CLASS REPITILIA

Examples ; snakes, crocodiles, tortoises, lizards

Reptiles are poikilothermic air breathing animals and are well adapted to life on land. They lay eggs with a yolk and a tough leathery shell and inside these the embryo develops into mature adults

There is no free living self-supporting larvae stage

Fertilization is internal and takes place inside the female's body. They have bodies covered by dry epidermal scales which are over lapping backwards or towards the posterior

They have similar simple teeth which are of the same shape and size which are described as homodont teeth.

Most have got two pairs of limbs which are pentaduct (with 5 digits) and the digits have claws for gripping.

EXTERNAL FEATURES OF A LIZARD

Diagram

ADAPTATIONS OF REPTILES FOR LIFE ON LAND

- ❖ They have dry skins covered with scales to prevent loss
- ❖ Possess lungs which enables them to do gaseous exchange effectively on land
- ❖ Lay eggs with a leathery shell to prevent water loss hence the eggs do not dry up
- ❖ Their limbs are jointed and well developed for movement and have digits with curved claws for climbing and gripping apart from snakes
- ❖ Some have external ear drums for detecting sound waves
- ❖ Presence of eyes for sight. The eyes have a nictitating membrane which protects them from dust without affecting sight.
- ❖ They undergo internal fertilization which increases fertilization of eggs by the sperms

EXTERNAL FEATURES OF A LIZARD

- ❖ They have eyes for sight. The eyes have a nictitating membrane which protects them from dust without affecting sight.
- ❖ They have nostrils for breathing
- ❖ They have an eardrum for detecting sound waves

- ❖ The gular fold is used during courtship when its lowered when it is also lowered when the lizard is scared
- ❖ For limbs and hind limbs have digits with claws for gripping and climbing
- ❖ The tail is for balancing during movement
- ❖ Nuchal crest is used during fighting in males
- ❖ The vent is for passing out urine faeces and gametes

CLASS MAMMALIA

Mammalia is a class under phylum chardata and kingdom Animalia. Mammals are warm blooded

CHARACTERISTICS OF CLASS MAMMALIA

Hair covers the bodies of mammals wholly partially e.g an elephant, there are only patches of hair

Female mammals posses mammary glands that secrete milk for feeding their young ones

Most mammals are viviparous, there young ones are retained for a specific period in the body of the mother where they developed to an advanced stage

The primitive mammals are said to be oviparous

Mammals are heterodonts, they have different types of teeth, canines, incisors, molars, premolars, except in primitive mammals

They have the external ear (pinna) in addition to the middle ear and inner ear which are present in other organisms.

The brains are larger and highly developed

The skin bears sweats glands

They posses diaphragm that separates the chest cavity from the obdominal cavity

EXTERNAL FEATURES OF MAMMAL

Body structures;

Mammals vary in size and shape of their bodies

Swift- running animals like the dogs and deer are often slender with long limbs. Aquatic animals like the whale and seal have streamlined bodies. In burrowing animals like moles have enongated bodies

The neck

Deers and horses are examples of grazing and have necks. Giraffes inclusive also have elongated legs to browse leaves of trees

The tails

The tail performs various functions in different mammals and in each case they are suitably shapped. In rodents e.g squirrels which run about the tail is shaped in a way providing stability and balance

In whales, the tail is flat for propelling itself forward and also serves as a rudder (device for supporting and balance)

In some monkeys the tails is used for grasping branches.

The limbs

These are also raised in shape and purpose. In fast running animals, the limbs are slim and shaped towards the foot. In heavy mammals like elephants the limbs are paddles shapped and the buck toes are absent. In the bots, the fore limbs and fingers are elongated to grip for support

The foot

The bask no of toes on each foot of a mammal is five but in some animals the number two is reduced in the deer and sheep, the third and fourth toes are enlongated but the second and fifth toes are reduced to be small.

The external ear.

In grazing animals like the deer and horses the external ear is large and movable

In burrowing animals/ mammals like rats, the external ear is small. The external ear is absent in aquatic animals

The eyes

Mammals which feed on plants in the open need to keep watch for enemies so their eyes are at sight of the head

Rodents like squirrels, rabbits hoofed mammals like cattle, pigs. The eye of carnivals and other primates are positioned at the end of the head e.g. lions and dogs and cat family

Functions of the skin in mammals

It regulated body temperature using the hair or sweat glands or flat deposits

It serves as a protective covering from the damage by fungi, bacteria or mechanical means

For secretion of sweat by excretion by means of sweat glands

To receive stimuli- heat, cold pain and tough by means of nerve endings

SOME FEW ORDERS FOR CLASS MAMMALIA

1. **MONOTREMATA**; These are egg laying mammals which are also insect eaters e.g. platypus, spiny anti food is termites and aunts. The claws are used for digging up when looking for food.

2 **MARSUPIALS** These are pauched mammals e.g. Kangaroas, Koala, bears, wallaby. They are born before their development is complete and they use their fore limbs to pull themselves into the mother's pouch from where they access the mother's teats.

N:B; Monotrems also like Echido farm pouncher for a short time during breeding seasons

3. **RODENTIAL (RODENTS**); These are gnowing mammals with two pairs over growing chisel shapped incisors. They are mainly herbivals and have whiskers for sensation. Examples include squirrels, rats mice guinea pigs and porcupines. The rodents have a very high production rate so they out number all other mammals

4. **EDENTATA;** These are toothless mammals which burrel during day and feed at night. have scaly spiny ant eater armadillo.

5.. **CENTACES**; They are very fast locomoters with strong jaws and enlarged canines. They also have very good eye sight and sense of smell

They are carnivorous aquatic mammals with no hind limbs. Their limbs are modified into flippers. They have fish like tail and lungs so that they breathe for a long time

A flat blubber is present in the blue whale other examples are dolphins, whales and manatees, seals, porpoises

6. **PROBOSCIDEA.;** These are vegetation land mammals with their nose and upper lip extended to form a trunk. they have stout limbs (massive and elabonate) enloarged grinding teeth. Upper incisor is modified into a tusk. These are the largest known mammals today. e.g. elephants. They lack canines

7. **CARNOVORA:** These are flesh eating mammals with claws and strong canines for tearing flesh. The cat family e.g lions, cheetahs, jaguars, leopards etc. the dog family e.g. fox, bears wolves and hyenas etc.

8. **UNGULATA (HOOFED MAMMALS)**

These are divided into subgips i.e. is ruminants and non ruminants

i. **ANTIODACTYLA**

These have an even number of toes and are herbivocous. The third and fourth toes are enlarged and have a central ……. Btn them forming a cloven hook. Examples include cows, goats deers, carmel, oxen. They have a specialized digestive system with a four chambered stomach i.e. rumen, reticulum, abomasum, omasum. They chew cud.

ii. PERISSODACTYIA

They have an odd number of toes. Digestion of cellulose i.e. complex in the leaves. Examples are zebras, horses rhinocerous. The third toes is central and enlarged compared to others. Only one toe touches the ground.

9. CHROPTERA; These are flying mammals with their fore limbs modified into wings. These wings have a leathering skin stretched out btn its long fingers have a large claw to hand for support. The fingers have large claws to hang up side down on trees and other structures. They also have poorly developed eye sight but very high developed hearing. Therefore they squeak to enable them locate objects by echo locomotion e.g. birds

There are two types of flying mammals

i. Fruit eating mammals

These are very large with long muzzies

ii. Insect eating mammals

These are very small with short muzzies

10. INSECTIVORA; these are primitive placental mammals which live in burrows and feed on insects. They have small brains and teeth are primitive

11. Primates; this is the highest order of mammals. Most are tree dwellers. They are well known for a highly developed brain, excellent parental care to the young ones and internal gestation i.e. carrying their young ones in their mother's womb for a prolonged period of time They have nails instead of claws and rely more on sight than on smell.

They have well developed arms with opposable thumbs. Their fingers are used for grasping or holding their eyes are positioned front wards not sideways, most are omnivorous e.g. monkeys apes, chimpanzees and man etc.

Placenta animals include rodentia, chiloptera, ungulate and primates

Tubulendeta; They are ant eating animals with a long anout. Examples are aardvark. They have peg like teeth.

Lagamofa; These are rabbits and hares. They have two pairs of chisel shaped incisors which they use for gnawing for this reason these teeth grow constantly.

INVERTEBRATES

These are animals without back bones

THE PHYLUM ARTHROPODA

This is the largest group of invertebrates having the following characteristics

They have an exo- skeleton made up of a hard substances called chitin forming a cuticle. This protects the inner delicate parts from mechanical injury or damage, prevents excess loss of water from the body parts and protects the inner tissues from infections/ entry of pathogens. It also have an attachment area for muscles that brings about movement.

- They have segmented bodies
- They have dorsal heart and ventral nervous system
- They bilaterally symmetrical
- They have jointed append ages (legs/ limbs, antennae, mouth parts, wings)

  This phylum is divided into five closes and these are,

Class: Crustacea

Class: Insecta

Clas: Arachnida

Class: Diplopoda

Class: Chilopoda

CLASS CRUSTACEA

Examples are crabs, lobster, shrimps barnacles, water fleas Cyclops

GENERAL CHARACTERISTICS

- ✓ Nearly all are aquatic
- ✓ Breathe through the gills
- ✓ Head has two pairs of antennae
- ✓ In the prawns and crabs the exo skeleton is thick and hard and heavy because it contains both chitin and chalk (is a calcium carbonate)
- ✓ The head and thorax are fused and vovered by a corapase stalks and several pairs of mouth parts on the head
- ✓ The thorax usually has more than four pairs of legs. The first pair of thoracic legs and in powerful claws used to seize/ capture and hold food
- ✓ A number of plates called swimmerets used for swimming are attached to the abdomen.

