timbers
ii. Metal bars
iii. Build a house on top of the pit
fix a net or screen on top of the vent pipe.
Place the pipe in its hole.

**How to maintain a VIP latrine**

- The floor should be swept or washed if it's cemented.
- Wash or remove any feaces, insects, cobwebs and dust from walls and corners of the roof
- Trim grass and bushes around the latrine
- While using a latrine, make sure that the feaces go directly into the hole.
- Clean with any soft tissue or leaves
- Wash your hands with soap after using the latrine.

**Toilets (water closet system)**

This is a bowl shaped device used for disposing human waste, which is flushed away the bowl by water from a tank (cistern).

**Components of a flush toilet system**

Parts include;

i. A tank that stores water for flushing
ii. A seat with a cover for sitting.
iii. A pipe that takes water from the tank to the bowl and another that takes it to septic tank.
iv. A septic tank, an underground storage hole for human waste and waste water from kitchen and bathroom (i.e.Sewage)
The waste materials in the septic tanks are called sewage.
Sewage from septic tanks may be carried away by pipes (sewers) for treatment to make it less harmful.
Where there is no pipe system, it is carried using vehicles called cesspool emptiers.
In Uganda, collection and treatment of sewage from homes and institutions is done by National water and sewage corporation (NSWSC).
v. The lever is either pulled or pushed top release water during flushing.

Flush toilets are commonly used in cities, towns and other places where there is piped water.

**Advantages**

- Can be put inside the house and vehicles
- They are easy to clean
- They are user friendly, even young children can use them.

**Disadvantages**

- They are very expensive
- They require a lot of water to function
- They are only used where there is piped water.
- They can easily get blocked if hard objects are put in it.

**How to maintain flush toilets**

- Keep the seat clean, do not step or urinate in them.
- Flush toilets after use.
- Use only soft tissue or toilet paper after cleaning your self.
- Do not use the toilet when it is blocked.

**THE REPRODUCTIVE SYSTEM**

Growth is an increase in size e.g. changes from larva to adult.
Development refers to growing gradually and becoming more mature.

**Reproduction**
This is the process by which all living things multiply and increase in number (become many) i.e. give rise to new off-springs (young ones) to continue a generation of the species.

**Types of reproduction**
There are two types of reproduction
i) Asexual reproduction
ii) Sexual reproduction

**ASexual reproduction**
This is the type of reproduction where no reproductive cells (gametes) are used to produce young ones.

**Examples of asexual reproduction**
Vegetation propagation in plants e.g. budding, grafting, layering, marcoting, stem cutting, sulkers, bulbs crown, slips, leaves, and root cutting, cell division, binary fission in single celled animals e.g. Amoeba, bacteria, paramecium.

**Sexual reproduction**
This is the type of reproduction which involves joining (fusing) or two reproductive cells, male and female gametes.
The union /fission of a male female gametes is called fertilization.
The nuclei of the two cells unite and form a Zygote develops into a new individual or foetus.
In animals, the male reproductive cells (gametes) are called sperms and are produced by the reproductive organs called testes.
The female reproductive cells are called Ova and are produced by the ovaries.

**Hermaphrodites**
These are animals that contain (have) both male and female reproductive organs (Testes and Ovaries) on themselves. E.g. earth worms and snails.

**Types of fertilization**
There are two types of fertilization
i) External fertilization
ii) Internal fertilization

**External fertilization**
This is where the female lays eggs and the male pours sperms on them outside the mother's body to fertilize them e.g. fish and amphibians.

**Internal fertilization**
This is when eggs are fertilized inside the mother's body after mating.

**Human sexual reproduction**
Diagram showing the cross section of the female reproductive organs (system)

The female reproductive organs and their functions
**The Ovary:** there are two ovaries. One on the left and another on the right. Ovaries produce ova (ovum) the female reproductive cells.
**Oviduct (fallopian tube):** it is the tube down the uterus (womb) from the ovary. It is the passage for an ovum to the uterus. This is where fertilization takes place.
**Uterus (womb):** it is a bag like structure inside which the foetus or Zygote grows from.
**Cervix:** This is a ring of muscle which helps to close the lower end of the uterus to the vagina there by protecting it /foetus from external damage.

