**MOTHER MAJERI PRIMARY SCHOOL**

**PRIMARY SIX SCIENCE LESSON NOTES FOR TERM 1, 2019.**

**THEME: THE WORLD OF LIVING THINGS**

**TOPIC:CLASSIFICATION OF LIVING THINGS**

**What are living things?**

-Living things are things which have life.

**Characteristics of living things**

* They feed.
* They grow.
* They breathe.
* They respire.
* They move.
* They excrete.
* They reproduce.
* They respond to stimuli.

**What are stimuli?**

-These are signals in the environment to which living things respond.

**Examples of stimuli**

* Water
* Light
* Touch
* Gravity
* Chemicals

**Groups of living things**

* Plant kingdom
* Animal kingdom
* Bacteria/Monera kingdom
* Fungi kingdom
* Protoctista kingdom

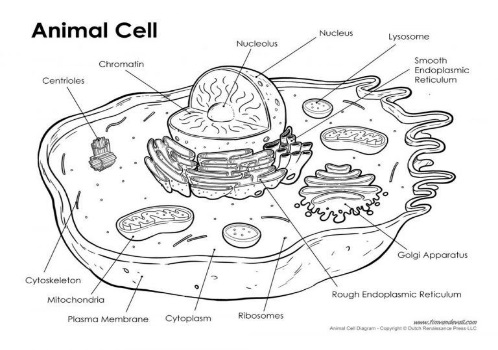
**NB**: All living things are made up of cells.

**What is a cell?**

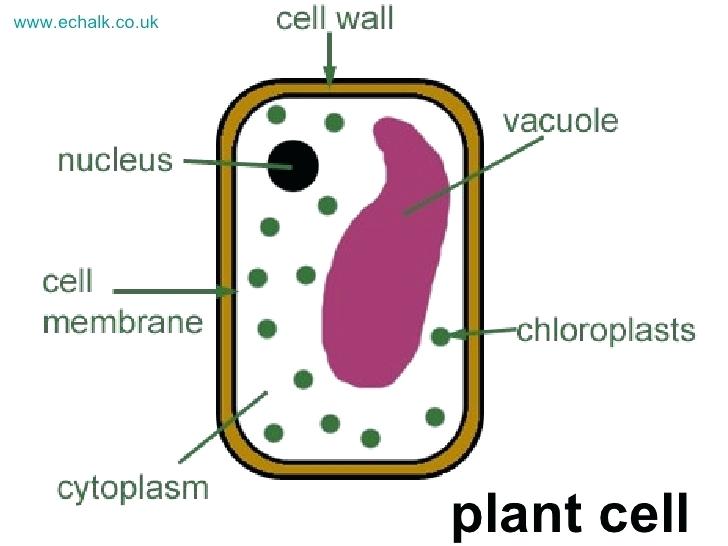
-A cell is the smallest functional unit of a living thing.

-Cells enable living things to grow, excrete, reproduce and protect themselves.

**A structure of an animal cell**



**A structure of a plant cell**

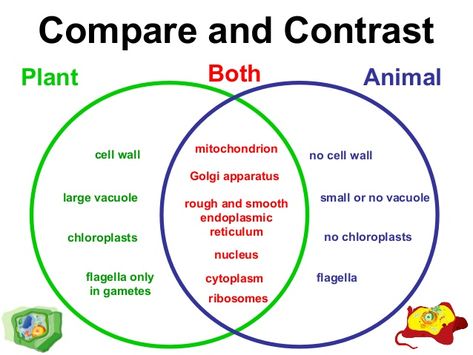


**Where does respiration occur in a cell?**

* Mitochondria.

**Differences between plants and animals**

* Plants have chlorophyll while animals lack chlorophyll.
* Plants make their own food while animals can’t make their own food.
* Plants have slow response to stimuli while animals have quick response to stimuli.
* Plant cells have cell walls while animal cells don’t have cell walls but have cell membranes.
* Animals move from one place to another while plants can’t move from one place to another.



**ANIMAL KINGDOM**

**Classification of animals**

-Classification is the grouping of things according to their common characteristics and features.

**Why are animals classified?**

* For easy identification

**Factors considered when classifying animals**

* Ways of breathing
* Ways of reproduction
* Body divisions
* Adaptation to the environment
* Number of legs
* Ways of movement
* Mode of feeding

**Groups of animals**

-Animals are divided into **two main groups**, namely;

* Vertebrates
* Invertebrates

**VERTEBRATES**

-Vertebrates are animals with backbones.

**Characteristics of vertebrates**

* They have backbones.
* Their brains are protected by the skull.
* They have endoskeleton.
* They have water proof skins.
* They have an alimentary canal.

**Classes of vertebrates**

-There are five classes of vertebrates, namely;

* Mammals
* Birds
* Fishes
* Reptiles
* Amphibians

**Major groups of vertebrates**

* Warm blooded (homoeothermic) vertebrates
* Cold blooded (poikilothermic) vertebrates

**Vertebrates**

**Warm blooded cold blooded**

**Homoeothermic poikilothermic**

**Mammals Birds AmphibiansFishesReptiles**

**Warm blooded vertebrates**

-These are animals that keep their body temperature constant.

-Their body temperature does not change according to the surrounding.

**Groups of warm blooded vertebrates are;**

* Mammals
* Birds

**Cold blooded vertebrates**

-These are animals that cannot keep their body temperature constant.

-Their body temperature changes according to the temperature of the environment they live in.

**Groups of cold blooded vertebrates are**;

* Amphibians
* Fishes
* Reptiles

**Examples of cold blooded animals**

* Frogs
* Toads
* Fish
* Lizards
* Tortoises
* Salamander
* Snakes
* Chameleon

**FISHES**

-This is a group of vertebrates with a scaled body living in water.

**Characteristics of fish**

* They have streamlined bodies.
* They have scaled bodies.
* They have fins for swimming and protection.
* They are cold blooded animals
* They use gills for breathing in dissolved oxygen in water.
* They reproduce by laying eggs.
* They undergo external fertilization.
* They have nostrils for smelling food materials.
* They have lateral lines for detecting sound waves in water.
* They live in water.

**Objects with streamlined bodies.**

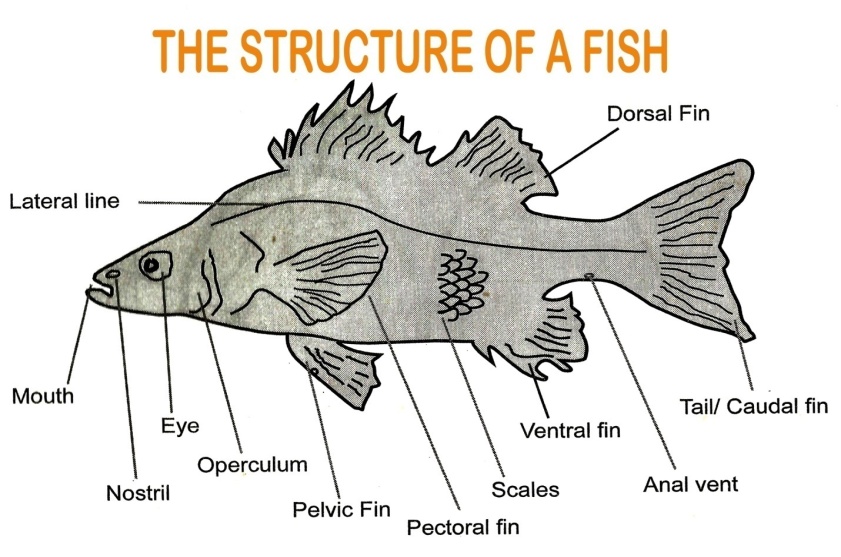
* Spear
* Arrow
* Aeroplane
* Fish
* Birds

**Qn. How is a streamlined body helpful to a fish?**

-It helps a fish to overcome viscosity friction in water.

**Qn.What is viscosity?**

-Viscosity friction is the force which opposes movement in liquids and gases/air (fluids).



**Functions of each part of a fish**

1. ***Mouth***

* It is used by fish for taking in food.
* It allows in water with dissolved oxygen.

b***) Nostrils***

* It is used by fish to for smelling and tasting food materials.

c*)* ***Eyes***

* It is used by fish to see while in water

d) ***Scales***

* They cover the fish’s body to provide protection against scratches.
* It protects the fish from external injuries.

e) ***Operculum/gill cover***

* It covers and protects the gills from damage.
* It opens to allow water to flow out when the fish is breathing.

f) ***Lateral line***

* It helps the fish to detect or sense danger in water by receiving sound waves (vibrations of water).

g*)* ***Fins***

* They enable the fish to swim in water.
* They are used for protection against its enemies.

h) ***Dorsal fin***

* It is used for defence against enemies.
* It helps the fish to balance while swimming in water.

i) ***Caudal fin***

* It helps the fish to change direction.
* It helps in forward movement.
* It helps a fish to increase speed.
* It enables the fish to swim by moving side to side.

j) ***Anal(ventral) fin***

* It prevents the fish from rolling in water.

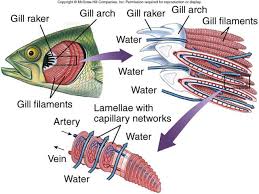
k) ***Paired fins(pectoral and pelvic fins)***

* They are responsible for down ward and upward movement.
* They help in body balance.
* They also enable the fish to slow down or to stop when swimming.

l*)* ***Swim bladder***

* It controls the depth at which a fish swims.
* It keeps the fish buoyant on water.
* A tilapia has a swim bladder.

**Breathing mechanism of the fish**



**Functions of each part**

**a). Gillrakers**

* It traps solid particles which are swallowed in water.

**b). Gill bars**

* It gives attachment and support to the gill filaments.

**c). Gill filaments**

* They provide the surface area for the exchange of gases.
* It is where gaseous exchange occurs.
* They absorb dissolved oxygen from water.

**NB**;

-The fish breathes in dissolved oxygen in water using the internal gills.

**Why does a fish die immediately it is removed from water?**

* It can only use gills to trap dissolved oxygen from water.
* It can only breathe in dissolved oxygen from water.

**What do fish feed on?**

* Algae
* Planktons
* Frogs
* Worms
* Smallfish
* Insects
* Toads

**Reproduction in fish**

-Fish reproduce **by laying eggs**.

-A group of eggs laid by fish is called**a row.**

-They undergo external fertilization.

**Qn. How does external fertilization occur in fish?**

* The female fish lay eggs in shallow water and the male shed sperms on the laid eggs in water immediately.

**Qn.What name is given to the young one of fish?**

* *Alevin (fry)*

**How does a fish protect itself?**

* The fish has scales on its body which covers and protects it against scratches.
* The fish has a lateral line used for sensing and detecting the movement of its enemies in water.
* The fish uses the fins to swim so as to escape away from its enemies and uses the dorsal fin for spiking its enemies.
* The fish has a slippery body with mucus structure which enable them to easily escape from its enemies when caught.

**Adaptations of fish to swimming/living in water**

* The fish has a streamlined body which controls viscosity friction when swimming.
* The fish has gills used for breathing in dissolved oxygen in water.
* The fish has a lateral line used to sense danger while in water.
* The fish has fins used for swimming and protection.
* The fish’s body is covered with scales for protection against scratches.
* Some fish like tilapia have swim bladders which help to control the depth of fish and prevent it from sinking.

**Importance of fish**

* It is a source of food(proteins).
* Fish’s bones are crushed and included in animal feeds.
* Fish is exported to earn foreign exchange to the country.
* The fish industry is the source of employment to people.
* Fish controls the spread of malaria.
* Moon fish(mukene) is used locally to treat measles.
* Fish is used for decoration at home in aquarium.
* Fish bones are also used in making glue.

**REPTILES**

-Reptiles are crawling vertebrates with four limbs apart from the limbless reptile called a snake.

**Characteristics of reptiles**

* They reproduce by laying eggs (they are oviparous).
* They undergo internal fertilization.
* They have scaled bodies.
* They have hearts with three chambers.
* They use lungs for breathing.
* They are cold blooded animals.
* They have 4 limbs except the snake which is limbless.
* They have external ears.

**Groups of reptiles**

* Lizards
* Crocodiles and alligators.
* Shelled reptiles(tortoises, turtles and terrapins).
* Snakes

**Lizards**

***Examples are;***

* Chameleons
* Geckoes
* Common lizards
* Monitor lizards
* Agama lizards

**Characteristics of reptiles**

* They have two pairs of limbs
* They have movable eyelids
* Their tongues are fleshy

**Chameleons**

-They change colour to protect themselves.

-They also camouflage so as to trap their prey like mosquitoes and flies.

-They have sticky tongues for trapping their prey.

-They use tails to hold twigs so that they don’t fall.

**Qn: How are chameleons important to man?**

* They eat insect vectors like mosquitoes and houseflies which spread disease-causing germs.

**What is camouflaging?**

-This is the act of changing colours by the chameleon to resemble the immediate surrounding

**Crocodiles and alligators**

-These are the largest and strongest groups of reptiles.

-They are carnivorous.

-They have scaled backs.

-They partly live on land and in water depending on the temperature in the atmospheric temperatures.

-They lay eggs and cover them in sand to provide them with warmth and protect them against predators.

**Shelled reptiles**

-They have hard shells around their bodies for protection.

-They commonly live in water but they always come out to get food and lay eggs on land.

-They always lay eggs in sand and hide them from enemies which are hatched by the heat of the sun.

-Turtles and tortoise protect themselves by pushing/hiding their heads and legs inside the hard shells.

**Examples of shelled reptiles are;**

* Tortoises
* Terrapins
* Turtles

**Snakes**

-These are limbless reptiles which move by gliding.

**Characteristics of snakes**

* They have no limbs.
* They are carnivorous.
* They have forked tongue for touch and smell.
* They undergo moulting.
* They move by contraction of body muscles.
* They have a large number of ribs and vertebrae.

**Types of snakes**

* Poisonous snakes
* Non -poisonous snakes
* Constrictor snakes

**Non poisonous snakes**

-These are snakes without poisonous glands and without fangs.

-They don’t produce venom.

**Examples of non- poisonous snakes**

* Green grass snakes
* House snakes
* Flying snakes
* Sand boa
* Egg eating snakes
* Eastern hog
* Wolf snakes

**How do non- poisonous snakes defend themselves?**

-By running away from their enemies

**Characteristics of non -poisonous snakes**

* They don’t have fangs.
* They have solid teeth for biting.
* They don’t venom.
* They eat rats, mice, frogs and other snakes.
* They swallow their prey alive.

**Poisonous snakes**

-These are snakes with poison glands and fangs.

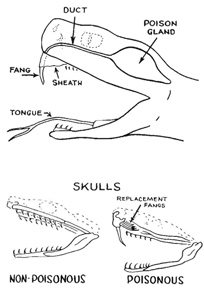
-They produce poisonous fluid called venom.

-They inject venom in their enemies to paralyse the prey to death.

**Examples of poisonous snakes**

* Green mamba
* Black mamba
* Puff adder
* The cobra
* Gabon viper

**The structure of a poisonous snake showing its parts**



**Function of each part**

**a). Fangs** –to inject poison into its prey

**b). Venom glands** –to produce poison (venom)

**c). Venom duct** –to pass poison from the glands to the fangs

**d). Backward pointed teeth** –for holding its prey

**e). Forked tongue** –sense organ for smell and touch

**Qn: How are eyes of snakes protected from dust?**

* By the help of transparent membranes.

**Characteristics of poisonous snakes**

* They have fangs.
* They produce venom.
* They always leave two marks at the bitten part.

**Why are snake fangs hollow?**

* To allow venom to pass through into its enemy

**Why do snakes bite?**

* Snakes don’t bite to offend but they bite for protection.

**Why do snakes moult?**

* To increase in size

**First aid for a snake bite**

* Tie above the bitten spot
* Put a black stone at the bitten spot.

**Steps followed when giving first aid for snake bites**

* Identify the type of snake if possible.
* Tie above the bitten spot.
* Apply a black stone at the bitten spot.
* Quickly carry the victim to the hospital.

Qn: **Why do we tie above the bitten spot when giving first aid for snakebites?**

* To stop blood containing venom from flowing to the heart.

Qn: **Why do we put a black stone at the bitten spot?**

* To suck poison from the bitten spot.

**Dangers of snake venom.**

* It paralyses heart muscles.
* It lowers temperature of blood leading to clotting of blood in body tissues.

**Constrictors**

-These are snakes that kill their prey by coiling around them using their strong muscles to suffocate them to death.

-They swallow their prey as a whole.

**Examples of constrictors**

* Pythons
* Anaconda
* Boas

**Advantages of reptiles**

* They are a source of food to some people for example snakes, tortoises and crocodiles.
* The snakeskins are used to make leather items.
* Reptiles act as tourist attractions.
* Snake venom is used to make medicine against snake bites.
* Reptiles are used to control pests and insect vectors by feeding on them.

**AMPHIBIANS**

-Amphibians are vertebrates that have the ability to breathe both in water and on land.

-They are double life vertebrates.

**Characteristics of amphibians**

* They are cold blooded.
* They live both in water and on land.
* They reproduce by laying eggs.
* They undergo external fertilization.
* They have three chambered hearts.
* The adults have two pairs of limbs.
* They breathe by using lungs, moist skin and lining of the mouth cavity.