STRUCTURE OF A CRAY FISH

CLASS ARACHNIDA

Examples are the spiders. Ticks, mites and the scorpians

✓ Body divided into two main parts i.e. Cephalathorax and abdomen. The Cephalothorax has several simple end in pincers

✓ Antennae are absent

✓ Posses four pairs of legs attached to the cephalathorax

✓ They are covered with a wox cuticle

✓ They breathe by means of lungs books. E.g. books and trachea

✓ Their abdomen is not segemented in most cases and in some spiders, the abdomen has spinnerttes which generates silk threads used for maksing cobwebs but not all spiders make the webs. The webs are used to trap prey, for moving i.e. providing a path way from one place to another, to shield their egges.

N:B Scorpions have segments abdomen with a stinging spine attached to the last segments Ticks feed an animal blood transmitting diseases like Relopsing Fever, Tick borne Typhus. Tick leads to loss of many cattle in the world. They belong to the order acarina.

STRUCTURE OF A TICK

ADAPTATIONS OF ARACHNIDA

✓ They have scutum (hard dorsal shield) for protection against damage and also reduces excessive water loss Ticks which do not have scutum have a leathery skin which impermeable to water and so reduces water loss

✓ They have pointed and sharp mouth parts for piercing the skin and tubular for sucking blood from the host mouth parts are also used for attachment onto the host

✓ They posses claws or have claws on their limbs for grasping when climbing the host or moving on grass

✓ They are doravenrally flattened in shape which enables them to pass through narrow crevices

✓ They have a simple gut (alimentary canal) as the food taken in is simple and in soluble form

✓ They are dull coloured, brown or black to provide a good caomouflage

✓ They passes simple eyes very sensitive to light this enables them to escape from enemies and then hide in dark places in the hosts body.

- ✓ They lay many eggs to increase the chances of survival
- ✓ They have a wide of hosts from which they derive food.
- ✓ Reducing competition for food, and reducing chances of survival
- ✓ They have many stages in their life cycle and this also increases the chances of survival
- ✓ They can survive for a long time with out food
- ✓ They are very rapid feeders

THE LIFE CYCLE OF THE TICK

Ticks are divided intwo two families namely

i) Family:- Ioxidae (Hard ticks)

ii) Family- Argorsidoe (Soft ticks)

These families are derived depending whether the tick has a hard scrutum or not having a scrutum

The family Iodidae are hard ticks. They have a hard shield called a scrutum. They have a life cycle having one nymph stage.

The Argarsidae are soft ticks. They have no scutum and instead have a leathery cuticele. They have many nymph stages.

When on the host, the ticks attach them selves firmly because they are ecotoparasites and when not on the host, they are normally found in grass and is where females lay thousands of eggs and later dies.

LIFE CYCLE OF THE TICK

Generally the adult female tick feeds on vertebrate blood and eventually falls off the host onto the ground.

The female tick then lays eggs on the ground cracks or on the bark of trees or underside of leaves.

After a few days the eggs hatch into larvae

The larvae molts to form nymph after 3 or more days depending on the type of tick. The nymph may also molt into two or more stages to formation of an adult tick.

Generally this life cycle consists of four stages as shown below.

Depending on the no of nymph stages tick can be divided into 3 groups namely;

i) One host tick life cycle

ii) Two host tick life cycle

iii) Three host life cycle

ONE HOST TICK LIFE CYCLE

They have one host in their life cycle. When their eggs hatch into larva, they attach themselves onto the host and remain on the host until they develop into adult which then falls off to lay eggs These are the most common types of ticks and very resistant to acaricides (medicine) example is the blue tick i.e. Boophilus dectatus which transports red water diseases

TWO HOST TICK LIFE CYCLE

These have two hosts in their life cycle i.e. eggs hatch into larvae which attach them selves onto the first host and then feed on its blood until they moult into nymphs. These nymphs drop from the adults. The adults then look for another host onto which they attach themselves, feed and mate

After mating the females fall onto the ground where they lay the eggs example the red legged tick (Rhipicepholus axertsi) which transmits East Coast fever.

THREE HOST TICK LIFE CYCLE

These ones need (3) hosts in order to complete their lifecycle. It is used especially by the hard ticks which normally cause a lot of diseases to cattle e.g. bone tick cause heart water disease

TICKS AS PARASITES

A parasite is an organism that obtains nutrients from another organism (host) which doesn't benefit but suffers a lot of harm.

Ecto parasites is a parasite that live outside the body of an organism

Ticks affect their hosts in the following ways

- Emaniciation (thinness of an organism)of an organism
- Can lead to anaemia
- They damage the skin of the host causing them to be of low economic value
- They are vectors of diseases known as tick borne diseases.

CLASS INSECTA

- This is the largest group of Arthropods because it makes up to 70% of kingdom animalia. Most insects don't have wings
- Some insects possess wings and therefore have the ability to fly. Therefore class insect is considered to be one of the most successful animals because of the following reasons.
- High reproductive rate by producing many eggs to increase the chances of survival
- They are small in size making the consuming small food and can occupy small spaces
- Some have wings for flight to escape danger occupy different habitants
- They have waxy cuticle to prevent water loss or desiccation.
- They have a variety of mouth part modification to feed in different types of food. By different species to avoid competition.
- They posses three pairs of legs for locomotion in crawing
- They have a pair of antennae for feeling
- The body is divided into three main division each with its function to increase efficiency of the functioning of the body.
- They are made up of an exoskeleton which acts as a protection of its inner organs and also prevents water loss
- Have a pair of compound eyes for sight
- Have different stages in their life cycles (Complete) and incomplete metamorphosis to increase their chances of survival

General economic importance of insects

HARMFUL EFFECTS

- They are pests e.g. locusts. Weavils, termites etc. they feed and damage growing crops or seeds.
- They destroy properly cockroaches destroy books termites destroy timber.
- Some are disease vector to man and livestock e.g. testifies, mosquitoes, houseflies
- Some are ecctoparasites to man and livestock e.g. bed bugs, lice, ticks

USEFUL EFFECTS

- Some are as a source of food to man e.g. grass hoppers, white aunts, termites
- Some are used as medicine or their products e.g. honey fram bees is used to sweeten medicine.
- Some insects are pollinator of crops e.g. butterflies bees. Moths which provide food to man.

- Some insects moke tunnels in the soil which improves on the aeration and drainage of the soil hence proper plant growth
- Some insects are predators to other insects which are harmful to man hence are used by man to control the population of the insect which are harmful to man.

GENERAL CHARACTERISTICS OF INSECTS

- They have three main body parts or division.
- They have 3 pairs of joined legs
- Have a pair of compound eyes but just a few may have simple eyes
- They carry out gaseous exchange by the tracheal system which is connected to the spiracles for breathing
- Excretion is by malpighian tubes
- Their bodies are covered with chitin which make up the exoskeleton
- They have a pair of antennae on the head

EXTERNAL FEATURES OF THE HEAD

- Head has a pair of antennae. The antennae are joined and bear organs sentive to touch, smell and vibration
- Compound eyes on each side of the head are made of many tiny units packed closely together and covered by a transparent cuticle
- They have modified joined mouth parts those include 3 pairs of jaws (mandible) and first and second Maxilloe. They vary according to the mode of the feeding of the insect e.g. grasshoppers and cockroaches have serrated inner parts which work against each other like blades of scissors.
- The palps which are modified parts of the first and second maxillae are used for testing the food and holding it.
- These two insects cut their food in to small pieces with their mandible
- Butterflies, moths and houseflies have sucking mouth parts

MOUTH PARTS OF A COCKROACH AND THE FUNCTIONS LATERAL VIEW OF A HEAD OF A COCKROACH SHOWING MOUTH PARTS.

ANTERIOR VIEW OF A HEAD OF A COCKROACH SHOWING MOUTH PARTS

EXTERNAL FEATURES OF THE THORAX

This has (3) segment's i.e. Prothorax, Mesothorax, Metathorax.

Each segment has a dorsal tergum (dorsal cuticle) each segment also has and ventral sternum (vertral cuticle)

Each segment has a pair of jointed legs which consists of a number of segments and ends in claws and pads.

In most inscects, the second and third thoracic segments (mesothorax and meta thorax respectively) each have a pair of wings used for flight. The outer wings are on the mesothorax and are hard for protection of the inner parts against damage while the inner wings membranours/ light and usually folded

N:B: Some insects remain wingles throughout their life e.g. bedbugs, while insects like flies and mosquitoes develop only one pair of wings.

In houseflies, the pair of wings is on the mesothorax and the second pair is reduced to halters (used for balancing) and are on the methorax.

DIAGRAM SHOWING SEPARATE MOUTH PARS OF A COCKROACH

ABDOMEN.

It contains six to twelve segments in adults but never more than 12. The last segment ends in an opening called an anus through which un digested food materials are egested.

The hind segments of the abdomen bare appendiages e.g. the avipaster used by the female grass hopper in egg laying.

