ANIMAL KINGDOM

Introduction

They differ from Monera and Protoctista members by having a very high degree of body organization especially in the features based body plans such as body symmetry, body layers, body cavity and segmentation.

Generally the kingdom Animalia form the major of known multicellular organisms and extraordinally diverse in their body shapes and functions

They show a very high degree of organization among importance features in body organization includes body symmetry, body layers, body cavity and segmentation.

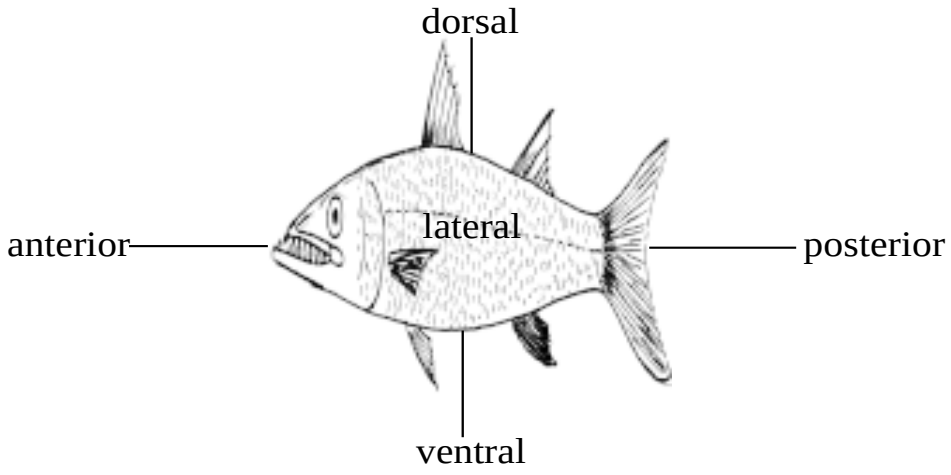
Symmetry this refers to the similarity of body size and the organs or parts on either side of a median plane the symmetry can either be **SPHERICAL**, **RADIAL** or **BILATERAL**

Spherical symmetry: is found in organisms which are ball shaped such as few of the protozoa and some microscopic algae such as ***volvox*** species.

Radial Symmetry: applied most coelenterates and adult Echinoderms. They can be divided into the similar halves by a plane passing through longitudinal axis. These forms usually have got a mouth at one end referred to as the posterior end. The ends are also commonly known as **ORAL** and **ABORAL** respectively such organisms are well adapted to sessile (fixed) mode of life.

Bilateral Symmetry: applied to animal where one place divides the animals into equilateral halves. This plane is known as **SAGGITAL** plane and passes through anterior, posterior axis and the dorsal – ventral axis.

Diagram



Such organisms are well adapted for forward movement. Most animals show this type/kind of symmetry.

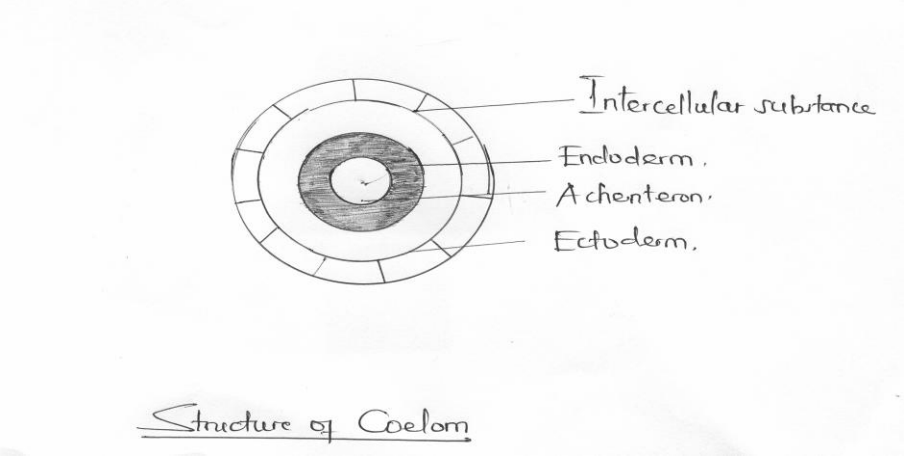
Associated with type of symmetry is differentiation of the anterior (head) and with great accumulation of sensory organ than the laid end. The differentiation of a definite head end is called **CEPHALISATION**.

Body layer: this is the embryotic development of **METAZOANS**. AND definite cell layer are organized. In the simplest metazoans and the coelenterates, the layers are two and the organism are said to be **DIPLOBLAS**. The outer most layer is **ENDODERM** (In Coelenterates) referred as **MESOGLEA.**

The flat worms (or Platyhelminthes) are divided from layers of cell and therefore **TRIPLOBLASTIC** are the rest of the animals groups

Body Cavity – is a space in a body of an organism which is present in most invertebrates and all vertebrates and contains the major organs of the body. In some lower invertebrates only the cavity present is the **ARCHENTERON** or primitive gut.

The archenteron or primitive body cavity is not true cavity is not true cavity as it is not formed within any of the three body layers. The **COELOM** is found in the Annelids and other groups of the animal phyla.