**Examples of amphibians**

* Frogs
* Toads
* Newts
* Salamanders

**NOTE:** The young one of an amphibian is called **a tadpole and it uses gills for breathing.**

**Differences between toads and frogs**

|  |  |
| --- | --- |
| **Toads** | **Frogs** |
| * Have short hind legs | * Have long hind legs |
| * Mostly live on land | * Mostly live in water |
| * Have no teeth | * Have teeth in the upper jaw |
| * Have dry rough skins | * Have moist smooth slippery skins |
| * Have partly webbed feet | * Have fully webbed feet |
| * Have poison glands | * Don’t have poison glands |
| * Lay eggs in double ribbon spawn | * Lay eggs in big masses |

|  |  |
| --- | --- |
| **Eggs laid by a toad** | **Eggs laid by a frog.** |
|  |  |

**How are frogs adapted to life in water?**

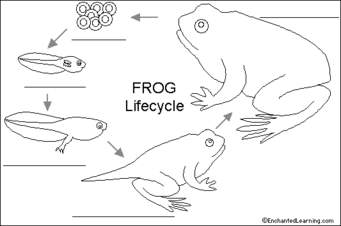
* They use their moist skins for breathing.
* They are streamlined.
* They have fully webbed hind feet for swimming.

**Reproduction in amphibians**

-Amphibians reproduce by laying eggs.

-They undergo external fertilization.

**Life cycle of an amphibian.**



**Why are eggs of amphibians laid with a slippery jelly on them?**

* To hold them together.
* To protect them from predators.
* To prevent them from drying up.

**Importance of amphibians to man**

* Some amphibians are eaten as food by some people.
* They eat disease vectors in the environment.

**How do toads protect themselves?**

* By producing a poisonous milky substance to cover their skins.

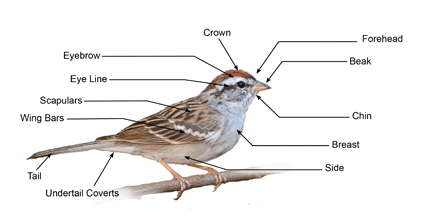
**BIRDS**

-Birds are warm blooded vertebrates whose bodies are covered with feathers.

**Characteristics of birds**

* They are warm blooded.
* Their bodies are covered with feathers.
* They undergo internal fertilization.
* They reproduce by laying eggs.
* They have scales on their legs.
* They have two pairs of limbs.
* Their fore limbs are modified into wings.
* They care for their young ones.
* They are streamlined.
* They use lungs for breathing.
* They have beaks for feeding.

**External parts of a bird**



**Function of each part of a bird**

**a). Wings** –used for flying

**b). Beak** –used to pick food

-to fight enemies

**c). Claws** –for holding and fighting enemies

**d). Spur** – used for defence against enemies

**Why are bodies of birds streamlined?**

* To overcome viscosity (friction) in air during flight.

**How is a nictitating membrane helpful to a bird?**

* It protects the bird’s eyes from moving air during flight.

**Types of feathers**

* Quill feathers (flight feathers)
* Covert feathers (body feathers)
* Down feathers
* Filoplume feathers

**Quill feathers/flight feathers**

* These are feathers that birds use **for flying.**
* They are found on the tail and wings.

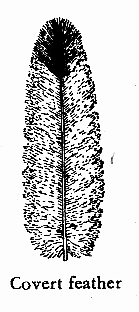
**A structure of a quill feather**

**Covert/body feathers**

-These are feathers which cover the whole body of a bird.

**Functions of body feathers**

* To keep the bird warm.
* To streamline the bird.

** A structure of a body feather**

**Down feathers**

* These are the first feathers to appear on a chick.
* They lie underneath the body feathers.
* They keep the chicks warm during cold weather (They help in insulating the bird).

**A structure of a down feather**



**Filoplume/hair feathers**

* These are the tinniest feathers found nearest to the skin of a bird.
* They can be seen clearly after removing the body and down feathers.
* They are the hairy feathers on the bird’s body.

**A structure of a filoplume feather**



**Functions of feathers to birds**

* They keep the birds body warm.
* They enable birds to fly.
* They give the colour and shape for identification.
* They protect the bird’s skin from injuries.

**How are birds adapted to flying?**

* They have hollow bones to reduce their weight.
* They are streamlined to reduce friction in air during flight.
* They have wings for flying.
* They have got flight feathers.
* They have hollow air sacs to make respiration effect during flight.
* Their eyes are covered with a nictitating membrane.
* They have no pinna to obstruct the flow of wind.

**Groups of birds**

* Perching birds
* Swimming birds
* Wading birds
* Climbing birds
* Birds of prey
* Scratching birds
* Scavenger birds
* Flightless birds

**Perching birds**

-These are birds that have two toes pointing forward and one backward which they use for perching on the branches.

**Groups of perching birds**

* Seed eaters
* Nectar suckers
* Insect eaters
* Fruit eaters

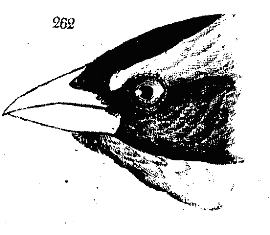
**Seed eaters**

-These are birds with short conical beaks which they use to pick seeds.

**Examples of seed eaters**

* Pigeons
* Doves
* Weaver birds
* Finches

**A diagram showing a beak of a seed eater**



**Insect eaters**

-These are birds with short narrow beaks used for picking insects on the ground

**Examples of insect eaters**

* Sparrows
* Robin
* Swallows
* Bee-eaters
* Swift
* Cuckoo

**Beak of an insect eater**



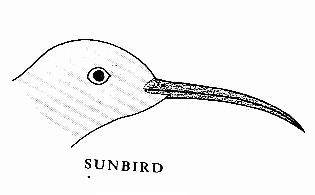
**Nectar sucking birds**

-These are birds which have long slender beaks for sucking nectar from the base of flowers.

**Examples of nectar suckers**

* Sun birds
* Humming birds

**A diagram showing a beak of a nectary bird (nectar sucker)**

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**Fruit eaters**

-A horn bill is a good example of a fruit eater.

-It has a long stout beak for collecting fruits.

**A diagram showing a beak of a fruit eater**



**Birds of prey**

-These are birds which hunt and kill their prey for food.

**How are birds of prey suitable for their mode of feeding (characteristics of birds of prey)?**

* They have strong hooked beaks for tearing flesh of their prey
* They have a strong eye sight to enable them locate their prey at a distance
* They have strong curved claws called talons for holding their prey

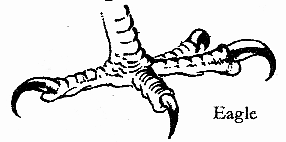
**Examples of birds of prey**

* Eagles
* Kites
* Owls
* Hawks
* Secretary birds
* Falcons

**A beak of a bird of prey**



**A foot of a bird of prey**



**Swimming birds**

-These are birds with fully webbed feet to enable them flap water and also float on water when swimming.

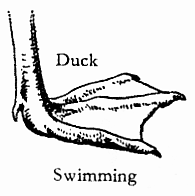
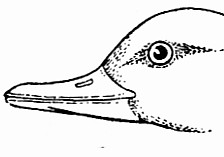
-They have a broad flat spoon like beaks.

-They mainly feed on worms, snails and other insects which are found in mud.

**Examples of swimming birds**

* Ducks
* Geese
* Swans
* Boobies
* Sea gulls
* Pelicans
* Cormorants
* Penguins
* Teals

**A foot of a swimming bird A beak of a swimming bird**



**Wading birds**

-Wading birds are commonly living a long side water bodies.

-They have long, thin beak for catching frogs, fish and worms.

-They have long and thin legs with half webbed toes which enable them walk in mud and shallow.

**Examples of wading birds**

* Heron
* Crested crane
* Flamingo
* Ibis
* Kingfisher

**A beak of a wading bird**



**A foot of a wading bird**



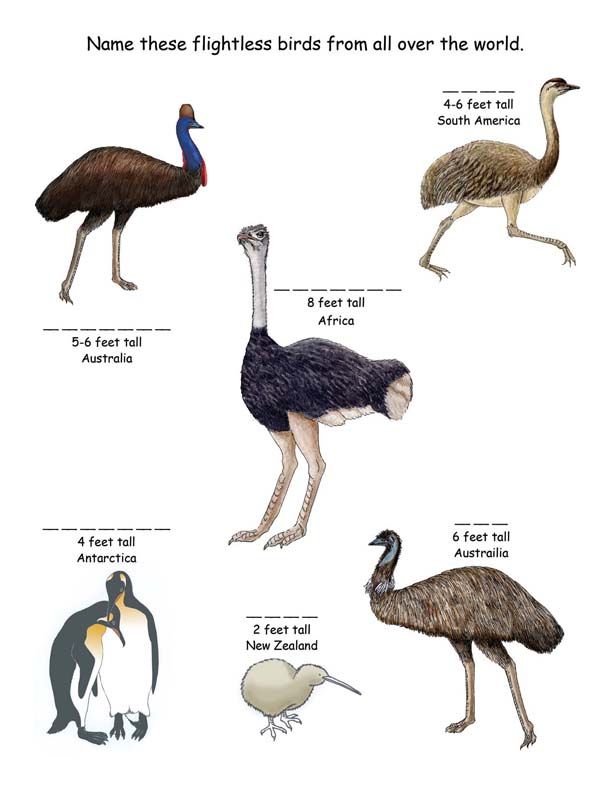
**Flightless birds**

-These are birds which are unable to fly but can run very fast on the ground.

**Examples of flightless birds**

* Kiwi
* Ostrich
* Cassowary
* Penguin
* Emu
* Rhea
* Pelicans

**Diagrams of flightless birds**



**Reasons why flightless birds are unable to fly**

* They have bone marrow which makes them heavy.
* They have small weak wings without flight feathers.

**Climbing birds**

-These birds have the ability to climb trees.

-They have a chisel shaped beak for digging holes in the trunk.

-They have two toes pointing forward and two toes pointing backward.

-These toes help them to hold themselves firmly on the trees as they climb.

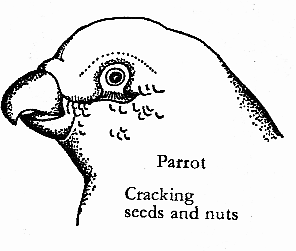
-A wood pecker feeds on insects found in wood.

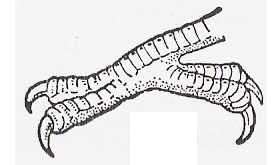
-A parrot feeds on hard nuts/seeds.

**Examples of climbing birds**

* Parrots
* Wood peckers

**A beak of a climbing bird A foot of a climbing bird**





**Scratching birds**

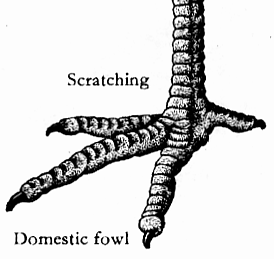
-These are birds with strong and blunt claws for scratching the ground to find food.

-They have short pointed beaks.

-They commonly feed on grains and insects.

**Examples of scratching birds**

* Chicken
* Turkeys
* Guinea fowls
* Crested francolin

**A foot of a scratching bird**

**A beak of a scratching bird**



**Scavenger birds**

-These are birds which feed on the meat killed by other animals.

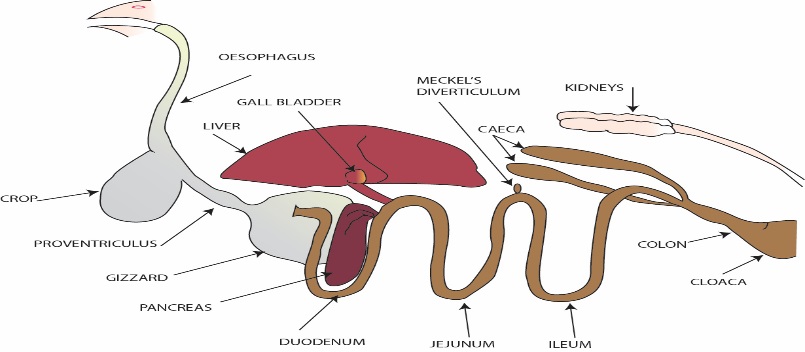
-They have beaks and talons similar to those of birds of prey.

-Scavenger birds help to clean up the environment by *eating the leftover meat killed by other animals*(carrion).

**Examples of scavenger birds**

* Vultures
* Crows
* Marabou storks

**The alimentary canal of a bird**



**Function of each part**

**a). Beak** –for picking food.

**b). Gullet** –passes food to the crop.

**c). Crop**–it stores, moistens softens food before it goes to the stomach.

**d). Stomach** –it is where food is mixed with digestive juices.

**e). Gizzard** –it is where food is crushed into soluble particles.

**f). Grit (palables)** –these are small stones found in the gizzard which help to crush food into small particles.

**g). Small intestines** –it is where absorption of food takes place.

**h). Large intestines** –it is where absorption of water takes place.

**i). Caeca** –it is where undigested food is stored before it is passed out as droppings.

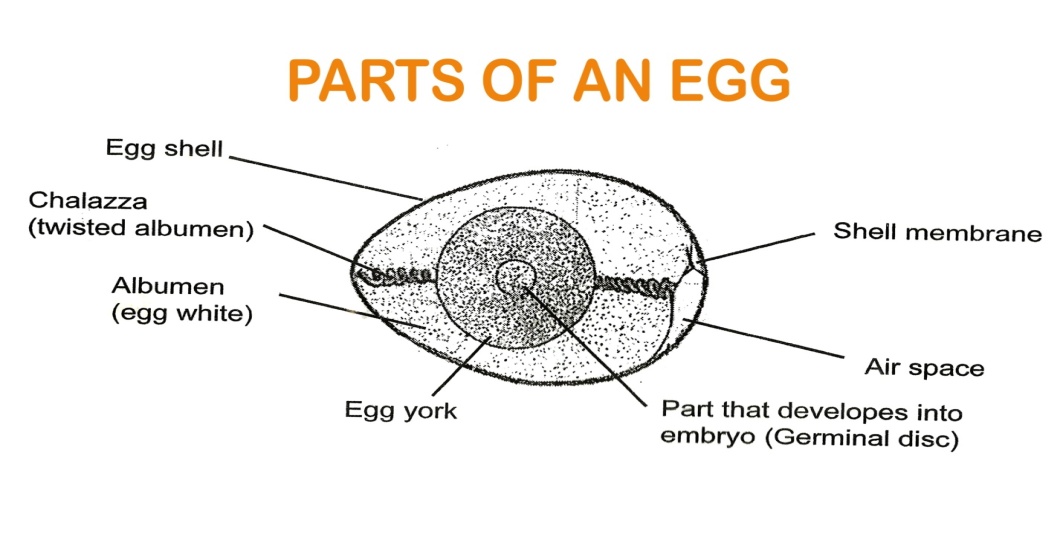
**j). Cloaca/vent** –it is an opening where undigested food is passed out of the bird’s body as droppings.

**NB:** Carnivorous birds (birds of prey and scavenger birds) **don’t have crops** because **the meat they eat does not need moistening and softening.**

**How do birds reproduce?**

* Birds reproduce by laying internally fertilized eggs.

**Parts of an egg**



**Functions of each part**

**a). Egg shell**

* It protects the inside parts of an egg from physical damage.
* The egg shell is porous to allow easy exchange of gases inside the egg.

**b). Shell membrane**

* It prevents bacteria and other micro -organisms from entering and destroying the egg.

**C). Albumen/egg white**

* It is the source of water and water salts to the growing embryo.

**d). Egg yolk**

* It is the source of proteins and fats for the growing embryo.

**e). Germinal disc**

* It develops into a chick after fertilization.

**f). Chalaza (twisted albumen**)

* It holds the yolk and the embryo in position.

**Why is the chalaza twisted?**

* To allow room for expansion and contraction during temperature changes.

**Uses of birds to man**

* They are a source of food to man in form of eggs and meat.
* Some birds help man in pollination of crops like sun birds.
* Bird’s feathers are used for decoration.
* Birds help in seed dispersal like the fruit eaters.
* Some birds like scavenger birds help to clean up the environment by feeding on the leftover meat of other animals which may smell and attract vectors like houseflies.
* Birds are a source of income to man once sold.
* Some birds are kept at home as pets.
* Birds are used for customary purposes like paying dowry.

**Dangers/disadvantages of birds in the environment**

* Some birds are crop pests for example doves, pigeons and weaver birds.
* Some birds cause accidents on run-ways of air ports.
* Some birds are vectors or keep vectors like fleas and mites.
* Some birds cause sound pollution especially weaver birds.
* Some birds are predators to poultry birds for example eagles, kites and vultures.

**MAMMALS**

-Mammals are warm blooded vertebrates with mammary glands, sweat glands and fur on their bodies.

-Mammals give birth to their young ones alive except monotremes.

**Special characteristics of mammals**

* They have mammary glands.
* They have sweat glands.
* They have fur on their bodies.
* They produce live young ones except monotremes.
* They breast feed their young ones.

**General characteristics of mammals**

* They are warm blooded.
* They have fur on their bodies.
* They care for their young ones.
* They have mammary glands.
* They use lungs for breathing.
* They have sweat glands.
* They have four chambered hearts.
* They undergo internal fertilization.
* They produce their young ones alive.