The structure of gametes
i) Female gamete (an Ovum)
ii) Male gamete (sperm)

The structure of male reproductive organ

Functions of parts of the male reproductive organ
**Scrotum:** it is a sac or bag that encloses and protects the testes.
**Testes**: these are glands that produce the male seminal fluids containing sperms; They lie outside the abdominal cavity to make them have lower temperature than the normal body temperature for maximum production of sperm; They start producing sperm cells during adolescence from age 11-16years
**Epididymis:** it is a long coiled tube which stores and then carries sperms.

**Sperm duct:** It is an extension of the epididymis and delivers the sperms to the urethra where they pass and go out.
**Prostrate gland**: produce a fluid (seminal fluid) which helps to neutralize (make harmless/ the acid in urine in the urethra. It also kill germs which are in sperms.
**Seminal vesicles**: it stores excess sperms.
**Erectile tissue (penis):** it is a spongy tissue which when filled with blood it erects (stands) to ejaculate sperms.

**Ovulation**
This is when mature ova are released from the ovary.
An ovary releases an ovum every month i.e. the release of ova is done alternately.

**Menstruation**
This is the periodic release of blood from uterus as a result of rapture of the uterus walls when fertilization has taken place
This helps to wash and clean the uterus in preparation to receive a foetus.
NB:
The first menstruation called menarebe starts in girls between the age of 9-15 years.
The last menstruation period end at around 45 years and is called menopause
Normal menstruation takes 3-4 days.
It takes place after every 28 days if all conditions are normal.
It may be interrupted by conception, strong fever, or any abnormalities in the body.

**Care during menstruation**
- To prevent infection and avoid germs, diseases, one must be clean.
- Use sanitary materials such as tampax, tampons, always, cotton.
- Visit health workers incase abnormalities are noted.

**Fertilization**
- Fertilization takes place in the oviduct /fallopian tube.
- Immediately after fertilization, the zygote moves to the uterus.
- The zygote attaches itself on to the placenta with the help of an umbilical cord, this process is called implantation.
- The placenta supplies the embryo with food nutrients and oxygen at the same time it removes waste products.
- The umbilical cord transports food to the foetus and waste products from the foetus to the placenta to be carried away by blood.
- The period of pregnancy from conception to birth is called gestation period and lasts for 9 months in humans.
- Development of the foetus takes place in the uterus.
- The ammotic fluid act as shock absorber and protect the foetus.

- The amnion/ amniotic membrane protects the body and had the fluids.

**The stages of development are;**
Fertilization - Zygote - Foetus - baby
**Diagram showing development of the foetus in uterus**
Sex determination
Sex of a child is determined by chromosomes found on the gametes/ sex cells, there are X and Y chromosomes XX chromosomes are for girls and XY for boys. Sperms carry XX and XY chromosomes

**Signs of pregnancy (good and Bad)**
- Morning sickness
- Vomiting and nausea
- Swollen legs
- General body weakness
- Swollen belly
- Frequent urination
- Faster breathing

**Requirement s of an expectant mother (pregnant mother)**
- Good diet (balanced diet) for proper growth of the baby.
- Should avoid taking drugs like tobacco and alcohol.
- Should visit antenatal clinic for medical check up and advice.
- Should rake vaccine against tetanus (texonus toxed)
- Enough rest and sleep.
- Wear maternity dresses to have comfort
- Perform light physical exercises

**BIRTH AND LABOUR**
After nine months of pregnancy, the mother will go into labour and produce a child.
This is called giving birth or parturition (child birth).
Labour refers to the effort of child birth shown by contractions of the uterus.