- The coelom develops within the mesoderm during the gastrulation

Based on the body layers and the coelom animals are categories into 4 groups

1. **Triploblastic acoelomate**

Made up of three layers and without coelom

Diagram

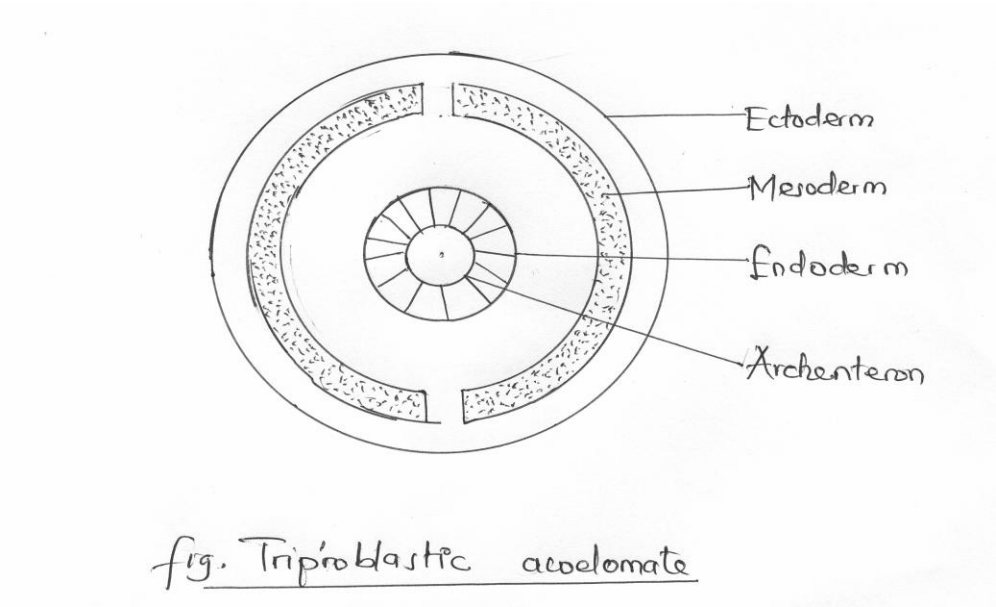


fig. Triploblastic acoelomate

2. **Triploblastic pseudocoelomate**

Made up of three layers of cells with a false coelom

Diagram

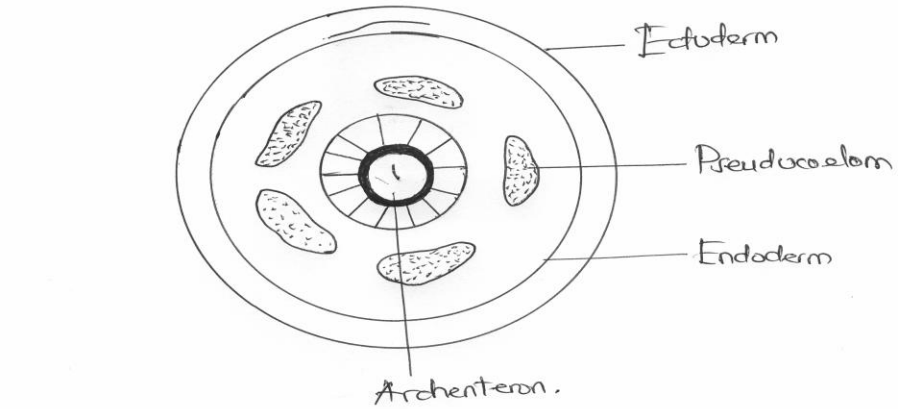
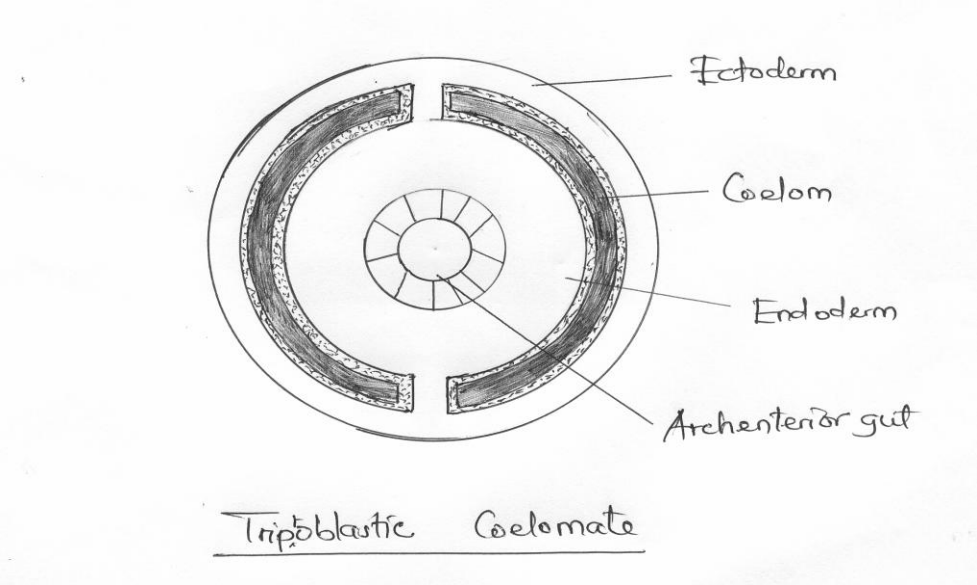


fig: Triploblastic ~~A~~ Pseudocoelomate.

3. **Triploblastic coelomate**

Made up of three layers of the cell with a coelom

Diagram



E.g. Annelida (and higher

The Coelom separates the body wall from the alimentary canal (primitive gut) and is generally filled with fluid.

THE FUNCTIONS OF THE COELOM

i. It may act as a hydrostatic skeleton
ii. Enables the activities of the body wall and elementary canal to operate independently for each other
iii. Primitive animals to become large.
iv. The fluid within a coelome may acts as a circulatory medium for transport of food, waste material and gases
v. Wastes material and access fluid may be temporally stored here
vi. Provide space for enlargement of internal organs
vii. May play parts in osmoregulatory activities of organs.

General and distinctive features of the Kingdom Animalia

- They are multicellular i.e. having many cells, nerve , sperm, blood, muscle, etc. Each cell is bounded by a plasma membrane only. All animals are multicellular and are therefore referred to as METAZOANS
- They are eukaryotic cells, with no cell walls
- They are non- photosynthetic, feeding heterotrophically.
- Except for sponges, they all have nervous coordination and hormonal system for detecting changes in their environment.
- All animals are capable of locomotion at least at one stage during their development.
- They have muscular system for movement, skeleton for support and a transportsystem.