**Groups of mammals**

* Primates (most advanced mammals)
* Ungulates (hoofed mammals)
* Rodents (gnawing mammals)
* Chiroptera (flying mammals)
* Monotremes (egg laying mammals)
* Marsupials (pouched mammals)
* Cetaceans (sea mammals)
* Insectivorous (insect eating mammals)
* Carnivorous (flesh eating mammals)

**Primates (most advanced mammals)**

-This is the most advanced group of mammals with well- developed brains.

**Examples of primates**

* Man
* Bush babies
* Chimpanzees
* Baboons
* Monkeys
* Gorillas

**Characteristics of primates**

* They have well developed brains.
* They use their fore limbs for holding and hind limbs for walking.
* They have five fingers on each hand and five toes on each foot.
* They are omnivorous
* They have four types of teeth, namely; incisors, canines, premolars and molar

**Ungulates (hoofed mammals)**

-These are mammals which have hooves in their toes.

-All hoofed mammals are mainly herbivorous.

-Herbivorous animals are animals which entirely feed on vegetation or plants.

**Groups of ungulates**

* Even toed ungulates
* Odd toed ungulates

**Even toed ungulates**

-These are mammals with an even number of toes; 2 toes or 4 toes.

**Examples of even toed ungulates**

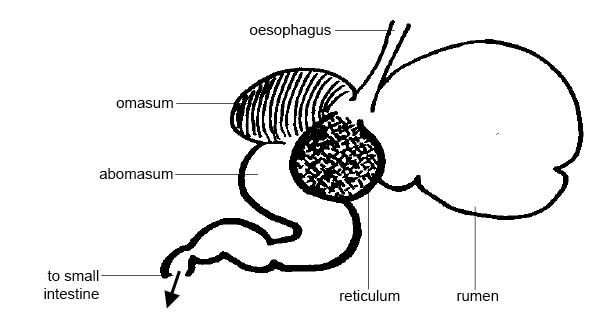
* Cows
* Sheep
* Hippopotamus
* Goat
* Pigs
* Antelope
* Giraffe
* Warthog

**NB**: Some even toed ungulates are ruminants or non- ruminants

**What are ruminant animals?**

-These are animals which chew cud.

They have **four stomach chambers**ie;



**Examples or ruminant animals**

* Cows
* Goats
* Sheep
* Camels
* Antelopes
* Zebra
* Giraffe

**What are non -ruminant animals?**

-These are animals which don’t chew cud.

**Examples of non -ruminants**

* Pig
* Warthog
* Hippopotamus

**What is cud?**

-This is food sent back in the mouth of ruminants for re-chewing.

**Odd toed ungulates**

-These are ungulates with odd number of toes; 2 toes.

**Examples of odd toed ungulates**

* Zebra
* Elephant
* Rhino
* Horse
* Donkey

**Hooves of different ungulates**



**Carnivorous or flesh eating mammals**

-These are mammals which feed entirely on flesh/meat.

**Characteristics of carnivorous mammals**

* They have well developed canine teeth for tearing the flesh of the prey.
* They have good speed to run and catch their prey (they are very fast).
* They have good sense of smell to trace easily the ways of their prey.
* They have a good eye sight to easily see their prey.
* They have sharp claws for killing, tearing and holding their prey.
* They have soft pads in their feet which help them to run after their prey without making noise.
* They have strong sense of hearing.

**Carnivorous animals are divided into two;**

* Dog family
* Cat family

**Dog family carnivorous mammals**

* Domestic dog
* Jackal
* Hyena
* Fox

**Cat family carnivorous mammals**

* Lion
* Cheetah
* Tiger
* Leopard
* Man-goose
* Jaguar
* Domestic and wild cats

**How are carnivorous mammals adapted to running after prey?**

* They have soft pads under their feet which enable them to run after their prey without making noise.

**What features do carnivorous mammals use for protection?**

* Claws
* Developed canine teeth

**RODENTS (GNAWING MAMMALS)**

-These are mammals with well- developed incisor teeth for biting food rapidly.

**Characteristics of rodents**

* They have well developed incisors for biting food rapidly.
* They make holes in the ground which they use as their habitats.
* Most rodents are vegetarians because they feed on vegetation.

**Examples of rodents**

* Squirrels
* Hares
* Mole rats
* Rats
* Mice
* Guinea pigs
* Beavers
* Porcupine

**Insectivorous mammals**

-They have sensitive snouts and strong claws for digging the ground.

-They have a good speed and a good sense of smell.

-They mostly hunt at night and sleep during day time (they are **nocturnal**).

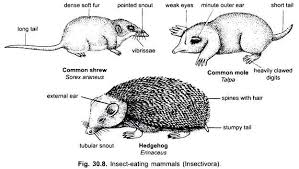
-Most of the insectivores are toothless like pangolin.

-They are protected by sharp pointed scales (spines) on their back for example a hedgehog.

**Examples of insectivorous mammals**

* Hedgehog
* Pangolin
* Aardvark
* Porcupines
* Aardwolf
* Elephant shrews

**Diagrams of insectivores**



**CHIROPTERA (FLYING MAMMALS)**

-These are mammals with their fore limbs modified into wings for flying.

**Examples of flying mammals**

* Bats

**Types of bats**

* Insect eating bats
* Fruit eating bats
* Vampire bats

**Insect eating bats**

-Insect eating bats are those that feed on insects like, grass hoppers, locusts, mosquitoes, white ants.

**Fruit eating bats**

-These are bats which feed on a variety of fruits

**How are bats useful to man?**

* They eat dangerous insects like mosquitoes
* Fruit eating bats help in seed dispersal

**How are bats dangerous?**

* They suck blood from animals like horses, cows and buffalos.
* They destroy farmers’ fruits.

**How are echoes helpful to bats?**

* They help bats locate their food at night
* They help bats to dodge obstacles

**MARSUPIALS (POUCHED MAMMALS)**

-These are mammals which have pouches (pockets) on their abdomen for carrying their young ones.

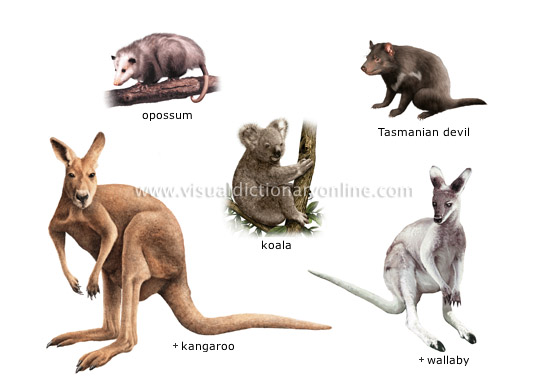
-The young ones are carried in the pouches until they are fully developed.

-In the pouch, there are breasts teats which the young ones suckle from.

**Examples of pouched mammals**

* Kangaroo
* Koala bears
* Wallabies

**Diagrams of pouched mammals**



**How is a tail very important to a kangaroo?**

* A kangaroo uses its tail to balance when it is moving or hopping.

**MONOTREMES (EGG LAYING MAMMALS)**

-These are the most primitive mammals because they reproduce by laying eggs.

-They are also called oviparous mammals.

**What are oviparous mammals?**

* Theseare mammals which reproduce by laying eggs.

**Reasons why monotremes are regarded as mammals**

* They have mammary glands
* They feed their young ones on breast milk
* They have sweat glands

**Examples of monotremes**

* Duckbilled platypus
* Spiny ant eater (echidna)

**Diagrams of monotremes**



**State any one similarity between monotremes, reptiles, amphibians and birds.**

* They all reproduce by laying eggs.

**CETACEANS (SEA MAMMALS/MARINE MAMMALS)**

-These are mammals which live in seas, oceans and great lakes.

-They are also called aquatic mammals because they live in water.

**Characteristics of cetaceans**

* They have internal ears (pinna).
* They have their front limbs modified as flippers for swimming.
* They have mammary glands.
* They give birth to their live young ones and feed them on breast milk.
* They have a layer of fats under their skins called **blubber** which they use to generate heat so as to keep them warm.

**Examples of sea mammals**

* Whales
* Seals
* Dolphins
* Porpoise
* Dugongs
* Sea lions

**Diagrams of sea mammals**



**How are sea mammals able to survive in cold water?**

* By the help of blubber fats that keep them warm.

**Name the largest sea mammal.**

* A whale

**Study the table below showing classification of vertebrates and use it to answer the questions that follow.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **E** |
| Frogs  Toads  Newts  salamanders | Lizards  Snakes  Chameleons  Crocodiles | Tilapia  Nile perch  Moon fish | Doves  Hens  Eagles  vultures | Man  Bats  Whales  Rabbits |

a). How are animals in group A, B and C similar?

b). How are animals in group D and E similar?

c). State any difference between animals in group B and D

d). How is the reproduction of animals in group E different from that of animals in group D?

e). How are animals in group C and D similar in terms of reproduction?

f). In which way is the fertilization of animals in group A different from that of group B?

**INVERTEBRATES**

* These are animals without backbones.

-Invertebrates are divided into six groups as shown below;

**Invertebrates**

**Coelenterates Worms Arthropods Echinoderms Sponges Molluscs**

**COELENTRATES**

-They are stinging animals.

-They have tentacles.

-They have cylindrical bodies with two layers.

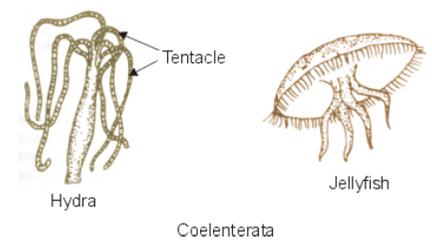
-They have only one opening which acts as the mouth and the anus.

-They live in seas and oceans.

**Examples of coelentrates**

* Hydra
* Jelly fish
* Corals
* Sea anemones

**Diagrams of coelenterates**



**MOLLUSCS**

-These are invertebrates with soft and unsegmented bodies.

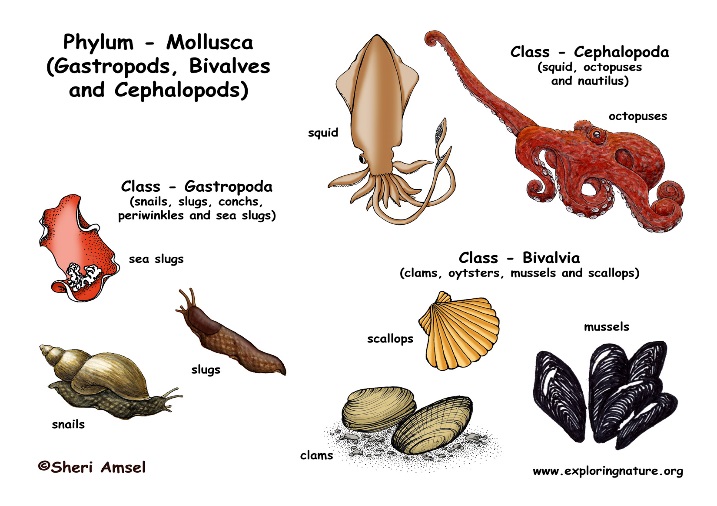
**Characteristics of molluscs**

* They have shells for protection.
* They have mantles.
* They have tentacles which they use as sense organ for smell, touch, detecting sound, temperature and tasting food.
* Sea molluscs use gills for breathing while land molluscs use simple lungs for breathing.

**Examples of molluscs**

* Water snails
* Garden snails
* Octopus
* Oyesters
* Slugs
* Cuttle fish
* Squids
* Cowries

**Diagrams of molluscs**



**Examples of sea molluscs**

* Oyesters
* Octopus
* Cuttle fish
* Squids
* Cowries

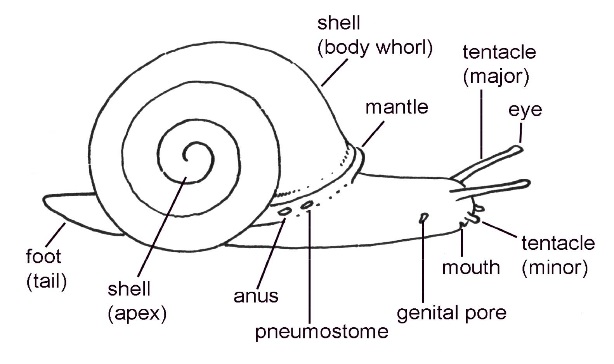
**Examples of land molluscs**

* Garden snails
* Slugs

NB: **Tentacles** are used by the slugs as sense organs ***for smelling and detecting sound and temperature.***

-Some molluscs like water snails spread schistosoma worms which cause **bilharziasis or schistosomasis** to man.

**The structure of a snail**



**ECHINODERMS**

-They are sea invertebrates.

-They have spines on their skins.

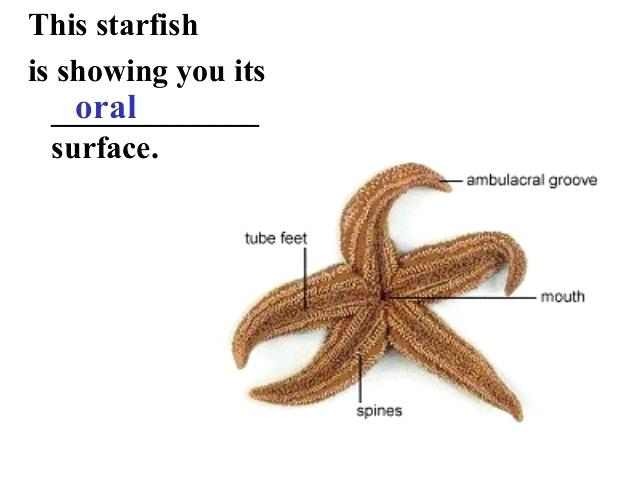
-They have unsegmented bodies.

-Their bodies are made up of 4 or more tentacles.

**Examples of echinoderms**

* Star fish
* Sea lilies
* Sea urchins
* Sea cucumbers

**A structure of a star fish**



**SPONGES (PORIFERA)**

-They live in water.

-They breathe and feed through many holes or pores on their bodies.

-Food and water are absorbed as water flows through the holes.

-They have internal flame of the skeleton of lime.

**WORMS**

-These are long and thin soft bodied animals.

-They breathe through the moist skin.

**Groups of worms**

* Segmented worms (annelids)
* Round worms (nematodes)
* Flat worms

**Segmented worms**

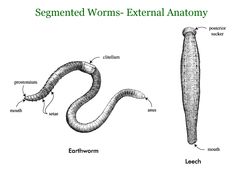
-These are worms whose bodies are divided into segments or rings.

-They mostly live in water and soil.

**Examples of segmented worms**

* Earthworms
* Leeches
* Bristle worms

**Diagrams of segmented worms**



**Earthworms**

-They live in the soil and feed on soil and dead decaying vegetation.

-They are hermaphrodites because they have two sexual organs.

**Importance of earthworms in the soil**

* Earthworms help to aerate the soil by making holes or tunnels in the soil.
* Earthworms decompose the organic matter to form humus in the soil.

**NOTE:**

-Earthworms respire through **their moist skin.**

-Earthworms die immediately if oil is poured on its body because **the moist skin is blocked and it is unable to breathe.**

-Earthworms come out of the soil after heavy raining in order **to get undissolved oxygen for breathing.**

**Flat worms**

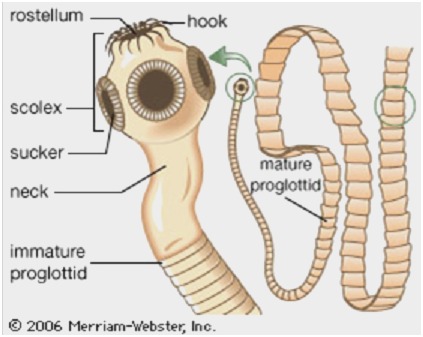
-These are worms with flat and segmented bodies.

-Flat worms are parasites because they depend on other animals for food.

**Examples of flat worms**

* Tape worms
* Liver flukes

**A structure of a tape worm**



-Tape worms live in small intestines and feed on the **digested food.**

-The head of the tape worms is called **scolex**.

-The body of the tape worm is divided in rings called segments.

**How people get infected with tape worms**

* Through eating under cooked meat from infected animals.
* Eating unwashed raw vegetables and fruits contaminated with tape worm eggs.
* Through drinking unboiled water contaminated with tape worm eggs.

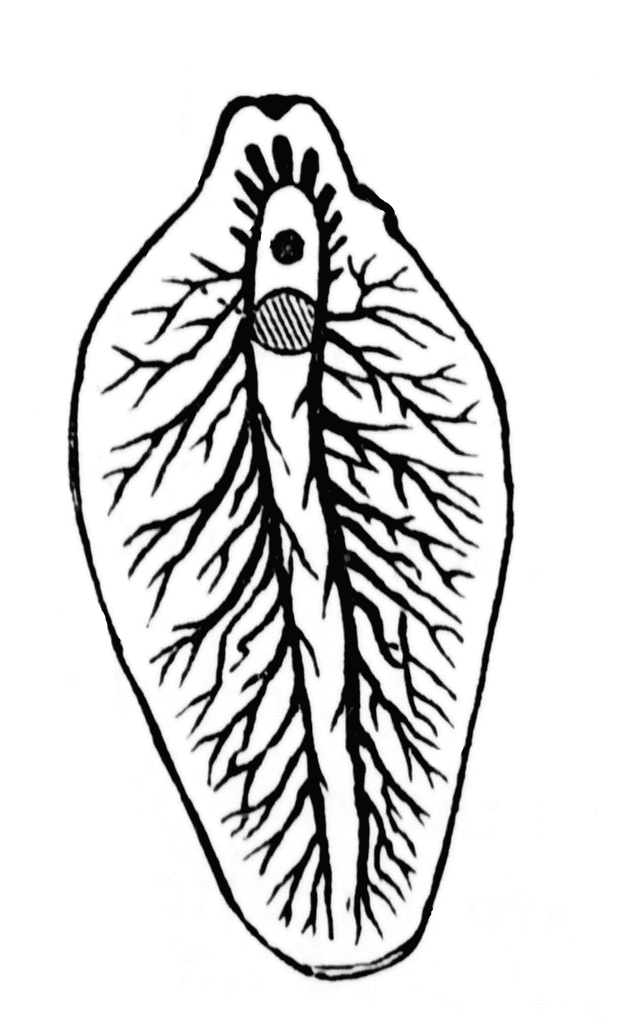
**Signs of tape worm infection**

* Passing out stool with eggs or segments of tape worms
* Passing out watery stool
* A person always feels hungry.