**What makes a baby after birth cry?**

It is due to sudden change in temperature (environment change). Crying helps to start the normal functioning of the lungs i.e. breathing starts at birth.
NB: incase a baby fails to cry/breathe artificial breathing should be done immediately.
Single child birth: this is when one child is normally born to mother.
Multiple birth: this is when two or more babies are born at the same time.
Twin: when two babies are born at the same time by the mother.

**Twins**
Identical twins
This is when one fertilized ovum divides normally and grows into two separate babies.
Identical twins are usually same sex
All their physical aspects are the same.

**Siamese twins**
These are twins whose body remained joined /fused at one point.

**Fraternal twins**
This is when two ova are released and fertilized and then develop into twins fraternal twins are not always the same sex.

**Multiple birth**
If there are three or more ova released and fertilized it results into multiple birth.

**Examples of multiple births**
Triplets: Three children are born
Quadruplets: Four children are born.

**Birth Control Contraception**
This is a method of avoiding getting many children you can not care for properly i.e. having the number of children you want and when you want them.

**Family planning**
This is the use of birth control methods to get the number of children you want and when to have them in family.

**Child spacing**
This is the provision of enough time between the birth of the different children in family.

**Functions of family planning association**
- It educates people about child spacing
- Educates people about quality of life when children are few
- Provides people with family planning contraceptives.

**Reasons why people have many children**
- Ignorance of family planning methods.
- High infant mortality rare
- Traditional practices and values (customs)
- Prestige or fame and security.

**Problems of having many children**

If a family has too many children, there will be;
- Inadequate financial resources.
- Lack of enough food for the children
- Poor education for children
- Lack of proper medical care
- High infant mortality rare
- Mothers sickness as a result of having too many children e.g. miscarriage, maternal anemia, fatigue, low birth etc.

**How to avoid infant mortality rate (death)**
- Immunization against infant killer diseases.
- Participating in health care services e.g. health education
- Practice family planning.

**Advantages of family planning**
- Immunization against infant killer diseases
- It reduces risk of serious disease and maternal death.
- It reduces cases of abortion/miscarriages

- It improves the health and well being of the family.
- Controls population growth.

**Methods of birth control**

There are two methods used for birth control namely;

i) Natural Methods
ii) Artificial methods

**Natural methods**

- Abstaining from sex
- Withdrawal/pulling out before releasing sperms during sex
- Bed separation by couples
- Prolonged breast feeding
- The mucus method (testing Jell)
- Using calendar or moon beads.

**Artificial methods**

- Use of condoms
- Use of contraceptive pills
- Birth control injections e.g. injecta plan,
- Intra uterine devices e.g. coils, spirals, diaphragm.
- Use of jellies and foams
- Sterilization by vasectomy in men and tube ligation
- Using norplant

**MYTHS AND MISCONCEPTION ABOUT ADOLESCENCE AND REPRODUCTION HEALTH**

- A myth is a traditional belief that is not true
- Misconceptions are false ideas or beliefs

| Myths and misconceptions | Truth |
|---|---|
| Family planning contraceptive make women permanently barren | When a woman feels she should become pregnant , she just stops using the contraceptives and become pregnant again |
| Family planning increases teenage pregnancy | Instead teenagers are protected against unwanted pregnancies and STDs / STIs |

| | |
|---|---|
| Use of contraceptive causes high blood pressure and kills women during birth | Once the women use the right drugs as advised by the trained worker. Complications are reduced |
| Use of contraceptive leads to producing babies with abnormalities such as having one eye , ear being blind or lame | This is not true |
| Family planning is against the teaching of the church | Atleast the church supports the natural family planning method. |
| Contraceptives make women to loose hair on the head and grow beards | There is no scientific proof about this |

**Changes during adolescence and puberty**

**Adolescence**

Adolescence is a period of development changes between child hood and adult hood.
A person at this stage is called an adolescent.

**Puberty**

This is the period of physical mental and sexual maturity i.e. when becomes a young adult capable of producing.
Changes in adolescents at puberty are called sex characteristics

There are three types namely;

i) Primary sex characteristics
ii) Secondary sex characteristics
iii) Emotional /psychological sex characteristics

**Primary sex education (Basic)**

This involves the development of sexual organs for reproduction.