THE CLASSIFICATION OF ANIMAL KINGDOM

The animal kingdom is divided into more than 20 phyla, many of which contain species which are not common. The following phyla will be discussed according to the syllabus of A – level.

i. Platyhelminthes (flatworm). It is divided into three classes.
   - Turbellaria – with free living organism e.g. Planarias.p.
   - Trematoda – organism are endoparasite e.g. Liver fluke
   - Cestoda – e.g. Tapeworm

ii. Aschelmminthesis (Nematoda) The round worms e.g. Ascaris

iii. Annelida (Earthworm etc.)
   The phylum is divided into three classes
   a) Oligochaeta (with few setae) e.g. earthworms
   b) Polychaeta (with many setae) e.g. lagworms
   c) Hirudinia (into leeches)

iv. Arthropoda (organism with jointed limbs)
   It divided into 5 classes
   a) Arachnida e.g. spider
   b) Crustacea e.g. crab, prawn etc
   c) Diploda e.g. millipede
   d) Chilopoda e.g. centipedes
   e) Insecta e.g. insect

v. Chordate (Animals with notochord)
   It is divided into six classes namely
   (a) Class Chondrichthyes e.g. Shark

(b) Osteichthyes e.g. Tilapia fish
(c) Amphibia e,g. Frog/ Toad
(d) Aves e.g. pigeon
(e) Reptilia e.g. Lizard
(f) Mammalia e.g. Rat

1. PHYLUM PLATYHELMINTHESIS

General and distinctive characteristics

(i) The body is usually dorso – ventrally flattened.

(ii) Organisms with triploblastic and acoelomate

(iii) Central nerve system anteriorly placed to form very simple ganglia or nerve ring.

(iv)Have complex hermaphroditic reproductive system and fertilization is internal.

(v)Excretion and osmoregulation is by system of branched tubules that end in ciliated cells called flame cells.

(vi) Incomplete and usually much branched digestive system with a mouth but no anus.

CLASSIFICATION OF PLATYHELMINTHESIS

The phylum has three classes

1. **Class turbellaria**
    - They are free living
    - They have soft body and delicate
    - They are leaf like flatworms
    - They have simple gut with mouth, pharynx and intestine; anus is absent

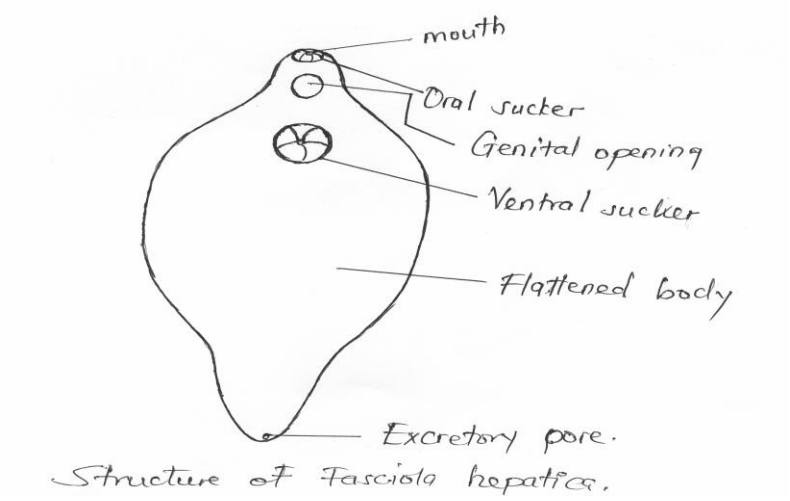
    E.g. Planaria,

    Diagram

planaria

2. **Class trematoda (the fluke)**
    - Leaf like structure
    - Endoparasite
    - Usually ventral sucker in addition to suckers on the colex
    - Thick cuticle no cilia in adult e.g. Fascilolahepaticae

    Diagram



Structure of Fasciola hepatica.

ADAPTATION OFFASCIOLA HEPATICAE TO ITS MODE OF LIFE

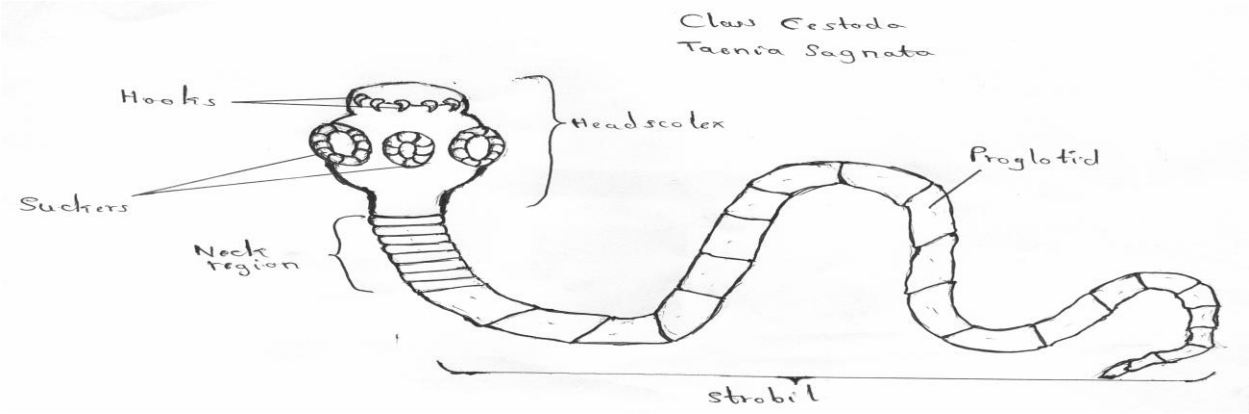
i. Have sucker for absorbing the nutrients from the host
ii. Miracidium – have cilia to swim towards the snail
iii. Produce three kinds of larva in its life cycle

3. **CLASS CESTODA**

- Elongated, divided into proglotides which are able to break.
- Mouth and gut absence in intestine and suckers and hooks

E.g. Taenia species – tape worm

Diagram



Adult are found in small intestine of man

- Eggs are found in small intestine of man and they are pass out with feaces
- Encysted to become a large known as csticercusboris is found in the muscle of the cow especially esophagus muscle of the heart jaw diaphragm shoulder.

ADAPTIVE FEATURES

i. Loss of unwanted organ like intestine and eyes
ii. It has cuticle to prevent digestion
iii. Have strong attachment organ i.e. hooks and suckers
iv. Production of large number of eggs to allow loses
v. Use of secondary host (line in pare with host)
vi. Living peaceful with host
vii. Anaerobic respiration
viii. Body shape long, elongated and flat.
ix. Hermaphroditic, this means ensure the production of fertile eggs
x. Presence of protective organs especially in the liver
xi. Production of high amount of mucus
xii. Production of Enzyme inhibitors

TAENIA SOLIUM

- The adult worm is found in the small intestine of man
- Eggs are found in feaces
- Larva is found in the muscle of pig or man
- The name of the larva is Cysticeruscellulosea

MORPHOLOGICAL FEATURES

- The head is small and globular in shape
- The scolex (head) has four (4) sucker for attachment
- Gravil segment has 8 – 10 branches in comparison with taeniasagnats to which has 8 branches

ECONOMIC IMPORANCE OF PHYLUM PLATHYHELIMINTHESIS

i. Causes diseases e.g. liver rots/ cirrhosis/schistosomiasis/ bilhazia.
ii. Cause death
iii. Reduce milk production – sheep
iv. People with worms can eat too much
v. Parasite is tightly in host so it is difficult to cure
vi. It take a long time to discover a disease because some disease are free.
vii. Losses which declared unfit for human body.