**How to prevent tape worm infection**

* Always eat well cooked meat especially pork.
* Washing vegetables and fruits properly if they are to be eaten when raw
* Washing hands before eating and handling food.
* Drinking well boiled water

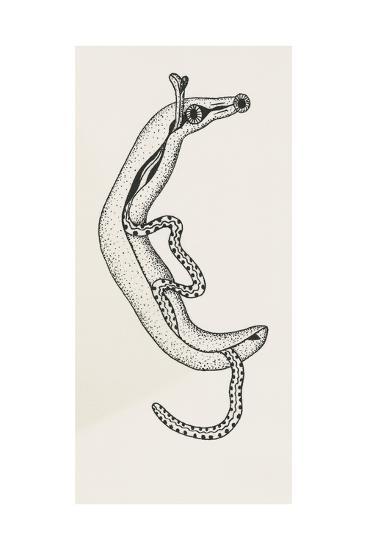
**Liver flukes**



-They are paper-like and they live in the liver of infected animals.

-They drain the liver of the infected animal and start feeding on the bile and blood.

**Blood flukes (schistosoma worms).**



-The schistosoma worms are parasites which cause **bilharziasis (schistosomiasis**) to man.

**Signs and symptoms of bilharziasis**

* Blood stains in urine.
* Blood stains in stool.
* Enlargement of the liver and the abdomen.

**How to prevent bilharziasis**

* Avoid swimming in streams, ponds or swamps with dirty water.
* Using latrines for proper disposal of human excreta
* Drinking well boiled water
* Washing hands with clean water and disinfectants.
* Control water snails by spraying chemicals on water.

**Round worms**

-These are worms with cylindrical bodies

**Examples of round worms**

* Common round worms
* Pin worms
* Eel worms
* Hook worms
* Thread worms
* Whip worms

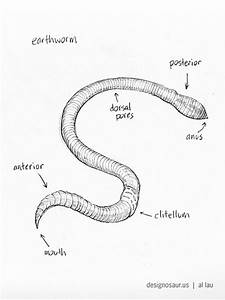
**Hook worms**

-Hook worm infection can lead to **anaemia** because hook worms suck blood from the victim.

**How hook worms enter our bodies**

* Hook worms mainly enter our bodies through walking bare footed in dirty places.
* Hook worms live in the blood streams where they suck blood from.

**A structure of a hook worm**



**Signs and symptoms of hook worm infection**

* Abdominal pain
* General body weakness
* A person develops diarrhoea
* Loss of weight
* Pale tongue and gum
* Pale eyelids and fingernails

**Ways of controlling hook worm infection**

* Always wear shoes whenever you are walking in the dirty places like toilets
* Use clean water to wash hands after using the latrines

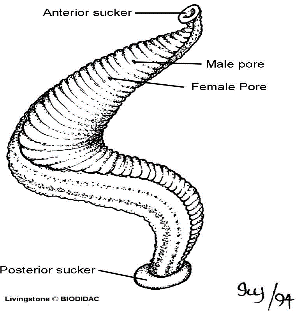
**Ways through which common round worms are spread**

* Drinking unboiled contaminated water
* Through eating with unwashed contaminated hands
* Through eating raw unwashed contaminated vegetables

**NOTE**

-Round worms live in **small intestines** and **they feed on the digested food**

**A structure of a common round worm**



**ARTHROPODS**

-Arthropods are invertebrates with segmented bodies and jointed legs.

**Characteristics of arthropods**

* They have jointed legs
* They have segmented bodies
* They have exoskeleton

**Groups of arthropods**

**Arthropods**

**Myriapodscrustaceans arachnids insects**

**MYRIAPODS**

-These are arthropods with many jointed legs and segments.

**Characteristics of myriapods**

* They have many jointed legs.
* They have many body segments.
* They have at least one pair of legs on each segment.

**Sub groups of myriapods**

* Chilopoda
* Diplopoda

**Chilopoda**

* They have only one pair of jointed legs on each segment.
* It has one pair of antennae and many legs.
* They move very fast and **feed on insects and worms** (they are carnivorous).
* They have fore limbs modified as poisonous claws that are used to paralyse the prey.
* They protect themselves **by biting.**
* They also produce a bad smell for protection.

NB: **A centipede** is an example of a chilopoda

 **Diplopoda**

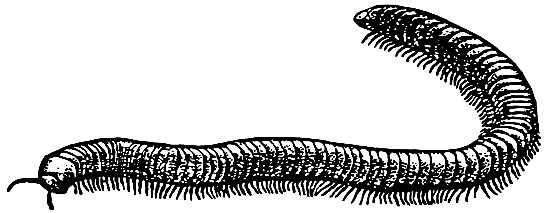
-They have two pairs of jointed legs on each segment.

-They protect themselves **by curling up or coiling**

-They feed on vegetation (they are herbivorous)

-They also produce a fluid with a bad smell and also irritating effect on the person’s body.

NB**: A millipede** is an example of a diplopoda.



**How are millipedes important in the soil?**

* Millipedes make holes tunnels in the soil which help in soil aeration.

**CRUSTACEANS**

-These are arthropods with a very hard exoskeleton and two main body parts.

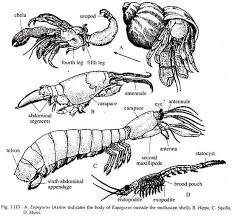
**Characteristics of crustaceans**

* They have five pairs of jointed legs
* They have two main body parts i.e. cephalothorax and abdomen
* Some live in fresh water and others live in salty water
* They use gills for breathing
* They are eaten as food

**Examples of crustaceans**

* Cray fish
* Crabs
* Wood lice
* Lobsters
* Prawns
* Shrimps
* Cyclops
* Sand hoppers

**Diagrams of crustaceans**



**ARACHNIDS**

-These are arthropods with eight jointed legs and two main body parts.

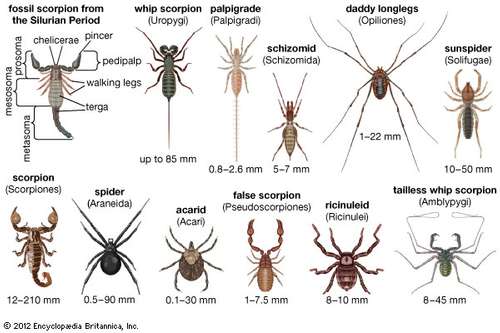
**Characteristics of arachnids**

* They have 8 jointed legs.
* They have 2 main body parts ie; cephalothorax and abdomen.
* They use **book lungs** for breathing.

**Examples of arachnids**

* Spider
* Lice
* Scorpion
* Ticks
* Mites

**Diagrams of arachnids**



**Spiders**

-They have spinnerets used to spin silk for making webs.

-Webs are used by spiders to trap their prey and also used for protection.

-Spiders breathe through special organs on their bodies called book lungs.

-Not all spiders make webs, some hunt for their prey.

**Scorpions**

-They live under stones, logs and holes

-They have large tails and a poisonous sting on their abdomen which they use to sting their enemies.

-Scorpions don’t lay eggs but give birth to live young ones.

**Ticks**

-They live on the skins of animals

-They carry many types of germs in the protozoan group which cause diseases to animals.

**Examples of tick borne diseases**

* East coast fever
* Heart water
* Red water
* Anaplasmosis
* Typhus fever in **man**
* Relapsing fever in **man**

**Ways of controlling ticks**

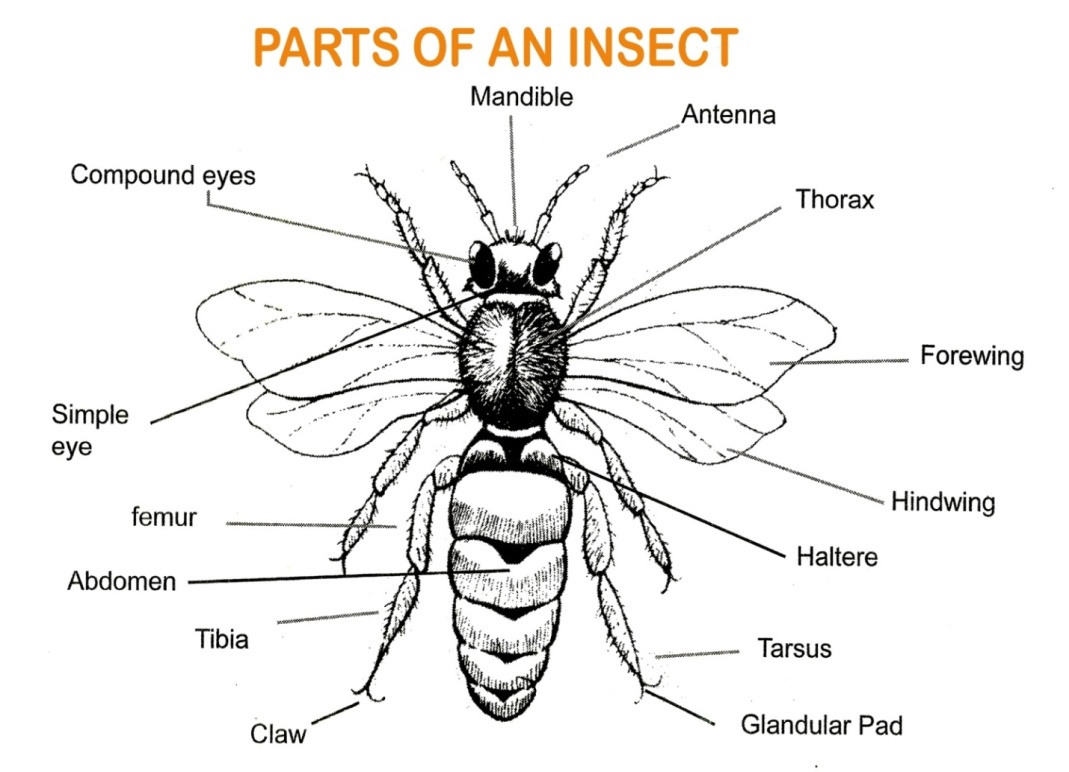
* By spraying using acaricides
* Dipping animals in dip tanks
* By practicing paddock grazing

**INSECTS**

-These are arthropods with six jointed legs and three main body parts.

**Characteristics of insects**

* They have 6 jointed legs.
* They have 3 main body parts ie; head, thorax and abdomen.
* They use spiracles for breathing.
* They have a pair of antennae.



**HEAD**

**Antennae/feelers**

* They are sense organ for tasting, hearing, smelling and feeling.

**Proboscis**

* It is a mouth part used for sucking food like blood, fluids from and nectar.

**Examples of insects which use proboscis for feeding**

* Mosquitoes
* Houseflies
* Bees
* Tsetse flies
* Butterflies
* Moths

**Insects that use mandibles for feeding** for examples;

* Termites
* White ants
* Grasshoppers
* Cockroaches
* Locusts
* Crickets

**THORAX**

* It gives attachment for the legs, wings and halters.
* Some insects have **suction pads** in their feet which enable them to walk on walls upside down without falling.

**Halteres**

* They are used by insects to balance in air during flight.

**ABDOMEN**

* It contains the breathing organs called spiracles.
* It contains the reproductive, digestive and respiratory parts.
* Stinging insects like bees have **stings for protection** and **ovipositor for laying eggs**

**METAMORPHOSIS**

-These are stages of growth and development an insect undergoes.

**Types of metamorphosis**

* Complete metamorphosis
* Incomplete metamorphosis

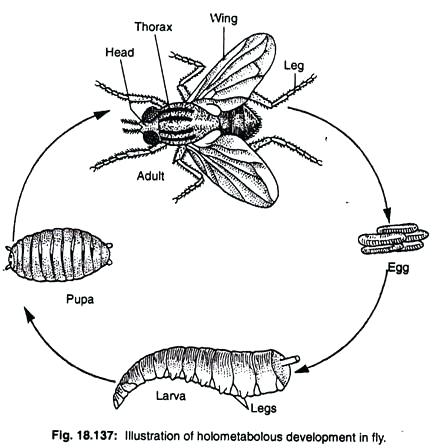
**What is complete metamorphosis?**

* This is where an insect undergo 4 stages of growth and developmentie; **eggs, larva, pupa and adult.**

**Examples of insects that undergo complete metamorphosis**

* Housefly
* Bees
* Butterflies
* Mosquitoes
* Moths
* Tsetse flies

**A diagram showing complete metamorphosis**



**Houseflies**

-House flies lay their eggs in rotting bodies, rubbish pits, exposed food and faeces.

-The larva of the house fly is called **maggot.**

-We are not allowed to pour oil/paraffin in the pit latrines because they can lead to death of maggots that **help in breakdown of large volumes of faeces.**

**How are maggots useful in latrines?**

* T**hey breakdown large volumes of faeces by feeding on it**

-The inactive, non-feeding or dormant stage of any insect is pupa stage.

-The adult stage of an insect is called **an imago.**

-The house fly is able **to carry germs** from one place to another because **it has a hairy body.**

**House flies are vectors because they spread the following diseases;**

* Typhoid
* Trachoma
* Cholera
* Diarrhoea
* Dysentery
* Polio

**Ways of controlling diseases spread by house flies**

* Covering the left-over food
* Keeping the latrines covered/clean and smoked
* Promoting proper disposal of human excreta
* Spraying all house flies using insecticides
* Burning all the rubbish on the rubbish pits to prevent breeding of house flies

**Mosquitoes**

**Types of mosquitoes**

* Anopheles mosquitoes
* Culex mosquitoes
* Aedes/tiger mosquitoes

**All mosquitoes above are vectors and each spread the following diseases;**

|  |  |
| --- | --- |
| **Mosquito** | **Diseases** |
| * An female anopheles mosquito | * Malaria |
| * Culex mosquito | * Elephantiasis/West Nile fever |
| * Tiger/aedes mosquito | * Yellow fever, dengue fever, |
| * Tiger/aedes mosquito | * Zika fever |

**Anopheles mosquitoes**

There are two types of anopheles mosquitoes i.e.;

-The male and female anopheles mosquitoes.

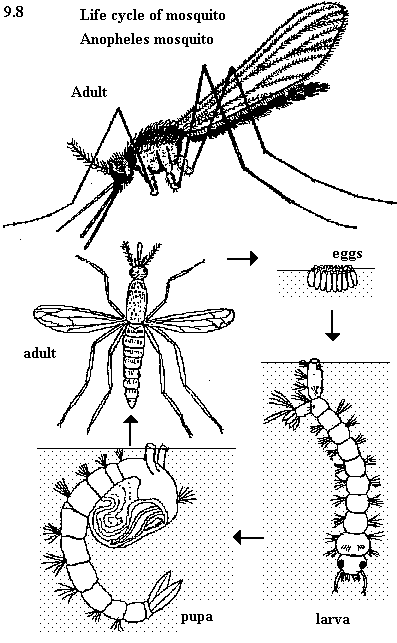
-Female anopheles mosquitoes spread plasmodia germs which cause malaria to man.

-Female anopheles mosquitoes feed on blood.

-Male anopheles mosquitoes feed on nectar or plant juice.

-Mosquitoes breed in stagnant water.

**The life cycle of an anopheles mosquito**



**Characteristics of anopheles mosquitoes**

* They eggs singly with an air float.
* Their larva stages lie parallel on water surface when breathing.
* The body of an adult lies in a sloppy position while at night.
* They have spotted wings.

**Culex mosquitoes**

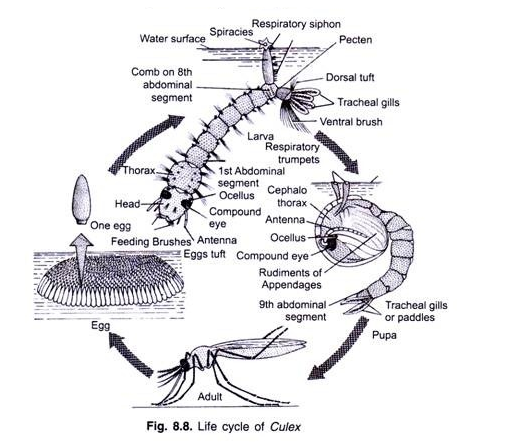
-Culex mosquitoes spread **elephantiasis or filariasis, West Nile fever and zika.**

-Elephantiasis is caused by **filaria worms.**

-The person suffering from elephantiasis grows big feet.