GROWTH IN INSECTS

In the typical insects e.g. grasshoppers, the female uses its avipostors to dig a hole into the ground in which it lays eggs. The it sectretes a liquid over them to form a hard egg case. After some time, the eggs hatch outside into nymphs. These moult about 6 times before becoming adults

CUTICLE AND ECDYISIS (MOULTING)

- ✓ It reduces loss of water vapour thru evaporation from the body
- ✓ It protects the inner parts from damage and bacterial invasion
- ✓ It maintains the shape of the insect
- ✓ It allows rapid locomotion
- ✓ It limites the size of the insect because if it is allowed to become very large, the cuticle will be very heavy to allow the muscles to allow muscles to move the limbs
- ✓ During development, the insect sheds its cuticle by the process called Ecdysis/ Moulting
- ✓ It increases the volume or size before the new cuticle hardens
- ✓ Only the outer most layer of the cuticle is shed. The inner one is digested by enzymes secteted from the epidermis as a fluid produced and is absorbed into the body.
- ✓ This type of growth is called intermittent growth as shown below.
- ✓

Muscular contractions results in flow of blood from the thorax causing it to swell and splits the old cutile along lines of weakness. The insect swallows air after Ecdysis as the new cuticle hardens keeping the body expanded. Moulting is initiated by a hormone thyroxin secreted by glands in the thorax. This occurs only in larvael and pupal stages and also nymphal stages i.e. mature insects do not grow.

DIAGRAM SHOWING A MOSQUITO SUCKING BLOOD.

ORDER DIPTERA

HOUSEFLY: Musca Domestica

CLASSIFICATION.

Kingdom; Animalia

Phylum; Arthropoda

Class; Insecta

Order; Diptera

Family; Musidae

Genus; Musca

Species; Domestica

These are the most abundant and common insects in every part of the World

External Characteristic features

HEAD; It bears the following features

A pair of large compound eyes

Three (3) simple eyes located at the dorsal part of the head between the compound eyes called (ocelli)

A pair of short segmented featherly antennae with 3 joints

A proboscis which is tubular / funnel shaped (to create a large surface area for feeding) for taking in soluble or dissolve food substance.

Has two pairs of wings, one is well developed and is membranous and the other is un developed as it is modified into small structures called haltares.

THORAX; It has the following features.

Has one pair of true membranous wings with the other modified into the haltares

Has a pair of halters or balancers for balancing

Has the three (3) pairs of jointed legs (one on each segment) which are hairy. The legs bare two claws and granular pads. The claws are for gripping out on rough surfaces during movement. The granular pads secrete a sticky substances when walking.

Thorax is stripped vertically with black or grey strips

ABDOMEN.

Short abdomen with only four segments clearly seen.

Hairy and segmented

Each segment has a pair of spiracles for breathing

N:B The abdomen is not stripped.

DIAGRAM OF A HOUSEFLY.

DIAGRAM OF A HEAD OF A HOUSEFLY

STRUCTURE OF ALEG OF A HOUSEFLY.

LIFECYCLE OF A HOUSEFLY.

Houseflies breed in any decomposing matter so long as it is warm and moist. They reproduce sexually. After fertilization, a female fly lay 5-6 batches of eggs in her life time each containing an average of 100-150 eggs and about 1mm in length

Egg

The female adult housefly lays an average of 150 eggs in decomposing matter e.g. faeces, food, manure heaps.

They hatch in about 12-24 hrs into larvae called maggots.

Maggots.

It is semi- transparent at first and becomes white after sometime. The larvae usually has 12 visible segments. The anterior is pointed at the ending in a small head with hooked mandibles. The hook is for tearing and movement. It has legs absent but movement is aided by spiny pads which have sharpened ends called protuberanes

Have spiracles on the 2^{nd} and 12^{th} segments used for breathing. The maggot feeds and grows rapidly for about 3-4 days after egg laying. It moults 2-3 times before reaching full length 1.25cm long . it moves to a dry place and pupates maggots like dump places not light.

PUPA

It changes from white to dark brown enclosed in a puparium. It doesn't feed and move for 4-5 days

It under goes tissue break down and internal re- organization to form different organs the pupa buets open at a weak point called puparium. The young adult emerges from the puparium and is called image 4- 5 days.

Image/ Adult

8-9 days or after laying eggs. Still in the puparium, the imago pushes off the front end of the pupal case by extending a special case on the front of the head.

The wings of the weak adult unfold. It flies off after a few hours when the wings of the adult unfold. It flies after a few hours when the wings have hardened after expanding. The imago becomes sexually active in 10.14 days and sometime can mate. It lays eggs days after mating

ECONOMIC IMPOTANCE OF A HOUSEFLY.

1. They spread diseases as they feed on food and decaying matter containing pathogens. E.g. bacteria.
2. As they feed or walk on human food, they spread contagious diseases e.g. bacterial diseases. Typhoid, red eyes, stomach ache paliamyelitis etc. these are paused on in the following ways.

a. The body and legs are covered in hair which pick up pathogens and transfer them to a human food as after feeding

b. W hen feeding, the fly may pour/ vomit out a drop of saliva which may contain harmful bacteria obtained, earlier when feeding on infected/ contaminated food.

c. I while feeding, the fly may defecate and pass out germs through its feaces.

Prevention of spread of diseases by Houseflies.

- Proper disposal of left over foods or keeping it covered
- Cover all food properly
- Proper disposal of wastes by keeping them in pits and burning them when necessary
- The holes of a pit latrine should be left covered
- Use fly traps and smoke the pit latrines regularly
- Compost pits should be well covered.
- Wash hands after going to the toilet
- Wash hands before and after eating
- Warm left overs
- Wash utensils properly

MOSQUITOES

Classification.

Kingdom; Animalia

Phylum; Arthropoda

Clas; Insecta

Order; Diptera.

Mosquitoes which are of economic importances are

Anopheles Mosquito

Ades Mosquito

Culex Mosquito

General Features

Generally, they are slender with six legs on the thorax

- They have the probasis used for sucking in males and piercing and sucking in females.

Mouth parts of a female bears a sharp structures called stylets for cutting host's skin during feeding. It then inserts he sucking and saturary tubes followed by secretion of saliva which contains anticoagulant which prevents blood from cloating. The blood is then sucked in solution form

It has a pair of wings, the second pair is not well developed to form small structures called halters for balancing.

DIAGRAM OF THE HEAD OF THE MOSQUITO SHOWING ALL MOUTH PARTS

DIAGRAM OF AN ANOOPHELES MOSQUITO

DIAGRAM OF A CULEX MOSQUITO

LIFE CYCLE OF MOSQUITO

Mosquito breed in stagnant water or still water. The adult female mosquito lays eggs which are boat shaped in the stagnant water

The eggs of anopheles mosquito are laid in singles and have a pair of air floats

The Culex mosquito lays eggs in batches

The eggs hatch into larvae after 10-12 hours/1-2 days. The larvae lives in water breathes through a tube called siphon (in culex) on the eighth segment. This larvae always lies at an angle (outer) to the water surface. The larvae of an anopheles mosquito breathes through a pair of spiracles and lies parallel to the water surface.

After two days, the larvae moults four times and then paupates thorax. The abdomen is narrow curved and segmented in ends in a pair of flat tails forming a tailfin

On the upper surface of the thorax are two small tubes called breathing trumpets which pierce the surface of the water and through which the pupa breathes

After two days, after pupation, the pupa skin splits to release the adult. The adult rests on the pupa case, the wings unfold, harden and it flies away.

No feeding occurs in the pupa stage but instead there is internal reorganization of the tissues and organ formation of the mosquito.

SUMMARY.

LIFE CYCLE OF AN ANOPHELES MOSQUITO

LIFE CYCLE OF A CULEX MOSQUITO

ECONOMIC IMPORTANCE OF MOSQUITOES

An anopheles mosquito transmits or causes malaria which is caused by pathogens called plasmodium which is a parasitic protozoan. When a female anopheles mosquito bites a person who is infected, it sucks blood containing the parasite. When they reach the stomach of the mosquito they develop into young parasites which move into the mosquitoes salivary glands. When the mosquito this times bites on un infected person it then transmits the parasites to that person. In this way, the plasmodium parasites is transmitted. The incubation period of malaria is 10 days.

SYMPTOMS OF MALARIA

- ✓ High fever is high temperature
- ✓ Pains in joints
- ✓ Headache
- ✓ Severe stomachache
- ✓ Convulsions
- ✓ Frequent vomiting
- ✓ Anemia; this is because it destroys red blood cells
- ✓ Miscarriages in pregnant women
- ✓ Brain damage when severe

A Culex mosquito spreads Elephantiasis caused by filarial worms

An Aedes mosquito causes yellow fever and Dengue fever ie

Aedes egypti transmits dengue fever

Aedes titus transmits yellow fever

CONTROL OF SPREAD OFMALARIA

Categories

A. Prevent the body from mosquito bites by, sleeping under

- ✓ A well treated insecticide mosquito net
- ✓ Wearing clothes that cover the legs, arms at night
- ✓ Close all windows and doors early to prevent mosquitoes from entering residential area
- ✓ Smear mosquito repelants

B. Destroy breed places for

- ✓ Cover ceptic and water tanks
- ✓ Remove broken utensils which collect water
- ✓ Cut grass and bushes around houses
- ✓ Paint buildings with brightly coloured paints to preven dark hiding places for mosquitoes
- ✓ Draingne stagnant water like swamps and ponds
- ✓ Spray swamps and ponds with insecticides and add oil to prevent the larvae from breathing
- ✓ Biological control i.e. introduce fish which can feed on larvae in ponds

C. Spray Persistant insecticides from the air or on the walls of houseses but has some effects i.e. DDT.DDT. Persists into fat tissues of insects when the insects are sprayed and when vertebrate eat the insects, the DDT remains in the tissue of the vertebrates e.g. birds. When the birds eat insects, the DDT contained effects the reproductive potential due to its adding in concentration leading to less number of birds in the habitant.