2. PHYLUM ASCHELMINTHES/ NEMATODA (Round worms)

i. Body is elongated, slender and pointed end.
ii. Body surface smooth cylindrical, round in cross section
iii. Body covered by thick elastic cuticle
iv. Triploblastic andpseudocoelom
v. Have longitudinal muscles in four quadrant but no circular muscles.
vi. Show degree of cephalization (possess of head with sense organs)
vii. Bilateral symmetry

- Sexes are separated (diaexious)
- Male is smaller in size than female
- When it is fresh the body has four lines
  i) Dorsal line
  ii) Ventral line
  iii) Lateral line (more prominent)
- Have 16 pairs of hair like sensory structure
- Lack flagella or cillia even a sperm cells
  Their excretory system consists of cells that function as gland.
- Canal system does not depend on flagella or cilia for its movement
- Have mouth with piercing organs slylets
  Some parasitic round worms
- Pathogens worms are
  i. Ascaris

Intestinal nematodes e.g. Ascarislumbrocoides large roun worms of man

ii. Hookworms e.g. Necator Americana, Avcylostomaduoclariale.
iii. Trachinella e.g. TrachinellarSpiralio cause Trichinosis e.g. in pig small intestine
iv. Guinea worms forms blisters in human skin
v. Fularia worms blocks up lymph vessels and causes the diseases elephantiasis causes cative worms in ChereriaBancroft

Ascirislumbrocoides

a) i) common name large round worms of man
   ii) Geographically distribution cosmopolitan worldwide distribution.
   iii) Habitat adult is found in small intestine of man but due to movement they may be found at any part
b) Eggs will found in faces when it has freshly passed out, not infective.
c) The eggs will contain an effective larva when it in soil or vegetable resistant to cold

STRUCTURE OF ASCARIS LUMBROCOIDES

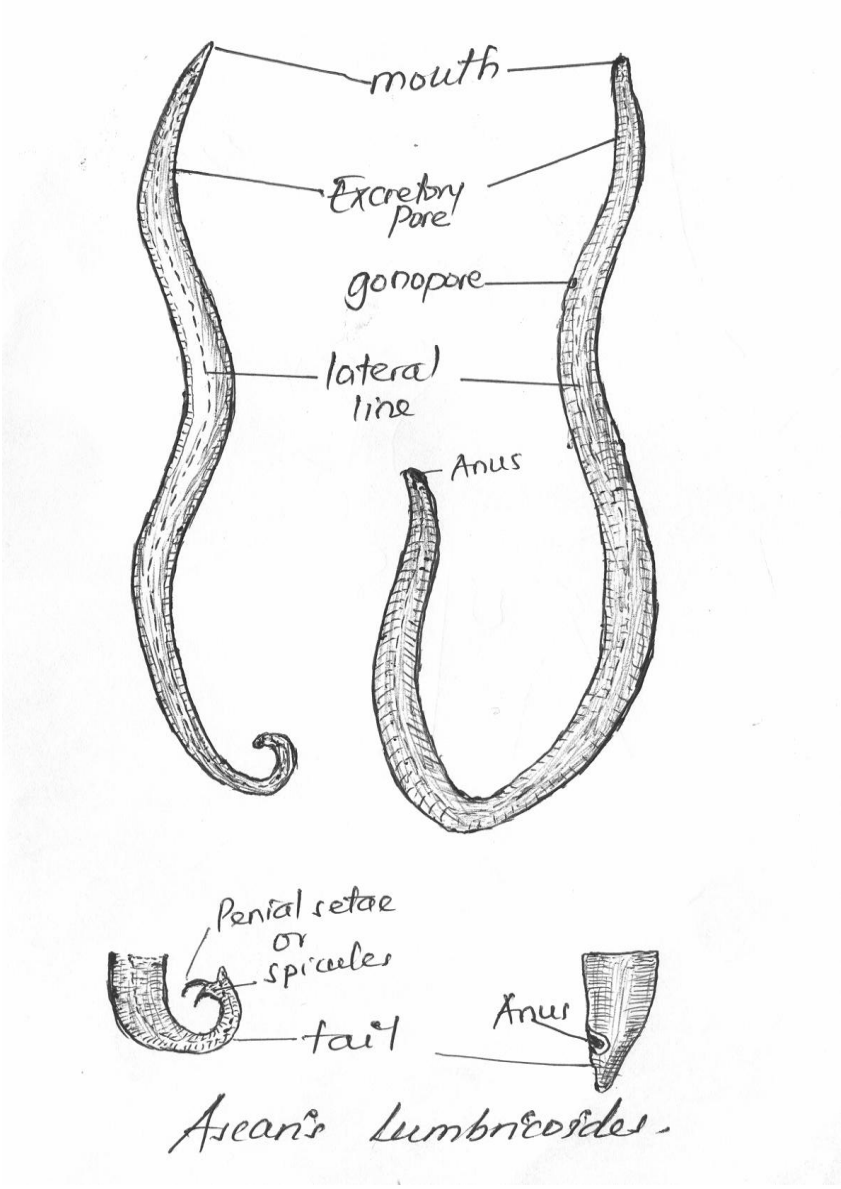
Adult worms

- It is brown – yellow in color.
- Its size is like earthworm
- Its mouth has lips one in dorsal and two in ventral
- Male is 25 cm in length and 5mm in diameter
- Posterior of female is straight while for male is curvet
- Eggs are thick, shelled and contain a brown conjugated coat
- Female may lay 200,000 eggs in a day the whole life reach 2 million eggs.