-The culex mosquitoes lay eggs in stagnant water.

**The life cycle of a culex mosquito**



**Characteristics of culex mosquitoes**

* They lay eggs in a raft (many together).
* The body of the larva lies at an angle on the water surface when breathing.
* The body of an adult lies horizontally while at rest.

**Aedes/tiger mosquitoes**

-Tiger mosquitoes spread yellow fever to man.

-Yellow fever is a watervector habitat disease caused by a virus.

-Tiger mosquitoes lay eggs in the stagnant water and bushes.

**Characteristics of tiger mosquitoes**

* They lay eggs singly
* The body of an adult tiger mosquito lies horizontally while at rest.
* The body of a tiger mosquito has white and black spots.
* The larva lies at an angle on the water surface when breathing.

**NOTE:**

-The larva of the mosquito has got the breathing trumpet called siphon which they use for breathing.

**Butterflies and moths**

-They undergo complete metamorphosis.

-Their larva stages are called caterpillars.

-They use a **proboscis for feeding**

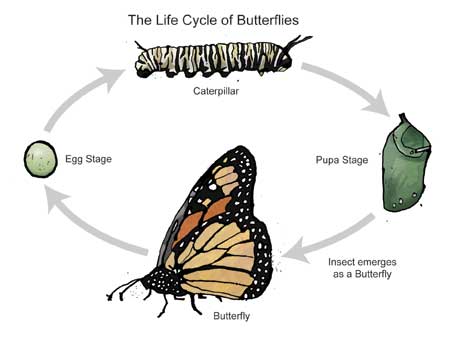
-Butterflies lay eggs under leaves for protection against sun’s heat and enemies.

-The stage of a butter fly which is harmful to the crops is the larva stage (it is a crop pest).

-Butterflies and moths are useful to man because they help in pollination.

-The moth is able to pollinate flowers at night by the help of the scent produced by flowers at night.

**The life cycle of the butterfly**



**NOTE:**

-Butterflies are harmful to man because their larva stages (caterpillars) are pests to man’s crops.

**How does a caterpillar protect itself?**

* By use of its **prickly hair** that irritates its enemies.

**Larva stages of different insects**

|  |  |
| --- | --- |
| **Insect** | **Larva stage** |
| * Mosquito | * Wriggler |
| * Housefly | * Maggots |
| * Butterflies | * Caterpillar |
| * Bees and wasps | * Grub |

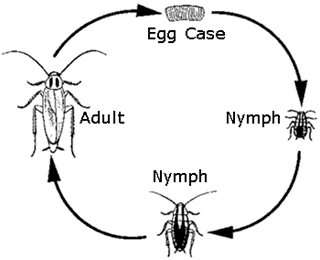
**INCOMPLETE METAMORPHOSIS**

-These are the 3 stages of growth and development an insect undergoesi.e.**; eggs, nymph and adult.**

**Examples of insects which undergo incomplete metamorphosis**

* Grasshoppers
* Locusts
* Crickets
* Cockroaches
* Termites
* White ants

**The life cycle of a cockroach**



-A nymph is different from its adult is that the nymph is wingless while an adult has wings.

-Locusts and grasshoppers **use mandibles to feed.**

-They are all crop pests.

**PROTOCTISTA KINGDOM**

**Characteristics of protoctista kingdom**

* They have one cell
* They have the nuclei enclosed in the membrane
* They are neither plants, fungi nor animals.
* They live in liquids (fluids) because they don’t have protection against drying out.

**Groups of protoctista**

* Algae
* Protozoa
* Euglena

**Algae**

-They have chlorophyll

-They make their own food

-They mostly reproduce by means of spores

-They grow on salty and flesh water

**Examples of algae**

* Spirogyra
* Sea weeds
* Focus

**Uses of algae**

* It is used as food to man and other animals
* They add oxygen in water which is breathed in by water animals
* They are used in in the making of fertilizers

**Protozoa**

-They lack chlorophyll

-They are very small (they are microscopic)

-They have only one cell

-They are found in flesh waters, seas, in blood of animals so they are parasites

-Protozoa like amoeba**reproduce by means of cell division or binary fission**

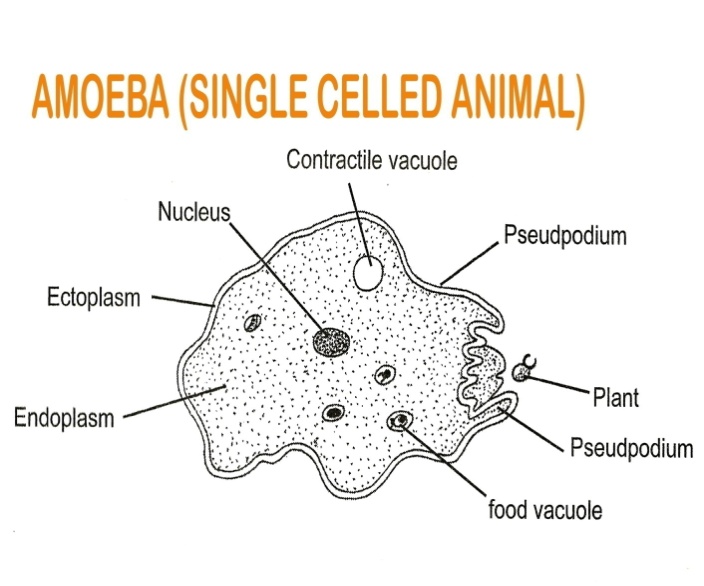
**Examples of protozoa are;**

* Amoeba
* Paramecium
* Trypanosome
* Plasmodium

**Diseases caused by protozoa**

|  |  |
| --- | --- |
| **Protozoa** | **Disease** |
| * Plasmodium | * Malaria |
| * Trypanosome | * Nagana in animals and sleeping sickness in man |
| * Amoeba | * Amoebic dysentery |

**A structure of an amoeba**

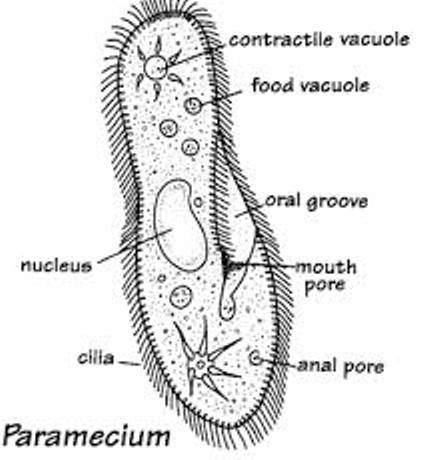


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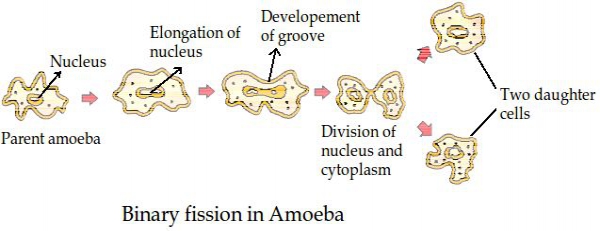
-Amoeba reproduces asexually by **binary fission/cell division.**

-Amoeba moves by means of the false legs called **pseudopodia**

**The structure of the paramecium**



**An illustration showing cell division or binary fission**



**THEME: MATTER AND ENERGY**

**TOPIC: SOUND ENERGY**

**What is energy?**

* Energy is the ability to do work.

**What is sound?**

* Sound is a form of energy which stimulates the sense of hearing.
* Sound is a form of energy that enables us to hear.
* Sound is a form of energy produced by vibrations of objects.

**What is meant by the term vibration?**

* Vibration is the to and fro movement of an object producing sound.

**Importance of sound**

* For communication.
* For entertainment.
* Provides employment opportunities to people.
* Promote culture ie traditional folk songs.

**Why do animals make sound?**

* To communicate to others.
* To locate food.
* For protection.
* To look for their mates.

**Types of sound**

***Music***

* Music is an organised sound produced by regular vibrations.

***Noise***

* Noise is a disorganised sound produced by irregular vibrations.

**Sources of sound**

There are two sources of soundie;

* Natural sources sound
* Artificial sources of sound

**Natural sources of sound**

-These are things that produce their own sound.

**Examples of natural sources of sound**

* Wind blowing
* Volcanic eruption
* Earthquakes
* Child crying
* Birds singing
* Cock crowing
* Dog barking
* A bull bellowing

**Artificial sources of sound**

-These are man-made objects which produce sound

**Examples of artificial sources of sound**

* Radios
* Telephones
* Drums
* Whistle
* Machines from industries
* Xylophones
* Pianos
* Band

**How sound is produced?**

-Sound is produced by means of vibration of an object

**Methods of producing sound**

There are 4 methods used for producing sound, these are;

* By pluckinge.g. guitar
* By blowing e.g. whistle and flute
* By hitting/beating e.g. drums and bells
* By rubbing e.g. tube fiddle

**How living things produce sound**

1. ***Mammals***

* By vibration of the vocal cords

2*.* ***Bees and mosquitoes***

* By rapid flapping or motion of their wings which cause air around to vibrate

3.***Grasshoppers and crickets***

* By rubbing their hind legs against their vibrating wings to produce sound.

4. *Birds*

* By vibration of the rings of cartilage in the trachea.

**Musical instruments**

-Musical instruments are grouped into three categories, i.e.;

* Percussion musical instruments
* Stringed musical instruments
* Wind musical instruments

**Percussion instruments**

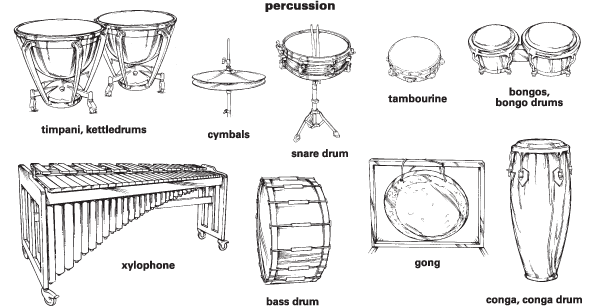
-These are instruments which produce sound after being hit or struck or beaten.

-These are instruments produce sound by striking them in order to vibrate.

**Examples of percussion musical instruments**

* Drum
* Xylophone
* Thumb piano
* Triangles
* Shakers
* Cymbals
* Bells
* Rattles

**Diagrams showing percussion musical instruments**



**NB:**

-The drum produces sound after the **vibration of the skin when hit or beaten.**

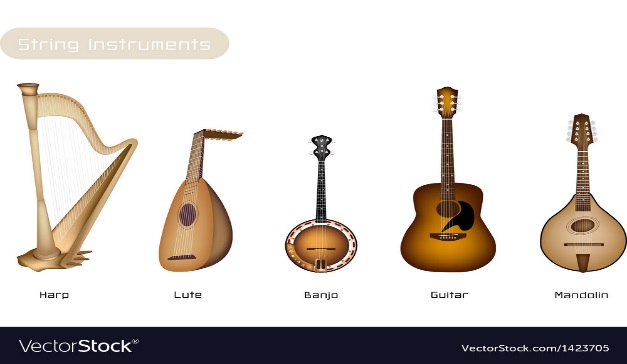
**Stringed musical instruments**

-These are instruments that produce sound when plucked or rubbed.

**Examples of stringed musical instruments**

* Tube fiddle
* Guitar
* Bow harp/Adungu
* Lyre
* Violin
* Bass violin

**Diagrams showing stringed musical instruments**



**NB**:

-Stringed musical instruments produce **sound by vibration of the strings when plucked or rubbed.**

-A bow harp has a hole that allows in air and sound box that amplifies sound.

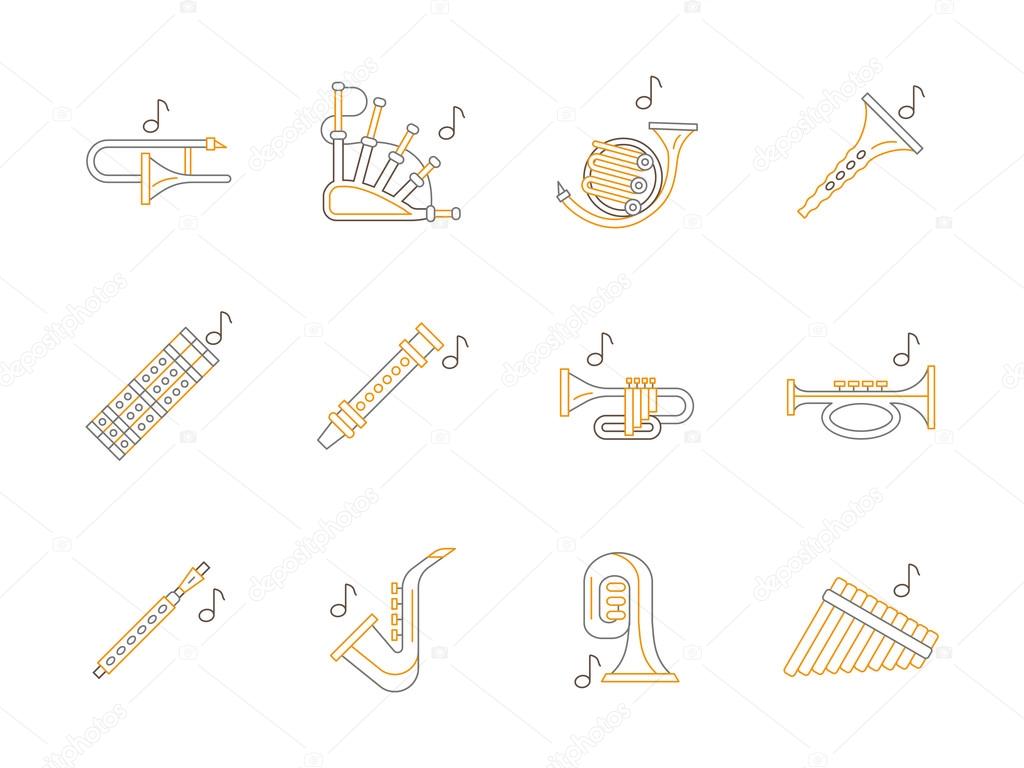
**Wind musical instruments**

-These are instruments that produce sound when air is blown into them.

**Examples of wind musical instruments**

* A flute
* Pan pipes
* Whistle
* Trombone
* Recorder
* A horn
* Trumpets
* Bugles
* Reeds

**Diagrams showing wind musical instruments**



**NB:**

-Wind musical instruments produce sound **by vibration of air blown inside.**

**How sound travels**

-Sound travels from one point to another **by means of sound waves in air.**

-Sound waves travel in all directions from the source.

-Sound travels in all states of matter i.e.; solids, liquids and gases.

-Sound travels **fastest in solids** because solids have closely packed particles.

-Sound travels **slowest in gases** because molecules are loosely held.

**Summary**

|  |  |  |  |
| --- | --- | --- | --- |
| **State of matter** | **solids** | **liquids** | **gases** |
| Comparison in relationship to sound transfer | fastest | faster | fast |
| slow | slower | slowest |

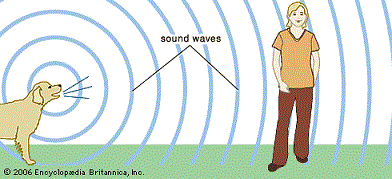
**NOTE:**

-In order sound to travel from one part to another, there must be a medium for sound transmission.

**Why can’t sound travel through a vacuum?**

* There is no medium that can transmit/carry sound waves.

**A diagram to show sound waves**



**Properties of sound**

* Sound travels by means of sound waves.
* Sound can be reflected.
* Sound needs a medium to travel.

**Which property of sound does an echo show?**

* Sound can be reflected.

**Speed of sound**

Sound travels at different speed in each state of matter as seen below;

* In normal air (gases) -330m/s
* In water (liquids) -1484m/s
* In iron (solids) -1500m/s

**Factors that affect the speed of sound**

* **Temperature**

-At night when temperatures are very low, sound waves travel very nearer to the ground. This is why we are able to hear clearly at night.

* **Heat**

-The heat of the day makes sound waves rise high making it difficult to hear sound.

* **Wind**

-Wind blows sound waves further if it is blowing against its movement.

* **Altitude**

-Sound waves move easily along lower altitude than climbing uphill or a higher altitude.

**Terms used in the study of sound**

* **Amplitude**

-This is the width of sound vibrations.

* **Decibels**

-This is a unit for measuring the loudness of sound.

* **Frequency**

-This is the number of sound vibrations produced by an object per second.

* **Volume**

-This is the loudness or softness of sound.

* **Pitch**

-This is the highness or lowness of sound.

**Factors that affect pitch of sound**

* **Length of the vibrating strings**

-Long strings produce low pitches while shorter strings produce high pitches of sound.

* **Tension of the vibrating object**

-Tight objects/strings produce higher pitch of sound than loosened ones.

* **Size of the vibrating object/surface area of the vibratingobject**

-Bigger objects produce low pitches of sound while smaller objects produce higher pitches of sound.

* **Thickness or thinness of the vibrating strings**.

-Thick strings produce low pitches of sound while thin strings produce high pitches.

* **Frequency**

-The higher the frequency, the higher the pitch of sound produced and the lower the frequency, the low the pitch of sound produced.