**Primary sex characteristics in boys**

Penis and testicles enlarge (increase in size)
The testicles start producing sperms (boys begin experiencing wet dreams.
Internal organs begin producing fluid like semen.

**Primary sex characteristics in girls**

Thickening of uterus walls
Menstruation begins
Ovaries develop and start releasing eggs (ovulation starts)

**Secondary sex characteristics (physical)**
These involve the physical development of the body parts.

**Secondary sex characteristics in boys**
- Voice breaks and deepens
- Hair grows on different parts of the body e.g. penis, armpits, chest, around the mouth and anus.
- Bones and muscles enlarge i.e. a boy becomes muscular.
- Sweat glands become more active.

**Secondary sex characteristics in girls**
- Breasts enlarge and looks tender and attractive
- Sweat glands become active making the face look smooth
- The hip (pelvis) enlarge and a girl puts on a lot of weight.

**AIDS**
The term AIDS stands for; Acquired Immune Deficiency Syndromes
**Acquired** means got from outside the body
**Immune** means protected against or safe from disease, the body is always protected by white blood cells.
**Deficiency** means lack or shortage or AIDS virus destroys white blood cells and the body has shortage or shem.
**Syndromes** mean a collection or group of diseases and signs which show the presence of a disease.
AIDS is a pattern of disease symptoms which attach and destroy white blood cells leaving the body unprotected against infections.

**Causes of AIDS**
AIDS is caused by avirus called HIV (Human Immunodeficiency Virus) commonly called AIDS virus.

**Transmission of AIDS virus**
- AIDS virus can only survive in the human body.
- The disease can be spread when body fluids of an infected person get into contact with that of the healthy person.
- Body fluids can be exchanged in the following ways;
- Sexual contacts with an infected person.
- Blood transfusion from an infected person.

- Sharing or using sharp cutting instruments
- From an infected pregnant mother to her newly born baby at birth.
- From the mother to the baby through breast feeding.

**AIDS virus can not spread by;**
- Normal shaking of hands
- Bites from mosquitoes and bed bugs
- Caring for AIDS patients
- Sharing cutlery and cooking utensils
- Hugging or embracing AIDS patients
- Cleaning, washing beddings and clothing of people with HIV/AIDS

**Signs and symptoms of HIV/AIDS**
**Signs**
- The major signs of AIDS are;
- Herpes zoster locally called "Kisipi" which inflames the skin making it appear as scalded.
- Chronic diarrhoea which may last for more than a week
- Sudden loss of about 10% of the normal body weight.
- Skin cancer which is also called Kaposis scarcomer, it causes itching and leads to scratching that leaves black spots.
- Swollen lymph glands especially those of the neck and armpits
- Oral thrush where by the tongue, gums, lips, and inside of the mouth plus the alimentary canal
- Chronic cough which lasts long.

**Symptoms**
- Tiredness without any proper cause
- General body weakness
- Persistent fever which is on and off
- Loss of appetite

**People who are at risk of getting HIV/AIDS**
- Sexually active people between the ages of 15-45years
- Rape and defilement victims

- Long distant truck drivers and traders who often have casual sex when away from their married partners for along time.
- Prostitutes who sell themselves for sex to many partners.
- Bar attendants.

**Effects of AIDS/HIV**
- These are many effects of HIV/AIDS on infected person, family and community.
- They suffer personal pain from the disease.
- The family spends a lot of money on treatment, care and feeding.
- They are stigmatized or isolated in the society.
- Loss of family income if the bread winner dies.
- Many children are orphaned and become child parents.

**Prevention and control of HIV/AIDS**
- There is currently no cure against AIDS, so people need to guard themselves against the disease by;
- ABC approach
- Having one faithful sexual partner
- Abstain from sexual intercourse until marriage
- Avoid practices which involve risks of getting AIDS like tattooing, ear piercing.
- Use of condoms during sex.
- Screening blood before marriage and transfusion
- Sterilizing medical instruments.
- Disposing syringes and needles after use.