Life history of Ascarislumbrocoide

i. Adult worm lives in small intestine of man where eggs are produced.
ii. Eggs will passes out through feaces, eggs are resistance to cold desiccation and dissifectant but are killed by boiling at 45°C at one hour.
iii. Eggs can remain viable unhatched for months
iv. Under favorable condition larva will develop within the eggs.
v. Larva will undergo molting but the skin will be retained as sheath.
vi. If a man swallow an egg with larva he / she will be infected
vii. This is when feeding in contaminated food, soil, water
viii. In the small intestine eggs will hatch out and penetrate the wall of the intestine and enter blood circulation.
ix. Enter to heart and lungs, then it will move to trachea passing through epiglottis and esophagus and then lastly to the stomach and small intestine where it will moult
x. In the lung it will moult twice

Diagram



PATHOGENECITY

i. During migration to lung can cause pneumonia
ii. Can cause diseases and death
iii. Can cause vomiting through nose
iv. Can break pancreas duct or bile duct
v. Can break small intestine of human

Diagnosis

i. Look for eggs in feaces
ii. Look for worms in feaces

Control

- Sanitary disporsal in feaces
- Boiling drinking water

Adaptative features of Ascarislumbrocoides

i. Lay eggs which has thick coat therefore resistance to cold and descation
ii. Female lay many eggs to increase chances of meeting a new host
iii. Larva is protected within the eggs coats from adverse condition in the surrounding.
iv. Larva undergo moulting while retaining its skin as a sheath
v. Has got mouth with teeth and three lips
vi. Body is covered with elastic cuticle which is resistance to enzyme action
vii. Have longitudinal muscle which enable movement
viii. Undergo several moulting to allow growth (4 times)
ix. Forms high calcified cysts so eggs can remain viable for many years in the soil
x. Have pseudocoelom, they have piercing mouth stylets

Economic importance of Nematodes

i. Causes diseases
- Man – Trichnosissalariasis, Anaemia
- Plants – Neerosis, DiscorationGallen leaves
  Juricidola attack a coconut,palan disease
  - Parasitic mode of life
    Cause reduced fecundity and vigor to both man and milk production

ii. Can be in genetic and development studies
iii. In biological control e.g. diseases in pinus radiate and noctilio (controlled by Delactemussincidoeola)

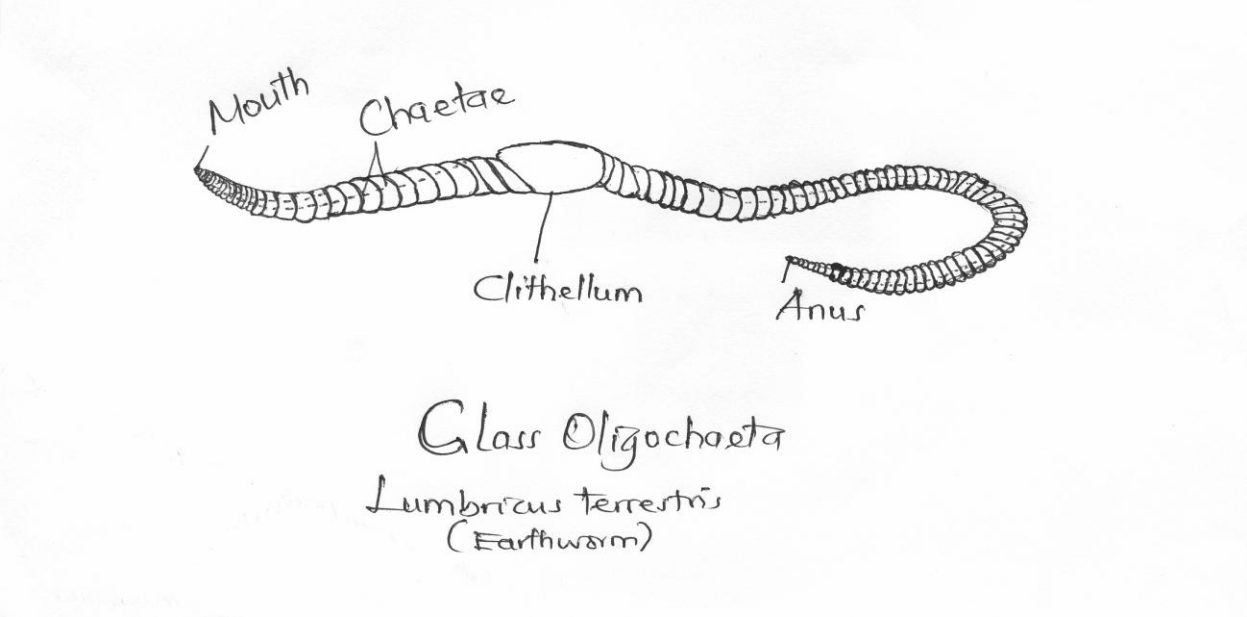
3. HYLUM ANNELIDA

GENERAL AND DISTINCTIVE CHARACTERISTICS

i. Metamerically segmented worms
ii. Triploblastic
iii. Bilateral symmetry
iv. Contain body cavity known as coelom (1^{st} coelomate animal)
v. Body is made up of thin chitinous exoskeleton
vi. Have chaeta in each segment
vii. Excretory organ are mainly nephridia
viii. Larva is typically a trochophone
ix. One way gut.