Spraying kills useful insects like bees, butterflies therefore DDT. Was abolished because of the above reasons and was building to high levels in human body.

PROBLEMS ASSOCIATED WITH INSECTICIDES USE TO CONTROL MALARIA

- ✓ The insecticides kill non- target organisms e.g. bees which may be useful to man
- ✓ Mosquitoes can develop resistant strain which cn no longer be liked by insectcides
- ✓ Some insectcides persist in the environment and hence may accumulate in the food chain e.g. DDT. Leading to death of many organisms.

ADVANTAGES OF USING INSECTICIDES

They kill insects instantly

BUTTERFLIES AND MOTHS (LEPIDOPTERA)

Kingdom: Animalia
Phylum: Arthropoda
Class; Insecta
Order; Lepidopteria
Family; Papilae
Genus; Papilio
Species; Demodorus

Lepidoptera means scaly wings common to butterflies and moths

The butterfly is a four winged insect with a small, hairly, elongated and cylindrical body

The wings are soft and membranous because are covered by scales as with the rest of the body

The body is divided into 3 distinct parts i.e. head, thorax and abdomen.

HEAD

It bears a pair of compound eyes used for detecting movement patterns and direction i.e. it is used for sight

A pair of long clubbed antennae that has sensory organs for feeling/ touch and smell

The antennae in the moth are more sensitive than those of butterflies.

Three 3 simple eyes which are hidden in the hairs on top of the head in the moths but not butterflies and this is why moths are nocturnal while butterflies are diurnal

Contains a long proboscis having a sucking tube. Then the proboscis is not in use, it is coiled away beneath the thorax.

Head of a Butterfly.

Diagram.

Thorax

It bears reduced prothorax, mesothorax and metathorax.

Prothorax is usually reduced bearing a pair of natural process called patagga.

Mesothoraz is the largest and most prominent segment and metathorax is medium sized.

Each segment bears a pairs of jointed legs (3) pairs of legs in all)

The mesothorax and Metathorax each bear a pair of wings for flight.

In butterflies, the wings are folded vertically positioned when not in flight i.e. when in rest, as for the moth, they are folded horizontally when not in flight i.e. when in rest

The wings have “false eyes” which give a pattern useful in camouflage which acts as a defence by scaring.

Each thoracic segment has a pair of spiracles.

ABDOMEN

It has ten segments each with a pair of spiracles.

The last segment bears external genitalia (external reproductive organ) for reproduction.

The three body parts are covered with flattened leathery scales which are diffently coloured but some may jave uniform colour forming a false eye (on the wing)

LIFE CYCLE OF A BUTTERFLY

Butterfly undergo complete metamorphosis. A female butterfly ready to reproduce, displays a particular scent/ smell that attracts the male.

The female demonstrates a courtship flight that enables the male to see and recognize it
When mating occurs the male holds the tip of the females abdomen with it abdomen claspers
The spermatophere (sperms) are then passed to the female i.e. external fertilization

LIFE CYCLE

The adult female lays eggs on the underside of the young leaves either in groups or singly. These hatch into larva after 4 days and its called caterpillar. These eggs are oval and flattened

Larvae/ Caterpilla

The caterpillar has three 3 main body parts i.e. the head, thorax and abdomen. The thorax has three 3 segments and the abdomen has 10 segments there are 3 pairs of true legs and four 4 pairs prolegs on the abdomen. It has a prominent head with chewing mouth parts or mandibles. It feeds continuously on leaves or vegetation. It has a pair of claspers on the last abdominal segments. It grows quickly and moults several times changing into a pupa/ chrysalis

DIAGRAM SHOWING THE LARVAE OF A BUTTERFLY

Pupa (Chrysalis)

The pupa is an inactive stage because it doesn't feed or move. It undergoes internal tissue breakdown and re- organization so that organs are formed.

DIAGRAM OF APURA OF A BUTTERFLY

Adult Butterfly

The adult, emerges after 10 weeks. The adult matures after 8-14 days (1-2 week)

DIAGRAM OF AN ADULT BUTTERFLY(DORAL VIEW)

SUMMARY OF THE LIFE CYCLE

Differences between a Moth and Butterfly

BUTTERFLY	MOTH
- Diurnal/feed in day	- Nocturnal / feed during the night
- Has clubbed antennae	- Has pointed antennae/ tapering
- Has wings positioned	- Has wings positioned horizontally at rest
- There are no simple eyes but only compound eyes	- Has 3 simple eyes hidden in the hair on top of the head
- Have brightly coloured patterns on wings	- Most dull coloured pattern on wings

Economic importance of Butterflies.

Adult butterflies are pollinators of crops

Caterpillars destroy vegetation/ crops e.g. beans maize and cabbage.

Caterpillar posses hair which can cause irritation of the skin.

Adult butterflies can be used on a-namental purpose particullary their wings and can be used for art, design and decoration.

THE COCKROACH

Kingdom	:	Animalia		
Phylum	:	Arthropoda		
Class	:	Insecta		
Order	:	Dictyoptera		
Family	:	Blattida		
Genus	:	Periplaneta	OR	Blatter
Species	:	Americana		Orientalis

CHARACTERISTICS OF A COCKROACH

- ✓ The head bears long segmented antennae which paratrude from beneatheach eye tapering at the tip
- ✓ The head also bears a pair of compound eyes
- ✓ The thorax has three pairs of jointed legs and have spines and claws
- ✓ The head bears chewing mouth parts or mandibles
- ✓ The theorax has two pairs of wings, the outer pair is harder and inner pair is membranous used for flight
- ✓ The abdominal segments bear spiracles and the last segment has a pair of cerci and in the male, there is a pair of anal style in addition to anal cerci
- ✓ In females, at the end of the abdomen pedical plate where the ootheca where the eggs and sperms in females are stored in the sperm theca before fertilization.

DIAGRAM OF DORSAL VIEW OF A COCKROACH

DIAGRAM OF THE VENTRAL VIEW OF A COCKROACH

It has the first Maxillae (Maxillary palp) which is jointed and S. shaped. It has the second maxillae called the labial pulpy which is jointed and connected to the lower lip known as the labium. It has a mandible which is used for out ting/ grinding

LATERAL VIEW OF A COCKROACH'S HEAD

ANTERIOR VIEW OF A COCKROACH'S HEAD

THE FORE WINGS(OUTER) OF A COCKROACH

THE HIND WINGS (INNER) OF A COCKROACH

THE ATENNA OF A COCKROACH

ABDOMINAL END OF MALE COCKROACH (VENRAL VIEW)

ABDOMINAL END OF FEMALE COCKROACH (VENRAL VIEW)

DIFFERENCES BETWEEN COCKROACHES AND GRASSHOPERS

i) They have atmost the same equal size of the limbs	They have different size of the limbs i.e. the hind limbs are longer and stranger mainly adopted to generate a thrust against the ground to aid in jumping (a form of locomotion)
ii) They have a poorly developed anal cerci	They have a developed anal cerci that is modified to form an avipostor in females

ORDER HYMENOPTERA

This is the Order; bees, wasps, ants and saw flies

General Characteristics

- ✓ They have biting (mandibles) and sucking (probosis) mouth parts
- ✓ They have membranous wings. The fore wings are usually longer than the hind wings
- ✓ The abdomen may be constricted to form a waist like structure after joining the thorax.
- ✓ It may be social or soliary, social insects are more

✓ The larva may resemble caterpillars as in saw flies or legs absent as in ants, bees and wasps

✓ Many are external parasites of other insects so can move and attach them selves on the other insects

✓ The first segments of the abdomen is fused together with the thorax.

✓ The avipostor is well developed and has a sting which may be used for defence

BEES , Apis mellifera/ Apis mellitica

External features.

Head

It is fixed on the thorax and is freely mobile

Has a pair of prominent compound eyes. It has three simple eyes.

Has a pair of short segmented antennae

It has modified proboscis forming mouth parts used for lapping during feeding and nest building with the gloss being modified for sucking

Thorax

Has two pairs of membranous and transparent wings

Hind wings are smaller than the fore wings and inter lock to the fore wing by hooklets, and one may think that it is one pair.

It has three pairs of legs which differ from each other as shown below .

STRUCTURE OF THE FORE WING

STRUCTURE OF THE HIND WING

DIAGRAM OF THE FORE LIMB OF A WORKER BEE

DIAGRAM OF THE MIDDLE LIMB OF A WORKER BEE

DIAGRAM OF THE HIND LIMB OF A WORKER BEE.

THE DIFFERENT CASTS OF BEES

A. The Queen

✓ It is the only fertile and viable female in the bee hive thus capable of laying eggs. Its work is to lay eggs only.

✓ It has a relatively longer and larger body with small wings each hive has only one queen. She mates once in her life time and with only one drone where she produce two types of eggs i.e. fertilized and unfertilized.