**How can we manage AIDS patients**
- People with AIDS need support in many ways..
- Eating a balanced diet.
- Join good social groups to relax and avoid heavy work.
- Should give up bad habits like smoking and drinking alcohol

**DISORDERS OF THE REPRODUCTIVE SYSTEM**
- Impotence is the inability of a man's penis to become stiff or erect
- Low sperm count

- Is the inability of the testes to produce enough sperms
- Penile cancer
- This is the growth of abnormal cells that form on the penis

**Enlargement of the prostate glands**
This disorder is common in elderly men over 50 years of age

**Fibroids**
These are swellings called cysts that develop on the wall of the uterus.

**Ectopic pregnancy**
This is a condition when a fertilized egg implants itself in the oviduct

**Ovarian tumours**
These are masses of abnormal cells that form on the ovary

**Cervical cancer (cancer of the cervix)**
This is the condition in which the cervix develop tumours

**Inflammation of the oviduct.**
- Counseling, is a special form of communication through which a person is helped to control his/her feelings by a counselor

**Types of counseling**
- Pre-HIV antibody test counseling
- Pest-HIV antibody test counseling
- Counseling HIV/AIDS patients

**Importance of counseling**
- It prevents AIDS victims from committing suicide
- Avoids spread of the disease to others knowingly.
- To encourage people to continue to live longer and useful.

**Organization in Uganda that offers counseling services**

In Uganda, there are many governmental organizations which offer counseling.

**TASO:** The AIDS Support Organization. It also provide food supplements food for patients.

**AIC:** AIDS Information Centre

**ACP:** AIDS Control Programme of ministry of health. It also provides HIV/AIDS testing.

**Gonorrhea**

- It is a venereal disease caused by a bacterium called gonococci (sing gonococcus)
- It is spread through unprotected sexual intercourse with an infected person.

**Signs in men**

- Pain when urinating
- Discharge of pus from the penis
- Painful swelling on the testicles
- Rash and sores on the genital areas

**Signs in women**

- Slight pain when urinating
- Sometimes very painful monthly periods.
- Vaginal discharge of smelly pus
- Pain in the lower abdomen.

**Signs in babies**

- Red and swollen eyes
- Pus comes out of the baby eyes
- Blindness.

**Effects of gonorrhea**

- It leads to permanent damage of male and female reproductive organs.
- Leads to sterility in both men and women.
- Cause blindness in babies.

- Blocks the urethra making urination difficult and painful.

**Control and prevention of gonorrhea**
- Using the ABC formula for preventing AIDS and other STDs.
- A-Abstain from sexual intercourse
- B- Be faithful to your partner
- Condoms should be used during sexual intercourse
- Seek early medical treatment
- Stop playing sex until you are completely treated.

**Syphilis**
Syphilis is a chronic and dangerous venereal disease caused by a bacterium called Spirochere
It is spread by having sexual contact with the infected person.

**Signs and symptoms vary with stages**
- Painful sores called chancre appears 2-5 weeks after infection.
- In second stage a number of signs and symptoms such as sores in mouth, throat, itching skin, rashes appear.
- In the third stage the bacteria cause heart disease, paralysis, blindness and insanity or madness.

**Prevention and control of syphilis**
It is prevented by practicing ABC approach
Infected people should see a doctor immediately

**Other urinary tract infection**
- Pelvic inflammatory diseases (PID)
- Infected people should see a doctor immediately
- It affects the abdominal and pelvic area.