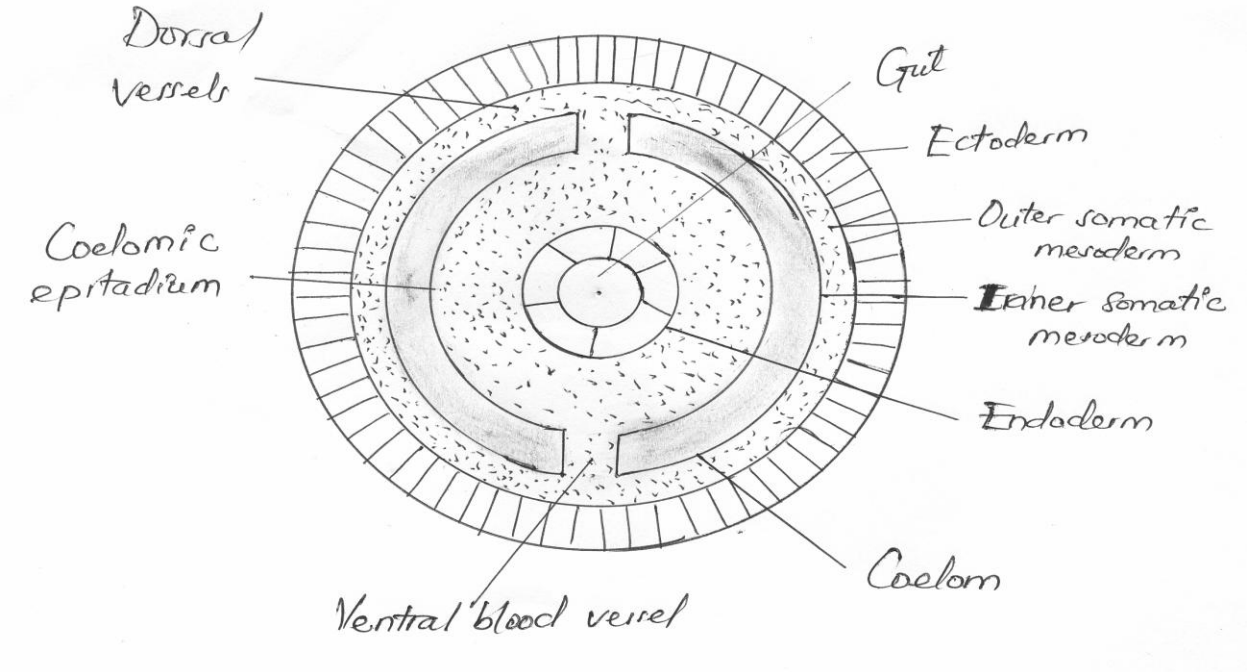
x. Have both circular and longitudinal muscle in body wall and digestive track

Diagram



Body plan of Annelida

Diagram



SEGMENTATION (Metamerically segmentation)

This is series of succession of identical segment

Importance of segments

i. Each segment of mesoderm may go on especially at early embryonic segmentation more or less complete set of the several organ systems.
   - Damage to any segment need not to be fatal to the individual other segment
   - Locomotion is far more effective when individuals segment can move independently because the animals as a whole have more flexibility of movement.
ii. A cavity/ space within the mesoderm filled with fluid (could be liquid organs)

Significance of coelom

i. All of its internal organs are passed by muscles and deformed by muscular activity so coelom compensate these limitation
ii. Body's organs are located within, hence can function without having to resist pressure from the surrounding
iii. The cavity may acts as circulatory system transporting food , water and gases
iv. Enable the digestion system to function more effectively because opening of the gut does not depend on movement of animals. (Separates the gut and the body will hence the two more freely)
v. Allows the digestive tracks its cooking of folding within the coelom to be longer than animal itself.
vi. Coelom provides space within gonads can expand so giving room for production of many sperms and eggs.
vii. When filled with liquid it acts as hydrostatic skeleton
viii. May play part in osmoregulation activities
ix. Waste material and excess fluid may temporally store here
x. Permit animal to become much larger.

CLASSIFICATION OF ANNELIDA

A. **CLASS OLIGOCHAETAE** (earthworm + freshwater worm)

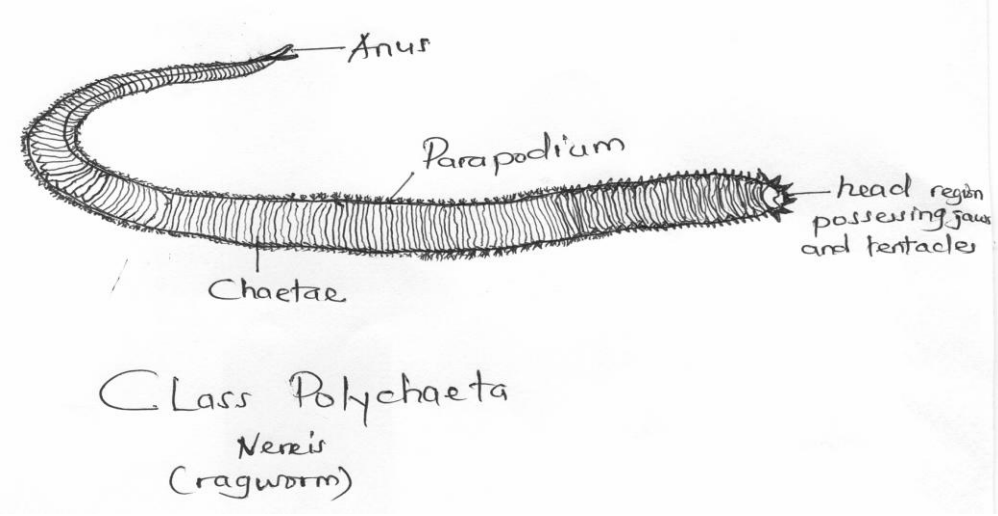
General characteristics

i. Contain both sex but fertilization is cross
ii. Two pair of chaetae in each segments
iii. Leave in wet soil and fresh water with high organic matter
iv. Has opening at both ends representing the mouth and anus
v. No Parapodia
vi. No distinct head

B. **CLASS POLYCHAETA** (Marine bristle worms)

General characteristics

i. Numerous chaeta inn each segment
ii. Have parapodia (out growth)
iii. Sexes are separated (division)
iv. Larva stage are present in its mode of life cycle
v. Have well worked (Cephalization)
vi. No cocoon



C. **CLASS HIRUDINEA** (e.g. leaches)

General characteristics

i. They are ectoparasite
ii. Coelom is reduced compared to others
iii. No chaeta and parapodia
iv. They are hermaphroditic
v. No larva form in their life cycle

Diagram

D. **CLASS ARCHANNELIDA**
(Small marine worms)

General characteristics

i. No parapodia and chaeta
ii. Show little segmentation
iii. Well-developed coelom compared to other

iv. Show sex dimorphism (differ size of sexes)

EARTHWORM (Lumbricusterrestris)