✓ The fertilized eggs develop into queens and workers and the unfertilized develop into drone.

✓ The type of food fed on will determine whether a fertilized egg will develop into a queen or a worker.

✓ The queen is fed and nourished by workers. Mouth parts are poorly developed and has a sting at the end of the abdominal segment modified into the oviposter. It uses it in the bee hive. She may also have a poison bag connected to the oviposter which can be used as a sting.

✓ The queen leaves the hive just before the new one hatches from the pups and goes away from the hive with a few drones in a sworm and thousands of workers

B. The Drone

- ✓ They develop from un fertilized eggs. A fully grown or developed male with a bulcky body and a blunt abdomen.
- ✓ It is fed by the worker and their mouth parts are not fully developed and has nosting. Its only work is to fertilize eggs in the queen. The successful drone which fertilizes the eggs dies after mating because it cannot fight the enemies
- ✓ The mating occurs when they go for a nuptal flight. When there is shortage of food, some drones are stung to death by the workers to provide food for the queen.

C. The Worker

✓ They develop from fertilized eggs. They are small in fertile females thus donot lay eggs and are the most numerous. They have more complicated external features as shown on the different legs especially the hind limb.

✓ The pollen comb/ brush are on the hind legs for escaping pollen from the abdomen into the pollen basket.

✓ There is a wax cutter at the opening of the pollen basket other parts of the body that are modified include,

i) Developed sting for defence
ii) Numerous hairs on the body for collecting pollen
iii) Wax plants on the ventral parts of the abdomen for producing wax used for making the comb.
iv) Proboscis for sucking nector.
v) Nurse gland for producing rayal jelly just above the mouth.

DUTIES OF THE WORKER BEE IN THE HIVE

- ✓ Guarding the hive against enemies
- ✓ They feed the queen and the developing grub on the milk
- ✓ Mend the hive
- ✓ Feeding the grub / larvae with royal
- ✓ Cleaning and clearing the hive by eating dirt and rubbish
- ✓ Ducking and staring honey and pollen in the cells of the honey core.
- ✓ Field work i.e. collecting food and pollen
- ✓ Producing wax from their wax glands. This is usually inform of sweat after they have eating and use the wax to build honey combs in which the eggs are laid

STRUCTURE OF THE WORKER BEE

STRUCTURE OF THE QUEEN BEE

STRUCTURE OF THE DRONE BEE

LIFE CYCLE

They undergo complete Metamorphosis i.e. Eggs, larva, pupa and adult.

The lifecycle differs after larval stage depending on what it is feeding on and there after on what cast it is going to develop into. Generally, the mole mates female once and alies soon after this because its reproductive organ is ripped its body during mating. It releases numerous sperms

A single mating enables the female queen to store sperms in the sperm sac (spermatheca) and these are used to fertilise eggs for the rest of her life (3-5) yrs

It lays about 2000 eggs every, one in each broad cell. The fertilized eggs hatch into tiny larvae which develop into pupa and then adult. The adult may either be a queen or a worker. The queen is developed as a result of constant feeding of royal jelly. Any unfertilized egg develop into a drone. The development of the casts is as follow,

Workers (21 days)

Eggs ……3 days……. Days larva ……pupa adult

Larva is feed on milk (royal jelly) for 3 days followed by a mixture of honey and pollen (nector)

Queen (16 days)

Eggs ……larvae pupa adult

Larva feeds on royal jelly throughout

Eggs larva pupa adult

Larva is fed on royal jelly for 3 days and later a mixture of pollen (nector) and honey

ECONOMIC IMPORTANCE OF BEES

Worker bees pollinate flower or crop plants which provide food to man

Source of honey (mixture of sugar) rich in carbohydrates for man. It can also be used for sweetening syrups, prepatation of drugs and toffees

It provides wax used for making candles, shoe polish, skin and underlined tissue because of the sting.

THE TERMITES

Kingdom	:	Animalia
Phylum	:	Arthropods
Class	:	Insecta
Order	:	Isoptera

They are social insects that live in ant hills/ termiteria

Termiteria may reach kgm or more in height and have extensive tunnels and chambers. They have 3 casts.

A. Reproductives
   - These are the king (mole) and the queen (female)
   - They have wings in their early stages of life.
   - They have functional reproductive organs and eyes

B. Soldiers
   - They are sterile, sightless and wingless
   - They have large heads with large jaws/ mandible for defence
   - They have short segmented antennae for sensing environment

C. Workers
   - They are also sterile, wingless and sightless
   - They have small heads with smaller jaws compared to the soldier termites

LIFE CYCLE/ LIFE HISTORY

Periodically, there is a nuptal flight of winged reproductive forms

They have transparent equal sized wings hence the name iso-ptera. They ate and then fall on the ground. They shed their wings and then make a tunnel in the ground. The queen lays eggs which hatch into nymphs hence have incomplete Metarmophosis. The grown up workers have the king and queen in the royal chamber and feed them. The king remains small and the queens abdomen swells or enlarges and the king remains a permanent marital companion to the queen.

FUNCTIONS OF WORKERS

- ✓ Remove eggs from the Royal Chamber
- ✓ Keep the nest clean
- ✓ They build and repair the nest
- ✓ Look for food (grass, wood, dead plants)
- ✓ They feed the royal pairs, the soldiers and the young ones
- Generally the workers feed on plant materials and are unable to digest celluloce them selves. They contain protozoa in their gut which secret enzymes to digest cellulose material. The enzyme is called Cellulase.

FUNCTION OF THE QUEEN.

- The queen lays eggs producing about 1 million eggs in a year and remains for several years
- The Royal pairs, soldiers and nymphs donot have the protozoa hence the workers regurditute their digestive food and in the saliva in which the food them on.
- Soldier Termites

  Their work is to guard and provide protection to the entire population using their large jaws, mandibles

  ECONOMIC IMPORTANCE
  - Are eaten as food
  - Destroy crops and there by sometimes are pests
  - Destroys man's property like furniture
  - Make tunnels in soil which aerate the soil and improve drainage
  - They turn the soil over thereby improving aeration, drainage and mix the nutrients
  - They break down dead organic matter for easy decomposition hence releasing nutrients back into the soil.

DRAWING OF THE DIFFERENT CASTES OF TERMITES

METAMORPHOSIS.

This is he change inform and structure of an organism in the course of its life cycle from eggs to adult.

There are two types of metamorphosis and these are shown amphibians and insects. These tyes are complete and incomplete metamorphosis

a) Complete Metamorphosis.

This consists of four stages of development. i.e. eggs, larva, pupa and adult

Each stage is very different in appearance from the one before and after it. They may also display different behaviors from others.

Examples are;

Bees, houseflies, butterflies, wasps, beetles

b) Incomplete Metamorphosis.

This consists of three stages with the absence of the pupal stage.

Each stage is a little similar or a small version of the adult.

The larvae all resemble and are called nymphs. The main difference between the larva and adult is that the larva lacks wings

Examples are;

Cockroaches,grasshoppers, locusts, bedbugs, termites

N:B Wingless insects don't undergo metamorphosis but the young resemble the adult from the time they hatch.

UNICELLUR ORGANISMS

These are organisms whose bodies are made up of only one cell. They can be seen using a microscope and re therefore referred to as microbes/ microscopic organism

Example are the bacteria, protoctista, i.e. paramecium amoeba amoeba and viruses.

BACTERIA

Bacteria are many small unicellular organisms and differ from other organisms e.g plants in many ways.

1. Bacteria are very small (microbes) and unicellular about 0.001mm in diameter i.e. about 20.5S times smaller than plant animal cells and can only seen under the highest power of an optical microscope.

2. STRUCTURE

A bacteria consist of a mass of protoplasm covered by a firm cell wall. The cell wall is made up of chitin and sometimes lipids but cellulose is absent.

The nuclear material is not enclosed in a nuclear membrane thus it lacks a definite nucleus. i.e. have no true nucleus as in normal plant and animal cells.

Granules of glycogen, fat and other food reserves may be present.

GENERALISED STRUCTURE OF A BACTERIUM CELL

3. Nutrition

Bacteria are found almost everywhere in water, air, soil and body of other organisms. The chloroplasts are absent therefore chlorophyll is absent but a gew can make their own food using light energy from the sun as green plants or they use certain chemical as source of energy therefore bacteria are usually.saprphytic or parasitic since cannot carry out photosynthesis

They feed by secreting enzymes onto the food and the soluble food substances diffuse into their body

Chemosynthesis; A few bacteria make their own food from simple inorganic molecules using energy from chemicals like

Hydrogen Sulphide e.g. Sulphur Bacteria

- Parasitic Some bacteria have parasitic mode of nutirion where they depend on the other organism i.e. the host for their nutrition

Mutualism; Some bacteria have mutual relationship with other organisms e.g. bacteira with ruminant animals, bacteria and termites

4. Movement

Some bacteria have one more flagella or filaments for moving through liquids e.g. water and blood in which they live.

5. Reproduction

They reproduce asexually by binary fission which is very fast in favorable conditions i.e. the parent cell divides into two. Here the nucleus lengthens and divides into two. At the same timer, the protoplasm divides into two portions each containing half as the nucleus which has divided. Therefore the mature bacteria forms two bacteria cells that are new, develop and divide within 30 minutes repeatedly thus making the bacteria very abundant in the environment

In adverse conditions e.g. very cold conditions, very hot conditions and many chemicals and species form highly resistant spores called endospores because they are formed inside

the cell. When conditions are not favorable, the bacterium forms the endospore and even If other organelles go, the endospore, enclosed in the bacterial wall remains when conditions become favourable, the endospore develops into the bacteria.