**Applications of pitch of sound.(Activity)**

1. **Using different sizes of drums.**
2. Which drum will produce the higher pitch of sound?
3. Give a reason for your answer in (a) above.
4. Which drum will produce the lowest pitch of sound?
5. Give a reason for your answer in (c) above.
6. To which group of musical instruments do drums belong?
7. How do drums produce sound?
8. How does sound produced by the drums above reach dancers ten meters away?
9. **Using a bow harp (adungu)**
10. To which group of musical instruments does a bow harp belong?
11. How does a bow harp produce sound?
12. Which string will produce the highest pitch of sound when plucked?
13. Give a reason for your answer in (c) above.
14. Which string will produce the lowest pitch of sound?
15. Give a reason for your answer in (e) above.
16. **Using bottles with different levels of water.**
17. To which group of musical instruments do bottles belong?

b) How do bottles produce sound?

c) Which bottle will produce sound of the highest pitch?

d) Give a reason for your answer in (c) above.

e) Which bottle will produce sound of the lowest pitch?

1. Give a reason for your answer in (e) above.
2. **Using strings of different thickness**
3. Which string will produce the highest pitch of sound?
4. Give a reason for your answer in (a) above.
5. Which string will produce the lowest pitch of sound?
6. Give a reason for your answer in (c) above.
7. **Using sound waves with different frequencies**.

Which sound wave above shows;

1. The highest pitch of sound?
2. The lowest pitch of sound?
3. The highest frequency?
4. The lowest frequency?
5. **Using panpipes of different sizes**
6. To which group of musical instruments do panpipes belong?
7. Which pipe will produce high pitch of sound when air is blown into them at once?
8. Give a reason for your answer in (b) above.
9. Which pipe will produce low pitch of sound?
10. Give a reason for your answer in (d) above.
11. **Using metallic round balls of different sizes.**
12. Which metallic ball will produce high pitch of sound when hit?
13. Give a reason for your answer in (a) above.
14. Which metallic ball will produce low pitch of sound when hit?
15. Give a reason for your answer in (c) above.

**ECHOES**

**What is an echo?**

* An echo is a reflected sound.

**How is an echo formed?**

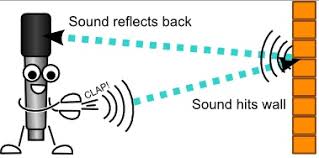
* An echo is formed by reflection of sound waves.

**What causes an echo?**

* Reflection of sound waves

**How echoes occur.**

When sound waves meet an obstacle like buildings or walls, it bounces back as seen in the diagram below;



**Why are we unable to hear words when echoes are formed?**

* The wave length of an echo is very low as compared to the wave length of the normal sound.

**Places where echoes commonly occur.**

* Empty rooms
* Valleys
* Corridors
* Mountains
* Forests
* Caves

**Advantages of echoes**

* Pilots use echoes from hills, mountains, tall buildings to easily direct them during flight to prevent accidents.
* Sailors/navigators use echoes to determine the depth of water bodies using **an echo sounder (fathometer).** The echo is recorded electrically by a **hydrophone** on the ship.
* War ships use echoes to determine whether there are obstacles in front of them.
* Bats use echoes to locate food and dodge obstacles.
* Sea mammals like whales use echoes to avoid danger and to keep in touch with the rest.
* Fishermen use echoes to detect fish shoals before setting the nets.

**Echolocation**

* Echolocation is the use of echoes to detect objects.
* A bat uses echolocation to find its prey and dodge obstacles.
* Blind people use echolocation to avoid obstacles on their way. They use a special device called **echo stick/white cane** to locate the ways between buildings and tell direction of cars on the road.

**Disadvantage of echoes**

* Echoes interfere with the original sound and cause noise.

**Ways of reducing echoes in cinema halls**

* Covering cinema halls with soft porous materials, like; sponges, thick carpets, thick clothes and soft boards
* Covering cinema halls with thick curtains

**How do soft porous materials reduce echoes in cinema halls?**

* By absorbing sound waves.

**NOTE:**

The speed of sound in air is 330m/s, calculate the distance and time covered by sound and echoes.

Speed = Distance

Time

Time = Distance

Speed

Distance = Speed x Time

**Example1.**

-Kakai heard a gunshot after 3 seconds. How far was kakai from the firing place?

Speed = 330m/s

Time = 3 seconds

Distance = speed x time

= (330x3) metres

= 990 metres

Kakai was 990 metres from the firing place.

**Example 2**

-Mutonyi was standing in a valley which was 660m and she heard a man clapping hands. How long did it take Mutonyi to hear the sound of the claps?

Distance = 660m/s

Speed = 330m/s

Time = Distance

Speed

= 660m

330m/s

= 2 seconds

It took Mutonyi 2 seconds to hear sound of a man clapping hands.

**Example 3**

-Vanessa heard an echo of a man splitting firewood from a forest after 4 seconds. How far was Vanessa from the man?

Speed = 330m/s

Time = 4 seconds

Distance = S x T

= (330x4) [it was an echo]

2

= 660 metres

Vanessa was 660 metres from the man splitting firewood.

**Example 4**

-Akambawas standing 990 metres far from a cliff and heard echoes of the cock crows. How long did it take him to hear the echoes of the cock crowing?

Distance = 990 m

Speed = 330m/s

Time = Distance

Speed

= (990x2) [it was an echo]

330

= 3x2 seconds

= 6 seconds

It took Akamba 6 seconds to hear the echoes of the cock crowing.

***Trial questions.***

* 1. Peter shouted from the valley and it took 5 seconds for Esther to hear the sound. How far was Peter from Esther?
  2. Ogwal was standing in the middle of the forest which was 1320m and he heard a woman chopping wood. How long did it take Ogwal to hear the sound from the chopping place?
  3. Ashaba heard an echo of a man splitting firewood from the forest after 4 seconds. How far was Ashaba from the man splitting wood?
  4. A man fires a gun while facing a cliff. He hears an echo after 8 seconds. If the speed of sound in air is 300m/s, how far is the man from the cliff?
  5. A cliff is 993 metres away from where Apendi is standing. If Apendi blows a whistle, how long will it take her to hear the echo if the speed of sound in air is 331m/s?
  6. A plane moves at a speed of 600m/s and the speed of sound in air is 300m/s;

1. Why is sound of a plane heard after it has already passed?
2. You are standing 1800m away from the plane in the air. How long does it take you to hear the sound of the plane?
3. By the time you hear the sound of the plane, how far has the plane moved?

**Methods/ways of storing sound**

* By recording
* By taping
* By writing notations i.e.solfa and staff notations

**Devices used to store sound**.

* Magnetic tapes
* Video tapes
* Video compact discs (VCDs)
* Compact discs (CDs)
* Digital Audio Tapes (DAT)
* Digital versatile discs/digital video discs (DVDs)
* Computer diskettes/floppy discs
* Memory cards
* Flash discs

**Devices used to reproduce stored sound.**

* Radio cassettes
* DVD players
* Gramophones
* Video disc players
* Video decks
* Computer monitors
* Film projectors
* Mobile phones
* Record players

**Ways of reproducing stored sound**

* Playing using radio cassettes
* Playing using mobile phones
* Playing using record players
* Playing using film projectors
* Playing using DVD players
* Playing using video decks
* Playing using gramophones
* Playing using computers
* Playing using video disc players

**Instruments used to reproduce sound stored by sol-fa notation.**

* Xylophones
* Guitar
* Keyboard
* Thumb piano
* Bow harp
* Panpipes
* Lyre
* Violin
* Viola

**Advantages of storing sound**

* For future entertainment.
* For future reference.
* For giving evidence in courts of law.

**Musical scales**

The musical scales consist of the notes called **diatonic scales.**

There are two types of musical scales, these are;

* Solfa notation
* Staff notation

**Note:**

-**Notation** refers to the act of writing musical sound using notes.

**Solfa notation Staff notation**

**How can sound stored on either solfa or staff notation be reproduced?**

* By singing solfas

**THE MAMMALIAN EAR**

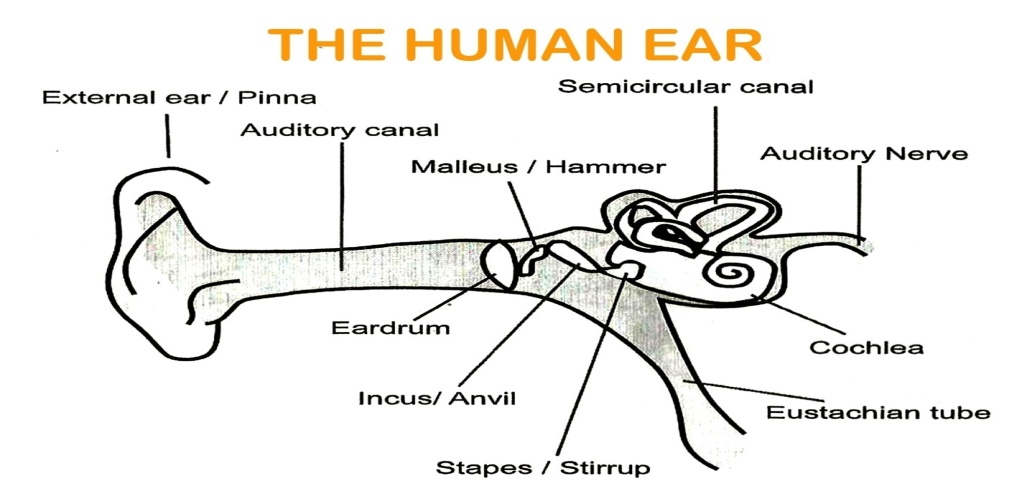
-The ear is a body organ that uses sound energy.

**Function of the ear**

* For hearing.
* For body balance and posture.

|  |  |
| --- | --- |
| **Animal** | **Hearing organ** |
| * Mammals | * Ears |
| * Birds | * Ears |
| * Fish | * Lateral line |
| * Insects | * Feelers/antenna |
| * Molluscs (snails) | * Tentacles |
| * Reptiles | * Internal eardrums below their skins |
| * Amphibians | * Amphibians papilla |

**The structure of the mammalian ear**



**Region of the ear**

-The mammalian ear is made of three main regions, ie;

* The outer ear
* The middle ear
* The inner ear

**The outer ear**

-It is made up of **two parts**, ie;

**Pinna**

* It collects sound waves from the environment.

**Auditory canal**

* It directs sound waves to the eardrum
* It also has short hair and wax which helps to trap foreign bodies like dust and some small insects from entering the middle ear.

**The middle ear**

-It consists of the eardrum, the ossicles and the Eustachian tube.

**The eardrum**

* It vibrates and transmits sound vibrations to the ossicles.

**The ossicles**

-It is a collective name given to the three small bones found in the middle ear.

-Their names can be got using the word ‘**MIS**’ or ‘**HAS**’ i.e.

**M**- Malleus **H**- Hammer

**I**-Incus **A**-Anvil

**S**-Stapes **S**-Stirrup

-The stirrup/stapes is the smallest bone in the human skeleton.

-The hammer (malleus) is attached to the eardrum while the stirrup (stapes) is attached to the oval window.

* The ossicles help to amplify and send sound vibrations from the middle ear to the cochlea.

**Oval window**

* It prevents the fluid from the inner ear from mixing up with air in the middle ear.

**Eustachian tube**

-It is the tube from the middle ear to the mouth.

* It balances air pressure inside and outside the ear.

-It does this by allowing air to enter and releasing air from the middle ear.

-The Eustachian tube opens when swallowing food or yawning.

**The inner ear**

-It is fluid filled space which consists of the semi-circular canal, cochlea and auditory nerve.

**Semi-circular canals**

* They help to maintain body balance and posture.

-It is controlled by the cerebellum of the brain.

**Cochlea**

* It changes sound vibrations to nerve impulses/signals.

-The cochlea has two fluids i.e. **perilymph** and**endolymph** that help **to convert sound vibrations to nerve impulses.**

**The auditory nerve**

* It transports sound impulses to the brain for interpretation

**Diseases of the ear**

* German measles
* Otitis

**Disorders of the ear**

* Boils
* Deafness

**Ear defects**

**Causes of deafness**

* Old age
* Diseases like German measles
* Serious fractures on the skull
* Too much wax in the ears
* Damage of the eardrum

**Permanent deafness**

-This is when a person is unable to hear completely.

-It is brought by many diseases like German measles.

**Partial deafness**

-This is when a person is unable to hear clearly which can be brought by damage of the eardrum.

**Correction of partial deafness**

* Putting oily ear buds in the ear overnight to soften wax.
* Injecting warm water through the auditory canal using a syringe (by syringing)

**Sensory deafness**

-This is when a person is unable to differentiate between sounds produced.

**Ways of controlling sensory deafness**

* Good feeding to enable one to keep healthy even at old age.
* Avoid travelling in vehicles under dangerous mechanical conditions (DMC).

**Ways of caring for our ears.**

* Wash the ears with clean water and soap daily
* Avoid cleaning ears using sharp piercing objects like needles because they can damage the eardrum
* Always remove wax from the ears to prevent accumulation that can result into partial deafness
* Avoid loud noise that can burst the eardrum
* Always keep ears well dried using a clean soft pointed endcloth or cotton wool
* Seek proper medical assistance in case of a foreign body in the ear.

**THEME: HUMAN BODY**

**TOPIC: THE CIRCULATORY SYSTEM**

-The circulatory system is the transport system of the body.

-This is the system of the body responsible for transporting blood in the body.

-It consists of the organs that enable blood to move around the body.

**What is blood circulation?**

* Blood circulation is the movement of blood around the body.

**What is double circulation?**

* Double circulation is the movement of blood twice through the heart before it is pumped to all body parts.

**Components/constituents of the circulatory system**

* The heart
* Blood vessels
* Blood

**The heart**

* The heart is a muscular pumping organ of the body.
* It is the major component of the circulatory system.
* The function of the heart is **to pump blood to all parts of the body.**
* The heart is made up of strong muscles called cardiac muscles.
* The heart is protected by **the rib cage.**

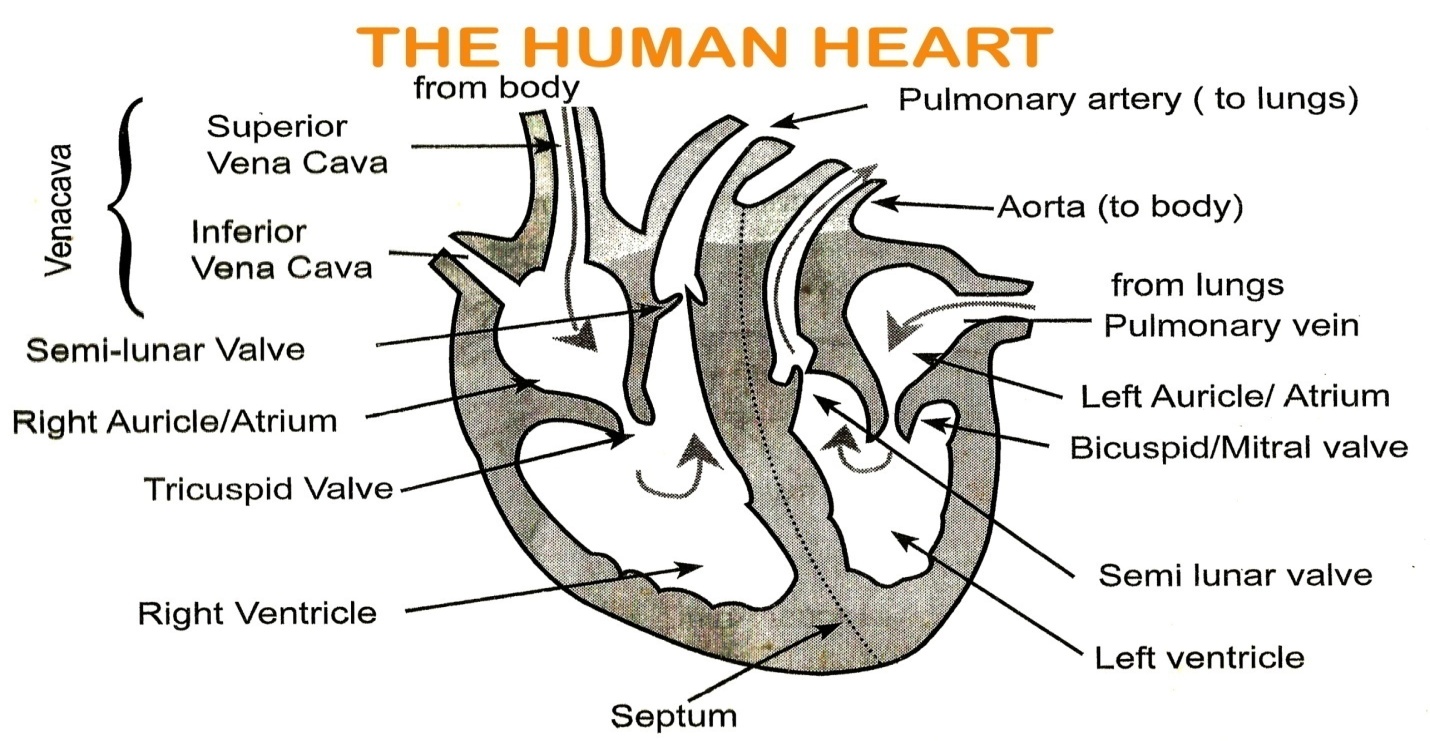
**The chambers of the heart**

-The heart has four chambers; the upper chambers are **auricles/atria** while the lower chambers are **ventricles**.