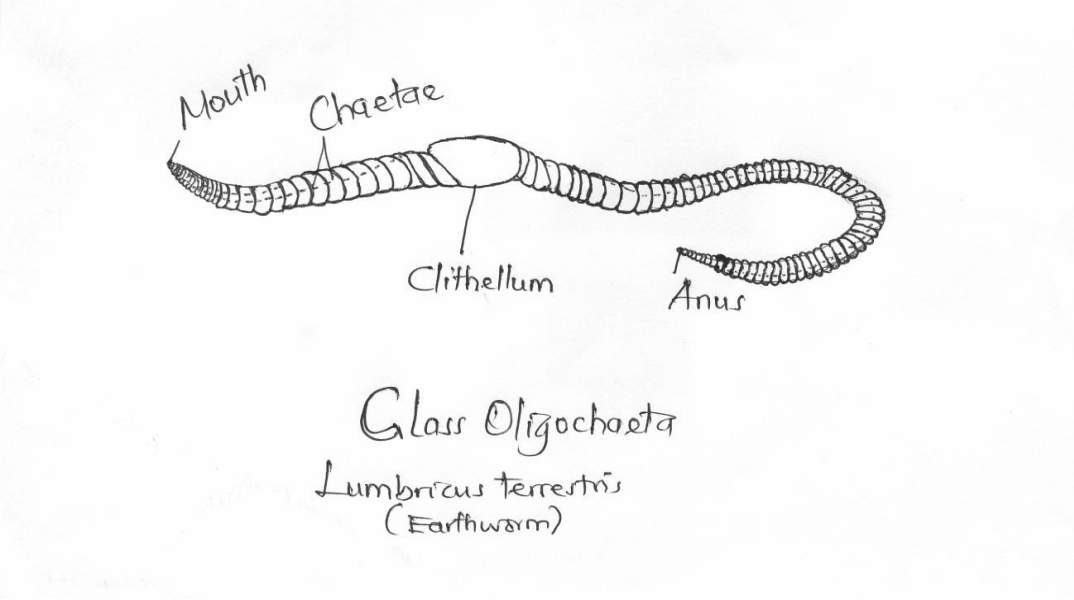
Habitat

They are found in wet soil

BODY STRUCTURE (FEATURES)

i. Body elongated and roughly (Cylindrical with slightly dorsal ventral flattening)
ii. The end is tempered
iii. The have very clear external segment
iv. The upper surface is deep red color than the lower surface
v. The anus is terminal, perforating the last segments
vi. Have thickened band clitellum
vii. They have four pair of chaeta on every segments

Diagram



viii. Copulation and cross fertilization
ix. No larva stages
x. Clitellum with egg laid in cocoon

BODY WALL OF EARTHWORM

i. There is delicate outer iridescent cuticle secreted by epidermis it is constructed of fine layer of collagen fiber.
ii. The epidermises follow as the layer of cells from the outer surface of the earthworm.

- This consists of columnar epithelial cells and mucus secreting cells which first in keeping the surface moist and sensory cells.

iii. Beneath the epidermis layer they have thin layer of connective containing a sub – epidermal nerve plexus

iv. Next layer consists of circular arranged muscle fiber which passes the whole length of the worms contraction of the circular muscle made the body thin and long

MOVEMENT IN EARTHWORM

Movement in earthworm is aided by circular and longitudinal muscles, retractor muscle and protector muscle plus chaeta.

Stages

i. Contraction of circular muscles at segment it results to elongation of the segment.
ii. This contraction of segment number 1 will be followed by contraction immediate segments also resulting to elongate of these segment 2,3,4,5…
iii. When this happening the chaeta of more posterior segment will be produced and grip the substratum
iv. As the anterior segment elongates will result to pulling of posterior segment
v. Anterior segment are pushed forward
vi. Chaeta from the posterior segments will be withdraw from the substratum
vii. When the longitudinal muscle contracts resulting to pulling of the posterior part of the body forward.

NOTE:

This muscle movement controlled by

i. Mechanical stretch stimuli
ii. Reflex are in the same cord

EXCRETION IN EARTHWORM

The principle structure which is used to excrete Nitrogenous waste in earthworm is Nephridium.

PARTS OF NEPHRIDIUM

i. Nephridium opening in the fore segments, it takes fluid from coelom duct.
ii. Intercellular duct is a tube formed by nephridium before the septum.
iii. Narrow ciliated tube.
iv. Brown ciliated tube is a bit wider.
v. Wide non – ciliated tube wide than the early mentioned
vi. Muscular tubes last tube and open out in a pore known as Nephridiopore.
vii. Nephridiopore has sphinter which control opening and closing.

MECHANISM

i. Nephrostone is like the mouth contain cilia it opens into coelom.
ii. Coelom contains coelomic fluid.
iii. The cilia of Nephrostone when they beat caused pressure which drive a coelomic fluid into a narrow tube of the nephridium
iv. When the coelomic fluid is in a narrow tube from blood which are adjacent to nephridium
v. The extraction of Urea will continue in brown ciliated.
vi. In a wide non – ciliated tube there is absorption of water from the fluid to the blood.
vii. In the muscular tube there is accumulation of urine will be ejected periodically when the sphinter open.

ADAPTION FEATURES OF EARTH TO ITS MODE OF LIFE

i. Have circular muscles, longitudinal muscle protractor muscle, refractor muscle and chaeta for movement.
ii. Nephridium for excretory.
iii. Stream line body with non – projecting structures with might ampede its passage through the soil.
iv. No eyes have light and touch sensitive organs concentrated in those segments near end of the body.
v. Have sensitive moisture detecting cells (This will detect the moisture condition detecting cells)
vi. Earthworms carry out their gas exchange at high moisture condition.
vii. Feeding on dead organic matter.
viii. Secretes mucus which saves to bind the wall of the burrow.
ix. They have grinding apparatus in the gizzard breaking up the plant tissue.
x. Not very active – oxygen consumption in low.
- Strong pharynx contraction which help sucking organic and other materials.

ECONOMIC IMPORTANCE OF ANNELIDA

i. Act as soil decomposer due to feeding in soil organic matter.
ii. Increase soil fertility when burrow causes soil aeration
iii. Improve soil drainage or easier water percolation.
iv. It is used as a fishing bait
v. Neutralize the soil addition of calcium carbonate.
vi. Improve the depth of the soil by burrowing into sub soil and bring it to the surface
vii. Improve soil structure (by mixing up the soil layer eating on soil)
viii. Their urine and feaces have considerable mammal value.
ix. They used in scientific research especially on bloodcloating by leech known as Hirudiniacinalis.

x. They are used in medicine e.g. Hiriudo medicinal (n canastretes) excess blood complication.
xi. They burrow leaves on the soil where it decay and decompose soil increase the organic matter content of the soil.