Bacteria and Man

Bacteria are the most plentiful form of life, they are found everywhere i.e. air, soil, dust, fresh water and in the sea, in an on all living and dead plants, animals and inorganic materials

Human beings provide a home for millions of bacteria i.e. our skin, our mouth and intestines

These bacteria are important in human life.

ECONOMIC IMPORTANCE

Majority of the bacteria cause diseases but some are useful to man e.g.

1. Those living in the soil are saprophytic and carry out decomposition of organic matter resulting into addition of nutrients and fertility of the soil.
2. Nitrogen fixing bacteria live in the root nodules of legumes and fix nitrogen into nitrates made available to plants.
3. Bacteria live in the mammalian intestines manufacture vitamins e.g. Vitamin B_{12} for their hosts
4. In the stomachs of ruminants which digest cellulose (herbivorous animals e.g. cows, sheep and rabbit) aid in breakdown of cellulose to release nutrients

Making use of Bacteria/ Usefulness to man/ Urilisation Bacteria.

1. In composite making; Break down of compost which depends on the action of saprophytic bacteria. This is why soil or old compost is added to start the process of compost making.
2. Sewage Disposal; Septic tanks and modern sewage work make use of bacteria and other micro- organisms i.e. sewage treatment
3. Making of Antibiotics; The anti-biotic used in treating diseases caused by pathogenic bacteria are made from other bacteria e.g. streptomycin and chloromyctin
4. Making butter and cheese
5. Industrial Processes e.g. manufacture of B12 and enzymes like amylase and invertase.
6. Some bacteria are used in the manufactory of vinegar. Lactic acid and citric acid. These acids are important in the food industry especially for preservation

Harmful Effects of Bacteria

- Most bacteria parasites to humans, farm animals, crops cause little or more harm to their hosts while others are useful. A few are pathogenic i.e. cause diseases.
- Bacteria feed on the same food as humans thus cause spoilage of food. They pass out enzymes which break down or decompose the food e.g. meat.

Processes used in food preservation

This is aimed at killing germs or making them inactive

1. Cooking; it kills most bacteria though endospores may survive little cooking
2. Drying food; It makes the bacteria inactive because they can't survive without water. Those which cannot form spores later die.
3. Salting and smoking; it makes food unfavorable for bacterial growth due to increase in alkalinity.
4. Refrigeration; Makes them inactive because they cannot stand cold conditions,but doesn't kill them.
5. Canning food; High temperatures and pressures are used to kill bacteria including endospores present. The cans are sealed in a vacuum which prevents entrance of new bacteria
6. Hygienically; Reduce spoilage of food by eating it as soon as it is prepared and also keep it covered from flies and dust

VIRUSES

A virus is a very small organism that can only be seen through an electron microscope. It is about 0.02 to 0.03 micro meters in diameter. It can only be seen with a magnification of about x30000.

Each virus consists of a central core which contains Nucleic Acid (DNA or RNA) and they are surrounded by a protein coat

DNA (Deoxyric banucleic Acid) has less oxygen than RNA

RNA (Ribonucleic Acid) has more oxygen than DNA

The nucleic acids (DNA and RNA) constitute the chromosome

A Chromosome is a red like structure in the cells nucleus which contains the heredity information of the organism and in the chromosome, the DNA, determines which kind of of enzyme and structural proteins the cell will produce and also controls the chemical build- up of these proteins

Viruses cannot survive outside the host cell. When not in the host cell, they become inert, respire, grow or reproduce outside the host cell. For these reasons, they are considered as Non-Living things.

At the same time, they are termed as Living things because they have the ability to reproduce and increase in number when they are in the host cell.

Viruses which attack bacteria are called Bacteriophages

A bacteriophage consists of the head which contains nucleic acid and the tail. They are called bacteriophage because they feed on bacteria

When a virus is in the host cell, it causes it to switch it normal activities from norma synthesis to synthe

STRUCTURE OFA VIRUS (BACTERIOPHAGE)

Viruses are generally parasites to living things because they derive nutrients from them and at the same time cause harm to them. They are major causes of diseases in plants e.g. cassava mosaic, tobacco mosaic and turns leaves yellow and distorted . other diseases caused by viruses in humans are influenxa, AIDS, Ebola, Marburg, Whooping caugh. In livestock are foot and mouth disease, Anthrax, Rabies in dogs.

Economic importance's of Viruses

They cause diseases to man, livestock and plants.

PROTOZOANS

These are Euryok.Eurakoryotic organisms which are microscopic, can live in water e.g. Amoeba, Paramecium or in blood of multicellular organisms. E.g Trypanasoma, Plasmodium and therefore some are parasitic

AMOEBA

STRUCTURE

It has an irregular shape and constantly changes its shape with finger like structures called Plaeudopodia. It has a jelly like appearance. It lives in fresh water ponds and its body is surrounded by a cell membrane.

It has two regions forming the cytoplasm i.e. the Ectoplasm and Endoplasm

Functions

a) Cell- membrane/ Plasma membrane
   - Protects inner contents of a moeba
   - Exchange of materials between amoeba and its sourroundings

b) Ectoplasm

Anon – granula/ clear outer layer and contains plasmogel

c) Endoplasm

it is a greying granular layer having plasmosol.

It contains many food vacuoles which are colourless droplets of water enclosing particles of food (feeding structure)

They are spherical in shape

d) Contractile vacuoles

These are clear round bubbles of liquid or water and controls the amount of water present in the cytoplasm i.e. used for osmoregulation.

e) Pseudopadia

This temporarary finger like structures formed by the flow of the cytoplasm. They are used for feeding and locomotion

f) Nucleus

It is a fine granule, homogenous in appearance and can be seen with in the endoplasm thru a microscope.

Function:

- It contains the hereditary materials
- It controls the organisms activities
- It is responsible for reproduction thru binary fission

MOVEMENT/ LOCOMOTION

It has no special organs for locomotion or movement but moves by formation of pseudopodia formed by the flow of plasmosol (endoplasm) into a projection of the ectoplasm in the direction of movement.

This is followed by all the protoplasm moving forward in the direction of the pseudopodium giving the amoeba a new position. Ti move slowly by the continued formation of pseudopodium in one direction and the with drawal of the cytoplasm i.e. that is behind.

Movement is mainly determined by acidity, alkanity and chemicals diffusing from suitable food materials

The formation of the pseudopodia will be towards or away from these conditions depending on the convenience of the amoeba

As pseudopodia is being formed in one direction, another one is withdrawn from pasteria.

Diagram to show flowing movements of amoeba.

NUTRITION/ FEEDING

Amoeba carrys out intracellular digestion (occurs inside the cell). It feeds on microscopic algae and flagellates. During the feeding the pseudopodia flows out and surrounds/ engulfs the food particle until it completely engulfs the food. The food/ organism is ingested with a drop of water into the cytoplasm forming a food vacuole. The surrounding cytoplasm them secretes digestive enzymes into the food vacuole and these enzymes digest the food or part of the food.

The soluble products of digestion are absorbed into the surrounding cytoplasm (endoplasm). The undigested food materials are egested by the vacuole moving and attaching itself to the membrane and then bursts to release and leave the contents behind as it moves forward.

- Has no mouth or anus and ingestion and egestion take place at any place on the surface

ILLUSTRATION OF FEEDING IN AMOEBA

REPRODUCTION

There are two types of reproduction in amoeba and both are a sexual reproduction and these are binary fission and sporulation (formation of spores)

a) Binary Fission

This occurs when conditions are favourable

An amoeba ready to reproduce stops moving and rounds off. The nucleus constricts in the middle and then divides into 2 equal parts and identical. This is followed by the constriction of the protoplasm which also divides equally daughter amoeba. These two move away to feed and grow into mature organisms.

ILLUSTRATION

SPORULATION/ ENCYSTMENT/ VEGETATIVE

When conditions are not favorable amoeba forms a protective outer covering and becomes a Cyst. In this state, the amoeba is not easily destroyed it continues to divide by binary fission to produce several new cells and when conditions become favorable, the cyt burts open to release many formed amoebae which can grow into mature amoeba.

IRRITABILITY/ SENSETIVITY

The whole body of amoeba is sensitive to stimuli. When the stimuli is harmful, the pseudopodia are formed on the opposite side and the amoeba moves away from it.

However, when is in useful, the amoeba moves to the direction of it e.g. food by flow of pseudopodia towards it

OSMOREGULATION AND EXCRETION

Is the maintenance of a constant level of water and salts with in the protoplasm of the amoeba.

The cell membrane of an amoeba is selectively permeable (semi permeable) so that the low osmotic potential (ability to give out water) of solutions in the endoplasm causes water to enter.

Water enters into the protoplasm of theamoeba through the cell membrane by osmosis. A small bubble appears where water collects and is called the contractile vacuole. As water enters the contractile vacuole, it gradually swells as it moves towards the cell. (cell surface) membrane to which it attaches it self and then busts open to release water to the exterior

When the water has been released, a small bubble soon appears and the processis repeated throughout the life of the amoeba. The water may contain some dissolved substances. E.g. wastes of metabolic activities (metabolic wastes), therefore, the contractile vacuole controls water content and is therefore the structure of osmoregulation.