**Epididymis**
Serious infection of the epididymis leading to swelling tenderness and pain in the testicles.

**Genital herpes**
These are sores (inflammation) of the genitals caused by virus called herpes simplex.

**Trichomoniasis Vaginalis**
It is caused by protozoa called trichomonas
The disease causes inflammation of the vagina

**Genital warts**
These are sores in the sexual parts and around the anus.
They are caused by a virus.

**Hydrocell**
It is an increase in quantity of fluids in the sac around the testis and epididymis.

**Orchitis**
Inflammation of the testis due to injury or infection of tuberculosis

**Candidasis**
It is also called thrash and is caused by a fungus

**Sterility**
In ability of a man to impregnant a women or a woman failing to conceive

**Lymph glandcoma**
This refers to enlarge lymph nodes spread by sexual contact.

**Urethriris**
A disease that cause the urethra to become sore and swollen.

**Prevention**
- Using ABC approach
- Seeking medical attention
- Personal hygiene especially of the genitals.

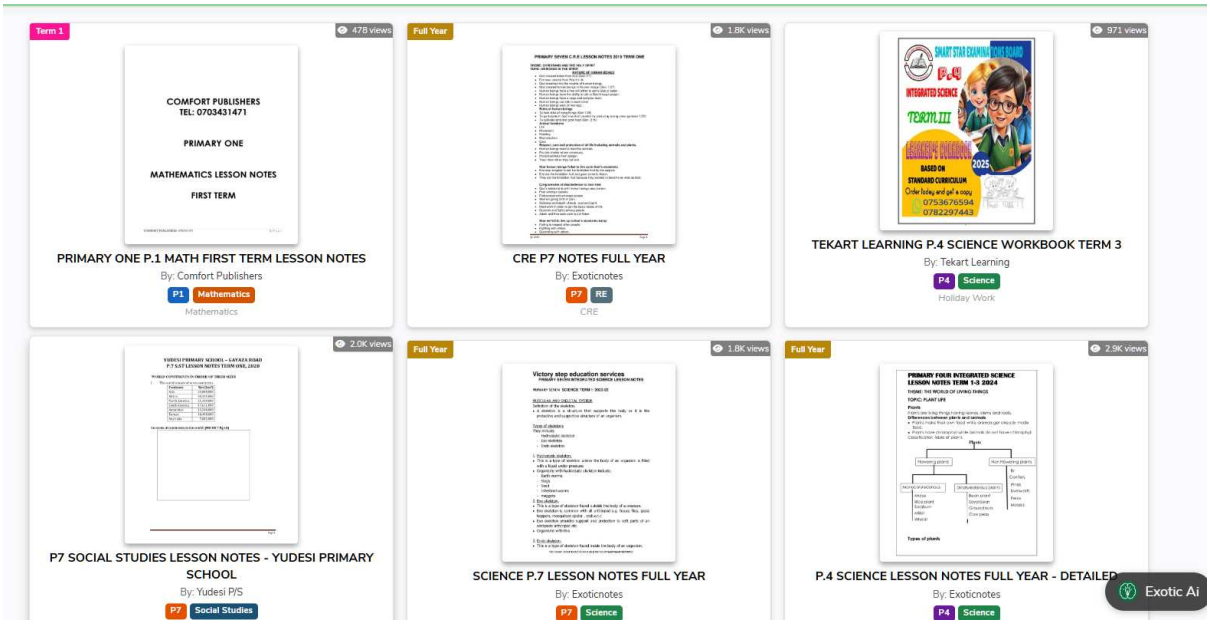
**PIASCY MESSAGES ABOUT ADOLESCENCE AND REPRODUCTIVE HEALTH**
PIASCY STANDS
P – Presidential

I – Intitiative on
A – Aids
S – Strategy for
C – Communication to the
Y – Youth
The following messages are passed to us through PIASCY activities

- Abstaining from sex until marriage
- Learn how HIV is transmitted
- HIV damages the immuse system
- People living with HIV and AIDS need care and support
- Testing for HIV
- Managing menstruation
- You need to understand how your body changes at puberty
- Sexually transmitted infections make it easier for HIV infections
- Say No to sex for gifts
- Life skills helps to protect you from HIV.
- Using violence to get sex is wrong
- You have the right to say No to forced marriages.
- Say No to bad touches
- Choose to delay sex
- Avoid risky places and risky behaviours

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