**The four chambers of the heart** are;

* Left auricle/atrium
* Right auricle/atrium
* Left ventricle
* Right ventricle

**The structure of the mammalian heart**



**Functions of parts of the heart**

**Vena cava**

* It carries deoxygenated blood from all body parts back to the heart.
* It is the biggest vein in the body.

**Pulmonary artery**

* It transports deoxygenated blood from the heart to the lungs.

**Pulmonary vein**

* It transports oxygenated blood from the lungs to the heart.

**Aorta**

* It transports oxygenated blood from the heart to all body parts.
* It is the biggest artery in the body.

**Septum**

* It is a muscular wall that divides the heart vertically into two parts, ie; the left and right hand side of the heart.

**Valves**

* They prevent the backward flow of blood.

**Types of valves**

* Aortic semilunar valves – found between the left auricle and the aorta.
* Tricuspid valves – found the right ventricle and the right auricle.
* Bicuspid valves – found between the left auricle and the left ventricle.
* Pulmonary valves \_ found between pulmonary artery and the right auricle.
* Coronary valves \_ found in coronary veins.

**How the heart works**

-The heart works by contraction and relaxation of cardiac muscles.

-When the heart contracts, it squeezes blood out of the heart

-When the heart relaxes, it allows blood to enter it.

**What term is used to describe the contraction and relaxation of cardiac muscles of the heart?**

* Systole

**Mention the scientist who discovered blood circulation.**

* Sir William Harvey

**Which instrument is used by doctors to measure the blood pressure of a person?**

* Sphygmomanometer

**Name the instrument used by doctors to listen to the heart beat of a patient?**

* Stethoscope

**What is the normal heart beat of a person?**

* 72 times per minute

**Why is the left side of the heart thicker than the right side?**

* It pumps oxygenated blood with greater pressure through a longer distance to all body parts.

**Why is the right hand side of the heart made up of thinner cardiac muscles?**

* It pumps deoxygenated blood with low pressure through a shorter distance to the lungs.

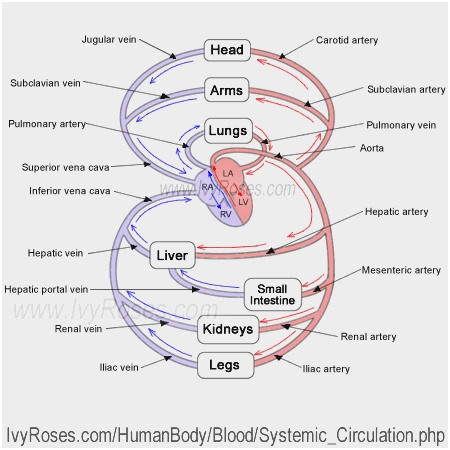
**Why does blood flow to the lungs?**

* To drop carbon dioxide and pick oxygen

**Why does the heart beat increase when a person is doing vigorous exercises?**

* The heart pumps more oxygenated blood to the body cells to generate more energy in the body.

**Diagram showing blood circulation and gaseous exchange in the body.**



**Body organs involved in blood circulation.**

**The heart**

* It pumps blood to all body parts.

**The brain**

* It controls the heart beat/pulse.
* It sends impulses to the kidneys to regulate the amount of salt and water in the body.

**The lungs**

* They help in exchange of gases i.e. they enable oxygen to diffuse into blood.

**The kidneys**

* The kidneys filter blood.

**The intestines**

* They help to absorb digested food and pass it to the blood streams.

**The liver**

* It helps in detoxification of harmful substances in the body.

**A table showing blood vessels that carry blood to various body organs**

|  |  |  |
| --- | --- | --- |
| **Body organ** | **Blood vessel that carries blood to.** | **Blood vessel that carries blood away.** |
| * Kidneys | * Renal artery | * Renal vein |
| * Lungs | * Pulmonary artery | * Pulmonary vein |
| * Stomach | * Mesenteric artery | * Hepatic portal vein |
| * Liver | * Hepatic artery | * Hepatic vein |
| * Brain (head) | * Carotid artery | * Vena cava |
| * Trunk (back and legs) | * Iliac artery | * Iliac vein |

**Blood vessels**

-These are network of tubes running from the heart to all body parts transporting blood.

**Types of blood vessels**

* Arteries
* Veins
* Capillaries

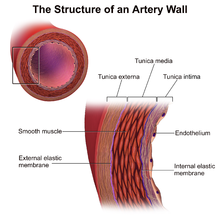
**Arteries**

-They transport oxygenated blood from the heart to all body parts.

-The biggest artery in the body is the **aorta.**

-All arteries originate from the aorta of the heart.

**A structure of an artery**



**Characteristics of arteries**

* All arteries carry oxygenated blood except the pulmonary artery.
* Arteries carry blood away from the heart.
* Arteries have narrow lumen.
* Arteries have thick walls.
* Arteries have no valves.

**Why do arteries have no valves?**

* They carry oxygenated blood with high pressure.

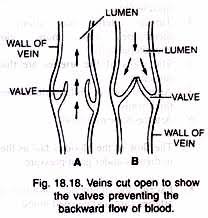
**Veins**

-They transport deoxygenated blood from all body parts back to the heart.

-The vena cava is the biggest vein in the body.

-All veins originate from the vena cava of the heart.

**A structure of a vein**



**Characteristics of veins**

* All veins carry deoxygenated blood except the pulmonary vein.
* Veins carry blood to the heart.
* Veins have wide lumen.
* Veins have thin walls.
* Veins have valves.

**What is the importance of valves in veins?**

* Valves prevent the back ward flow of blood.

**Why do veins have valves?**

* Veins carry deoxygenated blood with a low pressure.

**Which part of a clinical thermometer has the same function as the valves found in veins?**

* The kink/narrow bend/constriction

**How is a kink of a clinical thermometer similar to valves in veins?**

* Both a kink and valves prevent the backward flow of liquids.

**The structural differences between arteries and veins**

|  |  |
| --- | --- |
| **Arteries** | **Veins** |
| -They have narrow lumen | -They have wide lumen |
| -They have thick walls | -They have thin walls |
| -They have no valves | -They have valves |

**Functionaldifferences between arteries and veins**

|  |  |
| --- | --- |
| **Arteries** | **Veins** |
| -All arteries carry oxygenated blood except the pulmonary artery | -All veins carry deoxygenated blood except the pulmonary vein |
| -Arteries carry blood away from the heart | -Veins carry blood to the heart |
| -Arteries carry blood with high pressure | -Veins carry blood with low pressure |

**Capillaries**

-They are the smallest blood vessels that supply blood to all body cells in the body.

-They join arteries to veins.

-They carry both oxygenated blood and deoxygenated blood.

-They are thin walled to enable materials diffuse through easily.

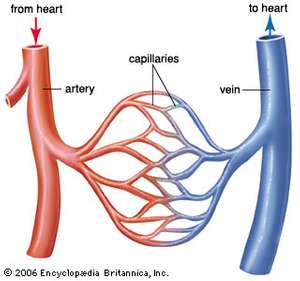
**How are capillaries important in the body?**

* They transport digested food oxygen and mineral salts to all body parts.
* They carry waste products from body cells to excretory organs.

**How are capillaries adapted to their function of exchanging materials in the body?**

* Capillaries are thin walled to enable materials to diffuse through easily.

**The structure of blood capillaries**



**Blood**

* Blood is a red liquid that flows in the body.

**Name the mineral salt needed in formation of blood in the body**

* Iron

**Types of blood**

-There are two types of blood, i.e.;

* Oxygenated blood
* Deoxygenated blood

**What is oxygenated blood?**

* Oxygenated blood is blood that contains oxygen.
* It is light red in colour.
* It is carried by most arteries except the pulmonary artery.

**What is deoxygenated blood?**

* Deoxygenated blood is blood without oxygen.
* It is dark red in colour.
* It is carried by most veins except the pulmonary vein.

**Components/constituents of blood**

-There are four components of blood, these are;

* White blood cells
* Red blood cells
* Platelets
* Blood plasma

**White blood cells**

-White blood cells are manufactured in;

* Bone marrows
* Lymph nodes
* Spleen

**How are white blood cells important in the body?**

* They fight against disease-causing germs.

**How are white blood cells able to fight against disease-causing germs?**

* By engulfing and digesting germs.
* By producing antibodies against disease-causing germs

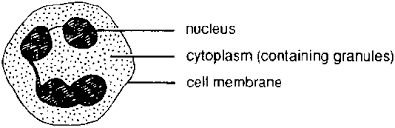
**What are antibodies?**

* Antibodies are chemical substances produced by white blood cells to defend the body against disease-causing germs.

**Characteristics of white blood cells**

* They have irregular shape
* They have nuclei

**A structure of a white blood cell**



**Red blood cells**

-Red blood cells form the highest number of blood cells in the body.

-Red blood cells are manufactured in the red bone marrow of;

* Sternum
* Scapula
* Vertebra
* Ribs
* Pelvis

**How are red blood cells important in the body?**

* They help to transport oxygen to all body cells.

**How are red blood cells adapted to their function?**

* Red blood cells contain a red pigment called haemoglobin.

**In which way is haemoglobin useful to red blood cells?**

* Haemoglobin enables red blood cells to pick and transport oxygen to all body cells.

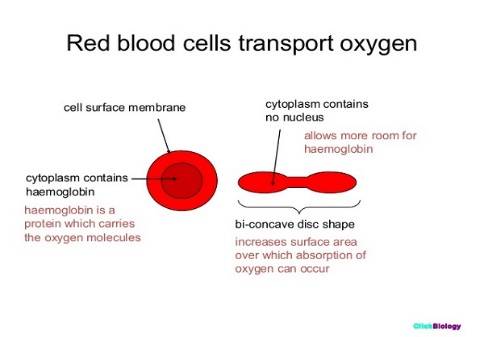
**Name the protein compound that is formed when oxygen combines with haemoglobin.**

* Oxy-haemoglobin

**Characteristics of red blood cells**

* They have regular shape (disc shaped)
* They have no nuclei
* They have haemoglobin

**A structure of a red blood cell**



**Platelets**

* They are made from red bone marrow.
* They help in blood clotting
* They form a network of a fibre around the wound to prevent further loss of blood.

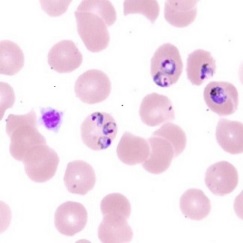
-Food rich in vitamin K helps in formation of platelets eg cabbage.

-Blood clotting occurs in the presence of vitamin K and calcium.

**How are platelets able to prevent excess loss of blood from a cut?**

* They form a network of fibre around the cut.

**A diagram showing platelets**



**Blood plasma**

* Plasma is the liquid part of blood.
* Plasma is the watery part of blood.
* It is the largest component of blood.

**What is plasma made up of?**

* Dissolved food
* Blood proteins
* Water
* Carbon dioxide
* Insulin
* Urea
* Uric acid
* Adrenalin
* Ammonia
* Mineral salts
* Glucose/sugars

**Importance of blood plasma**

* It transports digested food in the body.
* It transports waste products from body cells to excretory organs.
* It transports hormones from the glands to their target areas.
* It transports medicines to different body cells.
* It regulates body temperature.
* It distributes heat around the body.

**Functions of blood in the body**

* It helps to fight against disease-causing germs.
* It helps in clotting of blood.
* It transports oxygen to all body cells.
* It transports digested food in the body.
* It transports medicine to resist germs in the body.
* It transports waste products from body cells to excretory organs.
* It transports hormones from the glands to their target areas.
* It helps to regulate body temperature.
* It distributes heat around the body.

**Examples of materials carried by blood in the body**

* Oxygen
* Carbon dioxide
* Heat
* Hormones like insulin and adrenalin
* Digested food
* Urea
* Uric acid
* Medicines

**Ways of increasing the volume of blood in circulation**

* Eating foodstuffs rich in iron e.g. meat, liver, eggs, peas, beans and green vegetables
* Drinking enough fluids
* Blood transfusion

**Blood groups**

* Blood group **A**
* Blood group **B**
* Blood group **AB**
* Blood group **O**

**Who is a blood donor?**

* A blood donor is a person who gives blood to another person to save life.

**Who is a blood recipient/receiver?**

* A blood recipient is a person who receives blood from a donor.

**A table showing blood groups and how they donate blood**

|  |  |
| --- | --- |
| **Donor** | **Recipient** |
| A, O | A |
| B, O | B |
| A, B, O | AB |
| O | O |

**Why is a person with blood group O called a universal donor?**

* She/he can donate blood to all other blood groups.

**Why is a person with blood group AB called a universal recipient?**

* She/he can receive blood from all other groups.

**Name the scientist who discovered blood groups**

* Sir Karl Landsteiner.

**What is blood transfusion?**

* Blood transfusion is the transfer of screened blood from one person to another as long as the blood groups agree.

**Why is it important to screen blood before transfusion?**

* It helps to prevent the easy spread of diseases from a donor to a recipient like HIV AIDS, sickle cells and leukaemia.

**Disorders of the circulatory system**

* Artiosclerosis (blockage of arteries)
* Defective valves
* D-transposed great arteries

**Diseases of the circulatory system**

|  |  |  |
| --- | --- | --- |
| **Diseases of blood** | **Diseases of the heart** | **Hereditary diseases** |
| * Leukaemia/blood cancer * Haemophilia * Hypertension (high blood pressure). * Sickle cell anaemia * Anaemia * HIV AIDS * Malaria | * Coronary heart disease * Heart attack/cardiac arrest * Heart stroke | * Haemophilia * Sickle cell anaemia |

**Heart attack (cardiac arrest)**

* It is caused by formation of clots in the either branches of the pulmonary artery making pumping of blood very difficult.

**High blood pressure and low blood pressure**

* This is caused by abnormal high or low rate at which the heart pumps blood.

**Anaemia**

* It is caused by reduction in the number of red blood cells in the body.
* Anaemia is caused by lack of iron in the body.

**Sickle cell anaemia**

* This is an abnormal growth of red blood cells containing defective haemoglobin.

**Leukaemia (blood cancer)**

* This is a condition when a person has a large number of immature white blood cells in the body.
* These immature blood cells prevent production of normal blood cells causing severe anaemia.

**Haemophilia (poor blood clotting)**

* This is a condition when blood cannot clot easily.
* It is caused **by lack of vitamin K** in the diet.

**Malaria**

* It is caused by **plasmodia parasites** transmit through **an infected female anopheles mosquito.**
* It attacks and destroys the red blood cells which makes the body lose iron and makes a person become anaemic.

**HIV AIDS**

* It is a sexually transmitted disease **(STD)** spread **through unprotected sex with an infected person.**
* It is caused by a virus called **Human Immunodeficiency Virus (HIV).**
* The HIV virus attacks and destroys the **white blood cells.**

**Write AIDS in full**

* Acquired Immune Deficiency Syndrome

**How can a p.6 pupil protect herself against HIV AIDS?**

* By abstaining from sex/through abstinence

**Bad life styles that lower the efficiency of the circulatory system**

* Alcoholism
* Smoking
* Prostitution

**Ways of promoting the proper functioning of the circulatory system**

* Performing regular physical exercises
* Eating food rich in a balanced diet
* Eating meals which contain low animal fats
* Avoid smoking and alcoholism.

**Importance of performing physical exercises**

* They make joints flexible.
* They reduce the level of fats in the body.
* They reduce the risk of heart diseases.
* They make heart muscles to grow stronger and larger.
* They make digestion of food quick and easy.
* They strengthen tendons and ligaments in the body.

**THEME: HUMAN HEALTH**

**TOPIC: ALCOHOL, SMOKING AND DRUGS**

**What is alcohol?**

* Alcohol is a liquid substance which makes people drunk when taken in excess.

**Why is alcohol called a drug?**

* It can decrease or increase the body functioning.

**Types of alcohol**

-There are two types of alcohol, these are;

* Methanol (methyl)
* Ethanol (ethyl)

**Methanol alcohol**

-This type of alcohol is very poisonous to human health.

-It can cause death and blindness when it comes into contact with the eyes.

-Methanol is contained in;

* Petrol
* Diesel
* Methylated spirit
* Glue
* Jet fuel

**Ethanol alcohol**

-This is a toxic substance contained in alcoholic drinks like;

* Wines
* Beers
* Spirits

**Methods of making alcohol**

-There are two methods of alcohol, these are;

* Fermentation method
* Distillation method

**Fermentation method**

-This is a process by which sugar in juice from is turned into alcohol by the help of yeast.

-Yeast helps to produce an enzyme called **zymase** which speeds up the reactions.

**Equation of fermentation**

-Yeast +sugar = alcohol +carbon dioxiode + energy

-The alcohol processed by this method is not too concentrated like that of distillation method.

-This method is used to process drinks like;

* Malwa
* Kwete
* Tonto
* Munanansi
* Wine
* Pilsner
* Bell lager
* Club
* Nile special

**Cereals used in production of yeast locally**

* Millet
* Sorghum
* Barley
* Maize

**Distillation method**

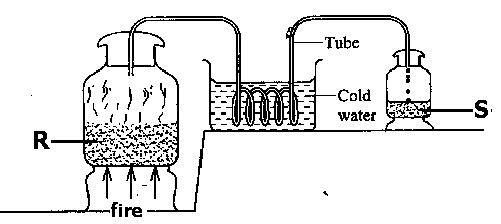
-This is a process of obtaining alcohol by boiling, evaporating the mixture containing alcohol and condensing the vapour.