ILLUSTRATION

PARAMECIUM

This is a ciliated protozoan and moves by means of rows of cytoplasmic filaments called cilia which extend from the surface.

It contains two nucle I.e. Mega nucleus and Micronucleus

It is a fresh water organism and maintains a constant shape

The cilia beat rhythmically therefore propelling the organism forward. The cilia also give the organism its shape because of a stiff outer covering of the cilia

STRUCTURE

MOVEMENT

It moves by means of cilia which flick in rhythmic waves and propel the organism forward and backward

FEEDING

It feeds via the oral groove. Ti has a row of special cilia which waft or move the food particles/ materials into the mouth pore through the gullet ingestion takes place forming a food vacuole. The food vacuole moves along a definite path through the cell as digestion occurs.

The undigested particle are egested at a point near the region of egestion this point is called the anal pore

REPRODUCTION

Paramecium reproduces by binary fission under favorable conditions or if they are unfavorable, it forms spores called cyst i.e. undergoes Encystment, sporulation.

The 2 nucleus divide into 2 one of the two halves of each nucleus moves towards one end of the organism this is followed by the transverse vision of the cyto plasm. Just behind the gullet. The two halves develop into 2 full sizes and divide again.

RESPIRATION/ GASEOUS EXCHANGE

The paramecium absorbs dissolved oxygen through the entire body surface from the surrounding water. The carbon dioxide from respiration passes through the surface by diffusion

EUCLENA

It is a unicellular organism and are generally said to be glagellates because of the possession of flagella, it is quite long and its beating action causes the Euglena to move forward and is therefore used for locomotion.

Most of them have chloroplasts containing chlorophyll for absorption of sunlight energy, photosynthesis and hence can make its own food (Holophtic nutrition)

Some take in already made food which they are able to digest (Holozoic nutrition). Some feed saprophytic ally i.e. they break/ digest dead organic materials by secreting enzymes and then absorbing the nutrients

An Euglena produces a contractile vacuole for controlling the amount of water with in the cell i.e. for osmoregulation

It has an eye spot as a sense organ

It posses paramyelon and paranoids for starch storage which is made during photosynthesis

It have a reservoir for storage of excess water and mineral salts.

The nucleus store the DNA and controls all the cells activities

Other protozoans are plasmodium, trypanasoma. These live in the gut or other parts of other (higher) organisms e.g. in blood

Some may be useful/ harmful. The useful ones are in the cellulose digesting ones which ae in the ruminants where they break cellulose using cellulose enzymes
The harmful ones cause diseases to higher organisms e.g. Malaria caused by the plasmodium which lives in the blood and entamoeba which live in the intestines and cause amoebic dysentery.

SIMPLE MULTICELLUR
Kingdom; Fungi
e.g. Yeast, Mushrooms, Puffballs, Toadstools, Rhizopus
STRUCTURE OF FUNGI
The basic unit of a fungus is hypha which is not a cell but in some species, the hollow tubes of the hypha may be divided by cross walls thus are said to be septate. Athose without crosswalls are said to be septate
Some few fungal hypha having wall contain cellulose but in most of the walls, there it is mainly an nitrogen compound called chitin
The cytoplasm fills the tips of the growing vacuole but some may have a centralvacuole therefore older fungi have very small nuclei in the cytoplasm.

The fungi don't have chloroplasts or chlorophyll. The food particles in the cytoplasm. The food particles in the cytoplasm are in form of soil droplets/ glycogen but not starch.
The hyphae spread over and into food materials making a visible mesh or mycelium. In some, the mycelium is massed to form fruiting bodies e.g. in mushrooms and toad stools.

Yeast
General Characteristics
This is an unsual form of fungus which is unicellular and consists of small cells
This consists separate spherical cells with in walls made of chitin and a nucleus plus food granules containing glycogen.
It le lives in sugar containing solutions e.g. nector and juice of ripe fruits causing fermentation

N:B
Volutin granules, grycogen granules and oil droplets are food reserves

REPRODUCTION IN YEAST

There are 2 types of reproduction in yeast i.e.

1. Budding (A Sexual reproduction)

When conditions are favorable, the yeast forms out growths projection at the side called a bud

The nucleus, first divides into two parts. The reproduction is very fast that before the daughter nucleus moves to the new bud, another bud is growing on complete movement of the nucleus into a new bud it separates off

Since budding occurs rapidly, the individual cells don't separate at once resulting into a group of cells attached to each other

N:B Other organisms where budding occurs are Bryophylum plants and hydra

2. Sporulation

Yeast undergoes spore formation when conditions are un favorable and yeast cell forms 4 spores with thick walls. The process begins with cells joining together and content fusing the fusion is called Conjunction

After conjugation, the contents of the cell divide into 4 individuals and each develops a thick wall a round itself and these cells are the spores which are restant. These spores can germinate into new yeast cells when conditions become favorable. They normally germinate when they settle in a substrate i.e. a substance containing nutrients

Importance of yeast

It is used in production of alcoholic drinks and industrial spirits

In fermentation process of sugar

Yeast contains enzymes which break down sugar into alcohol and carbon dioxide

It is used in baking which it is added to un cooked dough to make it raise as a result of carbon dioxide given off

Yeast can be cultured and used as a source of proteins to man and livestock and is also a source of vitamin B

MOULDS

These include the Mucer and common mould Rhizopus

STRUCTURE OF THE RHIZOPUS

Rhizopus is a name given the a genus of mould found commnonly growing sapraphytically on most organic/ dead matter e.g. bread, fruit, bananas. The woven mass of rhizopus on the surface of bread is called mycelia from which the hypae grow into organic matter. The hyphae secret enzymes which digest organic matter into soluble substances which can be absorbed. (extracellular digestion) They grow rapidly with in a few days. The whole substrate is covered with a dense white or grey mass of inter woven filaments

1. Sporangiophores;These are vertically and they contain fruiting body called sporangium at the tip and is swollen and this is where spores are formed
2. Rhizoids : These are rooting hyphae and they are tapering

The function is to anchor the mould into the substratum and also aid in digestion. The digestion is extracellular and occurs outside the organism

Stalans: These are connecting hyphae and their function is to provide support

The basic unit of molud is a hyphae and not a cell as in some species

A hyphae is a hollow filament containing cytoplasm at the side/ periphery which contains many nutrients. They are not divided into independent cells and as a result they have many nuclei in their cytoplasm

Therefore, sporangiophores, rhizoids, and stolons are the 3 types of hyphae in moulds.

FEEDING IN BREAD MOULDS

They feed saprophytically or parasitically but in both, there is an external digestion where enzymes are secteted from the hyphae outside the mould into the food which they breakdown and the soluble digested products are absorbed back into the fungus.

Such types of digestion is also called extra cellular

REPRODUCTION OF MOLDS

Moulds reproduce both sexually and asexually

1. A sexual Reproduction

Is one which doesn't involve fussion of gametes. They have rhizoids onto which is attached the sporangiophore which supports the sporangium. This forms the asexual reproduction or gan when the sporangium is ripe, it loses water and dries up and then busts open and releases the spores due to the strains that build up with in the sporangium walls. The spores are very light and easily blown by wind.

When they fall on a suitable substrate or material which is moist and with warm conditions, the spores germinate and grow into a mycelium forming a new mucor/ mould

When the mycelium grow into the air, they form sporangiophore with sporangium at the tip where the spores are formed. When the sporangium ripe, it again bursts releasing the spores.

SEXUAL REPRODUCTION

It occurs when two hyphae of different strains, one positive and another negative have their tip near and adjuscent to each other

SPIROGYRA

Is a simple organism found commonly on the surgace of fresh or slow moving water bodies like ponds. It is algae. They form a slimy green mass of cylindrical cells joined together to form a filament or cells which is one cell thick.

Each cell is capable of an independent life and each consists of a filament suspended in a strand of cytoplasm very large. Vacuole containing sap and the cytoplasm is pressed against the wall. The cell wall is made of cellulose has ribbon like chloroplast and spirally arranged in the cytoplasm. Along the length of the chloroplast are spots of pyrenoids which are sites of storage and starch and contain protein. There is also a mucilage: a protective coating on the surface of the cell wall.

STRUCTURE OF SPIROGYRA FILAMENT

STRUCTURE

NUTRITION

Spirogyra makes its own food by the process of photosynthesis because it has chloroplast which contain chlorophyll that traps sunlight energy for photosynthesis

When the food is manufactured it is either utilized or started in the pyrenoids

GROWTH

Sipirogyra grows in length but not in width or thicknesses. During this, 3 main events occurs

1. The nucleus of one cell in the filament divides into 2 halves there by forming 2 daughter nuclei.

DISEASES

A disease is a condition in which the normal body function is disturbed therefore is a disorder that interfears with the bodys normal functioning

Health is a state of physical wellbeing in which all body organs function well and efficiently and body processes normally. In such a state, the organism feels well both in body and mind.

Diseases may be due to several causes

Categories of Diseases

They can be categorized broadly into two

1. Infectious Diseases

Diseases are transmitted between individual usually caused by fungi and bacteria

They can appear as epidemic in a population and are mainly spread through contact

They may be spread through contact e.g. chicken pox, scabies ring worms

a) Air/ Water: Most diseases can be spread through air/ water e.g. T.B, Influenza

Sometimes infection diseases can be spread through vectors e.g. malaria by female anopheles mosquitoes, a vector of plasmodia, sleeping sickness by tsetse flies a vector of trypanasoma, bilharzia by water snail a vector of trachoma etc.

2. Non – Infectious Diseases.

These can't be transmitted among individuals

They are divided into

a) In- heritable/ genetic diseases

These are transmitted from parents to off springs e.g. sickle cells, haemophilia (In ability of blood to clot after an injury), red green colour blindness, cystic fibrosis etc.

b) Nutritional diseases

These develop through nutritional deficiency e.g. vitamin deficiency

c) Social diseases

These are brought about by social (peer) pressure and behavior, alcoholism, drug abuse leading to lung cancer

d) Digenerative diseases

These include heart attack, arthritis, strokes etc.

e) Mental illness

These are brain diseases i.e. the mind e.g. Schizophremia

Ways of disease transmission

Air borne disease

Water borne disease

Food borne disease

Vectors e.g. house flies

Contagious/ contact e.g. STD, ring worms

BACTERIA DISEASE

Bacterium	Method of Transmission	Name of Disease	Symptoms, Characteristic and Treatment
Mycobacterium tuberculo Mycobacterium bovis	Air borne Ingestion of untreated milk from infected cows	Pulmonary Tuberculosis T:B Bavine tuberculosis	- Entry of the bacterium isn't also followed by serious diseases but can affect any body organ; Control:- Fradication of cattle with T.B - Pasteurisation of milk - Vaccination by BCG Vaccine
Caryne bacterium diphteriae	Air borne	Diphteria	- Infection of the nose, thorax and larynx releasing a powerful toxin Control - Injection of anti- toxin - Anti biotics e.g. penicillin - Diphtheria toxoid
Mycobacterium Leprae	Air borne & slightly by contact	Leprosy	- Attack nervous fibres after along incubation period Control - Isolation to prevent infection now disappearing as a method of control - Drugs e.g. Sulphone and more recently dapsone
Salmonella typhi S- paratyphi	Water borne and food borne	Typhoid and Petratyphoid	Fever and muscular pains at first which give way Control; - Severe control of sanitation and water to prevent contaminaton

			- Vaccination which kills bacteria - Drugs e.g. ampicillin
Vibria Cholerae	Water borne	Cholera	Principal features, Profuse diarrhoeacalled rice water Loss of water from bodily fluids prime cause of death. Control - Severe sanitation control and water e.g. Tetracycline and Chloramphenical - Vaccination.
Tetanus Bacillus	Contact and skin – penetration	Tetanus (Lock jaw)	Mascular sposms particulary of the jaws (lockjaw) and convulsions Disease of war also in infants in India Control: Immunization by tetanus toxoid
Pneumococcuss	Air Borne	Pneumonia	- Bacteria aften in throat but become active if patient is in weak condition - Lungs invaded with respiratory tract causing fever, pain in the chest, silvery fluid in lungs Control Drugs e.g. anti biotics Sulphonamids
Meaningococcus	Air borne	Mengingitis	Enter through mucus membrane of throat and nose invades meninges leading to high fever

General Methods of Prevention of the spread of Bacterium,

Bacterial Disease

1. By proper sanitation achieved by washing hands before and after eating. Also boiling water for drinking and improving faecal waste disposal
2. Isolationg the infected persons/ avoiding over crowding
3. Treatment with drugs mainly with anti biotics
4. Carrying out vaccination and immunization
5. Proper keeping and preservation of food.
6. Sterilisation by heating and freezing

VIRAL DISEASES

These cause diseases by attacking particular groups of cells in the plant/ animal body

They multiply in these cells and destroy the cell structure and also inhibit cell activities

There are many viruses that cause server disease e.g.

- Rabies virus attacks brain cells
- Poliomyelitis attacks nerve cells of skeleton muscles
- Yellow fever virus attacks liver cells
- Leaf mosaic virus attacks outer cells of leaves

Method of Transmission	Name of Disease	Symptoms, Characteristics and Treatment
Air borne	Measles	Incubation period 10-14 days begins with fever , cotarrch and couphing which is harsh - A rash appears inside the mouth (Kopliks spots) and then spreads down wards - Very dangerous disease in yound age group - Control: Isolation of patients and reducing over crowding
Air borne	Rubella	Mild Infection compared to measles - 20% of such women will produce babies with deafness and defects of the heart

Air borne	Influenza (the sweating disease)	Symptoms arrive with dramatic speed- headache, sore throat, shivering, backache, fever develops with temp up to 40^0C The disease is of short duration unless complications develop Control: Prevention of over crowding, make patients comfortable use antibiotics to prevent secondary infection - The virus produces new strains and speeds rapidly around the world in an epidermic A considerable harzard both in developed and under developed countries
Food and water borne	Poliomyetitis (Intantile paralysis)	Attacks young and old and may produce only aminor illness compared with influenza in only a few cases the disease progresses to the nervous system producing meningitis and attacking the muscles the artificial aids to breathing must be used the iron lung Control Hygienic preparation of food and clean water supplies - Vaccination; Latest is oral vaccination - No specific drug treatment
Air borne	Small pox	Fever, headache, backache and vomiting

Water borne	Infective hepatitis	Could be a simple local infection of the bowels. Increases of the virus causes malfunction of the liver and further symptoms are loss of appetite nausea followed by jaundice Control: Boiling of water Grammoglobulum from a plasma can be used but it is very expensive and scarce - It can give protection for up to eight moths
Bite for Aedes mosquito	Yellow fever	Fever develops after 2-3 days together with headache and backache Temperature fall and virus enter the liver and kidneys jaundice develops Control: Removes all possible breeding places for mosquitoes - Spraying with DDT against adult mosquito - Inoculate against yellow fever - Sleep under a well treated mosquito net - No relaxation of measure when controlled for monkeys acts as a reservoir
		High fever develops, ensure pains in the joints besides the fever subside but then returns with typical rush Control Control mosquitoes in the breeding places by spraying with insecticides

	Dengue fever	No specific treatment for the disease

General control Method

- Vaccination
- Treating infecting people
- Proper sanitation
- Preventing bites from vectors e.g. dogs carrying pathogens for rabies

PROTOZOAN DISEASE

Some of these include: malaria caused by Plasmodia Malaria is transmitted by the female anopheles mosquito from the time the parasite enters the body, the incubation period is btn 10 days but can be extended depending on body's resistance

DISEASES	CAUSES	TRANSMISSON	SYMPTOMS & TREATMENT
Malaria	Plasmodium species - Malariae ovale - Falciparum (most)vivax	Infected female anopheles mosquito bite	Plasmodia injected into the blood multiply Rapidly. After 10 days, high fever develops which may be continuous, irregular/ twice a day Control: - Drainage of mosquito breeding places - Destruction of larvae with oil/ spray - Destruction of adults in man by drugs like quinine - Preventive drugs e.g. daraprine
Anti aebiosis (Amoebic) dysentery	Entamoeba Histolytica	Uncooked food, unhygienic preparation of food	Cause diarrhea with loss of blood, fever, mauses and vomiting, can lead to death Spread the disease Drug e.g. Emetine, antibiotics and sulphur drugs

Trypanasomia- sis	Trypanasoma species	Tsetsefly bite	A painless lump develop on the bite, lymph glands become enlonged, fever enlargement of spleen (Blood reservoir) and liver follow The parasite invade the nervous system resulting in sleeping and mascular spasm Control Control of flies the screens and drugs

Symptoms of Malaria

High fever

Headache

Shievering

Pains in body joints and whole body

Weakness of the patient

Increased heart beat and breathing rate

Anaemia and convulsions/ become unconscious

Deeply coloured urine (usually yellow) mainly to the poisons and waste products of the parasite.

- General Methods of Malaria Control
- Malaria and other protozoan diseases may be controlled by
- Drainage of breeding places i.e. stagnant water
- Destruction of adults with insecticides
- Use of biological methods i.e. use of a natural enemy of the pest to lower/ control the population of preventing mosquito bites e.g. use mosquito nets/ repellants

Protozoan Diseases may also include

A moebic Dysentery caused by Amoeba (Amoeba histtolytica) and can be controlled by;

- Hygienic food handling
- Treatment of infected persons
- Prevention of flies that spread the disease
- Proper human waste disposal
- Great improvement of sanitation

FUNGAL DISEASES

Spread by contact between people

Disease	Cause	Symptoms, other characteristic and treatment
Ringworms of the scalp	Microsparium audolline	- A highly contangious disease by contact i.e. combs, hats, etc among kids - It begins as a small scally spot which enlarges and older patches are covered with greyish scales.
Ring worm of the skin	As for scalp of M. cains	Lesions on the skin are seen as poles, scaly discs. There is more inflammation around the edges, causing swelling and blistering Specific site in the tropics is around grains area control; drugs e.g. griseofluvin
Ringworm of the feet (Athletes foot)	Tinea pedis	Common disease even in temperature change. Shows sudden peeling of skin between the toe that can be subject to secondary bacterial infection but cure rate is very low.
Candidiasis (Thrusts)	Candida Albicans	- A yeast like cell, 2-4 microns in diameter - Commonly harmless in the body but infection results from some local reduction in tissue resistance. Control; predisposing factor (general hygiene)