This method is used to obtain more concentrated alcohol.

**Examples of distilled alcoholic drinks**

* Coffee spirit
* Royal whisky
* Waragi/enguli
* Empire
* Royal vodka

**Diagrams showing distillation method**



**State the importance of cold water in distillation of alcohol.**

* It helps to condense alcohol vapour to form a distillate.

**Why is the delivery tube coiled?**

* To increase the surface area for condensation

**Why is locally distilled alcohol not good for drinking?**

* Its concentration is not controlled as it may contain a lot of methyl which is poisonous.

|  |  |
| --- | --- |
| **Alcoholic drink** | **Raw material from which it is made** |
| * Kwete | * Maize |
| * Malwa | * Millet |
| * Muramba | * Sorghum |
| * Munanansi | * Pineapples |
| * Tonto | * Sweet bananas |
| * Enguli or waragi | * Sweet bananas, cassava or maize |
| * Banapo wine | * Bananas and pineappples |
| * Beer | * Barley |
| * Wine | * Fruits |
| * Uganda waragi | * Bananas, molasses, cassava and potatoes |

**Uses of alcohol**

* It is a source of income.
* It is a source of government revenue.
* It provides employment opportunities to people.
* It is used for making cosmetics and perfumes.
* It is used for making soap.
* It is mixed with petrol to make gasohol fuel.
* It is used in Six’s thermometers to show readings.
* It is used in hospitals to sterilize medical tools and instruments.
* It is used in hospitals to sterilize areas on the body where injections are to be taken.
* It is used as a solvent to dissolve oils and fats on clothes.
* It is used in cultural functions in some trines as part of the dowry.
* It is used for making some drugs.

**Reasons why people drink alcohol**

* To quench thirsty
* To forget their problems
* To kill boredom
* To feel confident
* To fit in groups
* To feel happy and excited
* To feel mature if still young
* To improve on their mental performance

**Alcoholism**

* Alcoholism is a condition where a person totally depends on alcohol for normal body functioning.
* This is a state of depending on alcohol constantly for normal body functioning.

**Who is an alcoholic?**

* An alcohol is a person who totally depends on alcohol for his/her normal body functioning.

**Causes of alcoholism/factors that lead to alcoholism**

* Idleness
* Frustrations
* Peer influence
* Attractive advertisements/misleading adverts on TV, radios and Newspapers
* Bad example from parents
* Poor family background
* Poor social environment like slums

**Mention the body organs damaged by excessive taking of alcohol.**

* The liver
* The brain
* The kidneys

**Which body organ is greatly damaged by excessive taking of alcohol?**

* The liver

**Where in the digestive system of man does absorption of alcohol take place?**

* In the stomach

**Effects of alcoholism to an individual**

* It damages body organs like liver, brain and kidney.
* It leads to self -neglect.
* It leads to loss of appetite.
* It leads to loss of respect.
* It leads to liver disease called liver cirrhosis
* It leads to poor job performance.
* It leads to loss of body balance due damage of the nervous system.

**Qn.State any one effect of alcoholism to a school pupil.**

* It leads to school dropout.
* It leads to loss of respect for elders
* It leads to poor performance in his/her studies.

**Effects of alcoholism to a family**

* It leads to family neglect.
* It leads to divorce.
* It leads to poverty.
* It leads to violence
* It leads to child abuse
* It leads to moral decay among children in a family
* It leads to destruction of household property.

**Effects of alcoholism to a community**

* It leads to job neglect.
* It leads to increase in crime rates.
* It leads to low community development.
* It leads to traffic accidents in a community like from drunken drivers.
* Alcoholics become public nuisance in a community

**Ways of avoiding alcoholism**

* Always avoid bad peer groups.
* Make a decision one day to leave alcohol.
* Join good social groups of those who do not drink alcohol.
* Keep yourself busy during your leisure time in activities like games and sports.
* Never taste any alcoholic drink for pleasure.
* Learn more facts about alcohol and its side effects before tasting it.
* Learn how to cope up with stress and problems by not deciding to drink alcohol to forget them.

**Ugandan laws related to alcohol**

* All forms of home distillation are not allowed.
* No person is allowed to drive a vehicle under the influence of alcohol (Don’t drink alcohol and drive).
* Persons below 18 years of age are not allowed to drink alcohol.
* Bars with proper licences are required to maintain certain standards as laid down by the law during operations.
* Customers are not allowed to drink from in off licensed bars.

**Qn.A policeman found Wanyama, a p.6 boy drinking alcohol and arrested him. State the Ugandan law a policeman based on to arrest him?**

* Persons below 18 years of age are not allowed to drink alcohol.

**SMOKING**

**What is smoking?**

* Smoking is the regular/frequent use of tobacco.

**Types of smoking**

-There are two types of smoking, these are;

* Active smoking
* Passive smoking

**What is active smoking?**

* Active smoking is the act of inhaling tobacco smoke directly from a cigarette or a smoking pipe.

**What is passive smoking?**

* Passive smoking is the type of smoking in which a non-smoker indirectly inhales tobacco smoke from an active smoker.

**Who is a smoker?**

* A smoker is a person who inhales tobacco smoke.

**Types of smokers**

-There are two types of smokers, these are;

* Active smokers
* Passive smokers

**Who is an active smoker?**

* An active smoker is a person who inhales tobacco smoke directly from a cigarette or a smoking pipe.

**Who is a passive smoker?**

* A passive smoker is a person who inhales tobacco smoke indirectly from an active smoker.

**Why is passive smoking said to be more dangerous than active smoking?**

* It affects all people around an active smoker.

**Ways tobacco is taken into the body**

* By chewing tobacco leaves
* By sniffing tobacco powder
* By inhaling tobacco smoke set on fire.

**Poisonous substances found in tobacco**

* Tar
* Nicotine

**Name the addictive substance found in tobacco.**

* Nicotine

**Mention the poisonous gas found in tobacco.**

* Carbon monoxide

**What is tar?**

* Tar is a sticky brownish liquid given off when tobacco is burnt.

**What is addiction?**

* Addiction is a strong desire to continue using a particular drug.

**Why do people smoke?**

* To pass time
* To feel warm
* To relax and feel at ease
* To feel confident
* To fit in groups
* To concentrate on what they are doing
* To appear mature and important in case they are young
* They admire those smoking

**Effects of smoking to an individual**

* It causes respiratory diseases like lung cancer, emphysema and chronic bronchitis.
* It leads to self- neglect.
* It leads to unemployment.
* It leads to loss of respect.
* It leads to loss of appetite for food.
* It leads to loss of friends.
* It leads to discolouring of the teeth and lips.
* It worsens respiratory diseases like tuberculosis, diphtheria, pertussis and asthma.
* It lowers the life span of an individual because it damages body organs like the lungs.

**Effects of smoking to a family**

* It causes respiratory diseases to family members due to passive smoking.
* It leads to family neglect.
* It leads to poverty in a family.
* It leads to anti-social behaviours in a family.

**Effects of smoking to a community**

* It leads to fire breakouts.
* It causes air pollution.
* It increases crimes in the community like stealing.

**Effects of smoking to pregnant women**

* It leads to low birth weight.
* It leads to still births.
* It leads to premature births.
* It leads to abortion and miscarriages.
* It makes a mother loose appetite for food which leads to poor health of the unborn baby.

**Effects of smoking to non-smokers**

* It leads to passive smoking.
* It leads to health problems to the unborn babies.

**Diseases caused by smoking**

* Lung cancer
* Emphysema
* Chronic bronchitis
* Coronary heart disease

**Diseases worsened by smoking**

* Asthma
* Tuberculosis
* Diphtheria
* Whooping cough (Pertussis)
* Bronchitis

**Body organs damaged to smoking**

* The lungs
* The brain

**Which body organ is greatly damaged by tobacco smoking?**

* The lungs

**Ways of avoiding smoking**

* Avoid peer groups like those who smoke.
* Keep yourself busy during your free time in activities like games and sports.
* Always find out the bad effects of smoking before starting to smoke.
* Make a decision for yourself one day never to smoke.
* Never taste any substance related to smoking.
* Join good peer groups of those who don’t smoke.
* Destroy all substances related to smoking.

**How has the government of Uganda discouraged tobacco smoking?**

* By putting strict laws against public smoking
* By imposing high taxes on tobacco products like cigarettes
* By providing employment opportunities to people who seem to be idle to run away from smoking
* By sensitizing the public about the dangers of smoking through Health Public Education
* By forcing tobacco companies to write the dangers of smoking on cigarette packets

**Why has the government of Uganda failed to completely stop the habit of tobacco smoking?**

* It has failed to abolish tobacco companies because of the taxes it gets from tobacco manufacturing companies like British American Tobacco (BAT)
* It has failed to get a substitute crop for tobacco growers.

**DRUGS**

**What is a drug?**

* A drug is a chemical substance which affects the way one’s mind and how the body works.
* A drug is a chemical substance which can affect the physical and mental functions of the body.

**Ways drugs are taken into the body**

* By sniffing
* By chewing
* By injection
* By inhaling smoke

**Types of drugs**

-There are two types of drugs, these are;

* Drugs of dependence/Addictive drugs/Narcotics
* Essential drugs

**Drugs of dependence**

**What are drugs of dependence?**

* These are drugs which cause addiction after prolonged use.

**What is drug dependency or drug addiction?**

* This is a condition that results from prolonged use of a drug for normal body functioning.
* It leads to drug abuse in the society.

**What is drug abuse?**

* Drug abuse is the use of a drug in a way that is harmful to the body.

**Examples of drugs commonly abused (examples of drugs of dependence).**

* Tobacco
* Cocaine
* Alcohol
* Marijuana
* Herion
* Caffeine
* Glue
* Aviation fuel (jet fuel)
* Miraa
* Petrol
* Shisha
* Opium

**Factors that lead to drug abuse/drug dependency**

* Peer influence
* Idleness
* Frustration
* Family background and social environment
* Desire to stay awake
* Desire to be strong and bold

**Why do people abuse drugs?**

* To feel warm
* To keep awake or asleep
* To relax and feel at ease
* To forget their problems
* To fit in groups
* To feel confident
* To relieve pain
* To feel sophisticated

**Effects of drug abuse to an individual**

* It leads to self-neglect.
* It leads to loss of appetite.
* It leads to brain damage.
* It leads to job neglect.
* It leads to insomnia (inability to sleep).
* It leads to intensive sleepiness.
* It leads to low immunity to diseases.

**Effects of drug abuse to a family**

* It leads to family neglect.
* It leads to child abuse.
* It leads to spouse abuse.
* It leads to poverty in a home.
* It leads to criminal behaviours like rape and defilement.
* It sets a bad example to the children.

**Effects of drug abuse to a community**

* It leads to increased crime rates.
* It leads to poor job performance.
* It may lead to accidents due to loss of body balance.

**Ways of avoiding drug abuse/drug dependency**

* Avoid bad peer groups.
* Keep yourself busy during your leisure time in productive activities like games and sports.
* Join good peer groups of those who don’t abuse drugs.
* Drug addicts should be taken to hospitals for rehabilitation.
* Encourage drug addicts to attend seminars organised in villages on health education.

**Life skills to safe guard against alcoholism, smoking and drug dependency**

* Ability to cope up with stress.
* Good decision making.
* Having a skill of self-awareness.
* Having a skill of self-esteem.
* Having a skill of problem solving.
* Having a skill of assertiveness.

**Essential drugs**

**What are essential drugs?**

* Essential drugs are drugs that meet people’s health needs.

**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**

* Aspirin
* Panadol
* Fansidar
* Chloroquine
* Quinine
* Paracetamol
* Flagyl
* Mabendazole
* Cough mixture
* Tetracycline
* ARVs
* ORS
* Hedex
* Action
* Amoxilin
* Ibrufen
* Indocid
* Zental
* Penicilin
* Contraceptives
* Coaterm
* Vaccines
* Magnesium

**Storage of essential drugs**

* Drugs should be protected from moisture, sunlight and dirt.
* They should be stored in cool dry and dark places such as cupboards.
* Drugs should be kept out of children’s reach.
* Vaccines should be kept under cool conditions like in refrigerators.
* Polio vaccine and measles vaccine must be frozen.

**Why should drugs be kept in clean cool dry places?**

* To prevent drugs from getting spoilt
* To maintain their effectiveness
* To maintain their curative value

**Why should vaccines be kept under cold conditions especially in refrigerators?**

* To prevent them from getting spoilt.
* To maintain their effectiveness.
* To maintain their curative value.

**Why should drugs be kept out of children’s reach?**

* To prevent drug poisoning.
* To prevent them from damage.

**Uses of essential drugs**

-Essential drugs are classified according to **their uses**. These are;

* Pain killers
* Curative drugs
* Preventive drugs
* Contraceptives

**Pain killers**

* These are essential drugs used to reduce pain.

**Examples of pain killers**

* Panadol
* Action
* Flagyl
* Hedex

**Curative drugs**

* These are essential drugs that cure common diseases

**Examples of cure drugs**

* Coaterm
* Fansidar
* Quinine
* Mabendazole
* Chloroquine

**Preventive drugs**

* These are essential drugs used to prevent to common diseases

**Example of preventive drug**

* Vaccines

**Contraceptives**

-These are essential drugs used in family planning to space children and control unwanted pregnancies.

-Contraceptives help to control frequent pregnancies in a family and over population in a country.

**Examples of contraceptives**

* Birth control pills
* Birth control injections
* Spermicides

**Types of essential drugs**

-There are two types of essential drugs, these are;

* Laboratory manufactured drugs
* Traditional prepared drugs

**What are laboratory manufactured drugs?**

* These are drugs made by physicians in laboratories.

**Examples of laboratory manufactured drugs**

* ARVs
* Panadol
* Zental
* Aspirin
* Quinine
* Amoxilin
* Action
* Indocid
* Fansidar
* Coaterm
* Chloroquine
* Vaccines
* Hedex
* Mabendazole
* Ibrufen
* Paracetamol

**Characteristics of laboratory manufactured drugs**

* They have expiry and manufacturing dates.
* They are well prescribed.
* They are well packed.
* They are well tested.
* They are well labelled.
* They are made under good hygienic conditions.
* Their strength and stability is known.
* Their effect on human health is well known.

**What is expiry date?**

* This is a date at which a drug becomes too old and useless for human use.

**What is the danger of taking expired drugs?**

* It leads to drug poisoning

**What are traditional prepared drugs?**

* These are drugs locally made from available materials from the environment like plant materials, animal wastes and soil.

**Examples of traditional prepared drugs**

* Omuluza
* Ebombo
* Enkejje
* Black jack
* Ekiggagi

**Characteristics of traditional prepared drugs**

* They don’t have expiry and manufacturing dates.
* They are not well prescribed.
* They are not well packed.
* They are not well tested.
* They are not well labelled.
* They are made under poor hygienic conditions.
* Their strength and stability is unknown.
* Their effect on human health is unknown.

**Drug misuse**

* Drug misuse is the use of a drug without or against the doctor’s advice.

**Factors that lead to drug misuse**

* Severe pain
* Failure to interpret the doctor’s prescription
* Ignorance
* Poverty
* Sharing prescribed drugs for one patient by many patients

**Ways in which drugs are misused**

* Failure to use the given prescription
* Self- medication
* Buying drugs from unqualified people like shopkeepers, vendors and hawkers
* Sharing prescribed drugs for one patient by many patients

**What is drug overdose?**

* This is the act of taking more drugs than those prescribed by a doctor.

**Causes of drug overdose**

* Ignorance
* Poor interpretation of the doctor’s prescription

**Effects/dangers of drug overdose**

* It leads to drug poisoning
* It leads to brain and liver damage

**What is drug under dose?**

* This is the act of taking fewer drugs than those prescribed by a doctor.

**Causes of drug under dose**

* Fear of drugs
* Poverty
* Side effects of a drug
* Poor interpretation of the doctor’s prescription

**Dangers of drug under dose**

* It worsens the disease.
* It makes germs resistant to the drug.
* It leads to prolonged illness.

**What is drug prescription?**

* Drug prescription is the doctor’s written advice to a patient on how to use a drug.

**Factors considered when prescribing drugs for the patient**

* Age of the patient
* Weight of the patient
* Disease the patient is suffering from

**State the importance of drug prescription/why should drugs be prescribed?**

* It avoids drug misuse
* It avoids drug under dose
* It avoids drug overdose
* It enables a patient t know when to take the drug

**Why is it dangerous to buy drugs from shopkeepers, hawkers and market vendors?**

* Such drugs are not well prescribed.
* Such drugs may be expired.
* Such drugs may be fake drugs.
* Such drugs are kept under poor hygienic conditions.

**Qn. Babina went to a clinic and was given an envelope with drugs as shown below:**

|  |
| --- |
| ***2x3* Panadol** |

**a). What scientific term is used to describe the doctor’s advice ‘2x3’?**

* Drug prescription

**b).What does figure 2 represent?**

* Number of tablets to be swallowed each time in a day.

**c).What does figure 3 represent?**

* Number of times he is supposed to swallow the tablets.

**d). How many tablets is she supposed to swallow in a day?**

* 2x3 = 2+2+2

= 6 tablets