4. PHYLUM ARTHRODA

General and distinctive characteristics

i. Are animal with segmented jointed limbs.
ii. Have exoskeleton (chitinous cuticle)
iii. At least one pair of limb is modified to form a pair.
iv. Have got a heart which is dorsal placed it is placed in haemocoel
v. Metamerically segmented
vi. Triploblastic body
vii. They contain nervous system which is made by cerebral ganglia.

CLASSIFICATION OF ARTHRODA

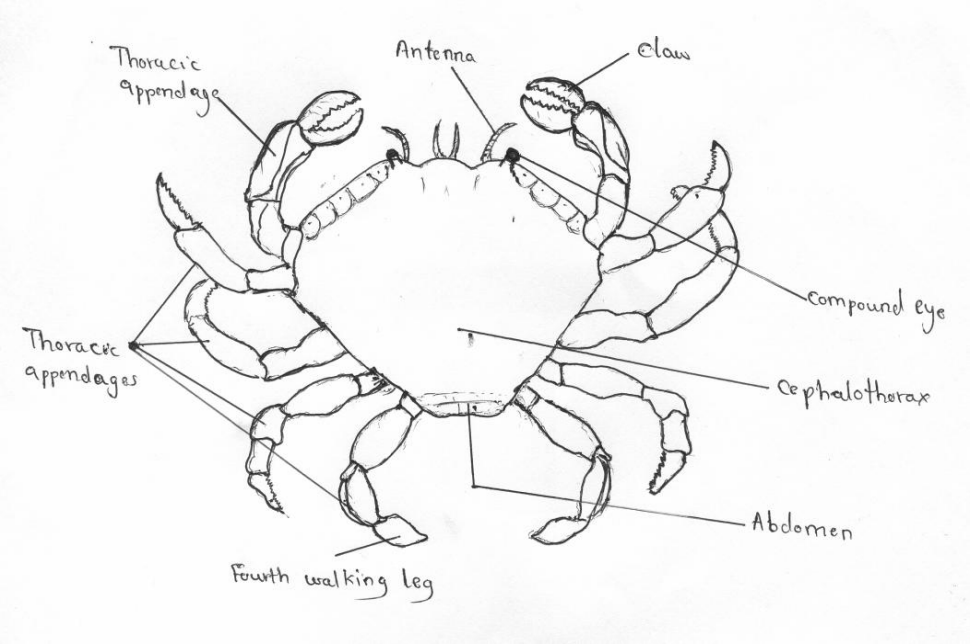
1. **CLASS CRUSTCEA** e.g. Crab, Cray fish, water flea

i. Mainly aquatic
ii. Breath means of gills.
iii. The exoskeleton is extrathickened.
iv. They contain two pair of antennae.
v. Some thoracic appendages some as jaw.
vi. Limbs are very much specialized have different function.
vii. Thorax and head fused to form cephalothorax.
viii. Two body parts i.e. cephalothorax and abdomen

Adaptation feature of crabs

i. Have gills for breathing (in water)
ii. Hard exoskeleton for sexual functions such as protection from dehydration, injury.
iii. Have modified limbs for various functions e.g. walking catching.
iv. Pair of compound eye raised on stalks can see 360°C

Diagram

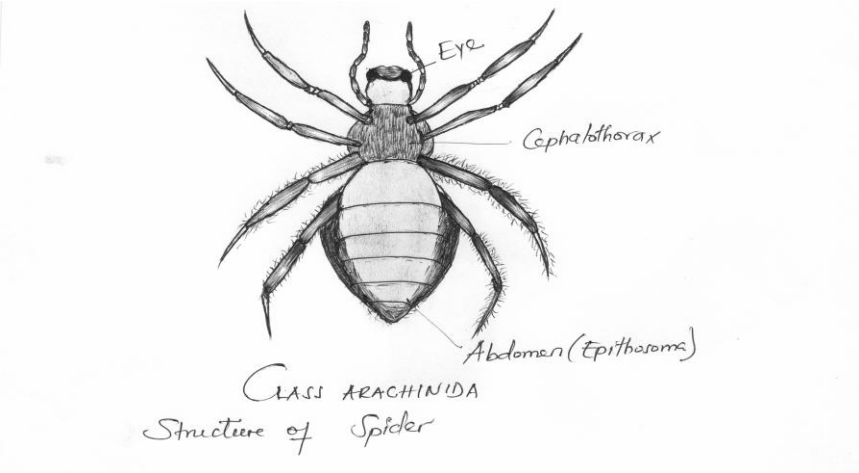


2. CLASS ARACHINIDA

E.g. spider, cow tics

i. Body is divided into two parts, cephalothorax (prosoma) and Epithosoma (abdomen)
ii. Respiration is by using lungbooks, gills and trachea
iii. No antennae and have eight (8) legs

Diagram



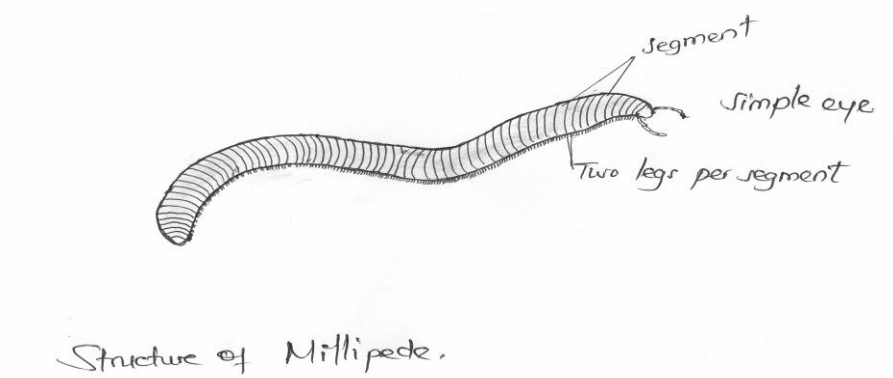
Adaptation/ adaptive features of spider

i. Exoskeleton
ii. Have poison gland for defence from their enemies

iii. Four pair of legs
iv. Ability to form cobwebs for trapping prey
v. Have several respiration means e.g. book lung, gills use of trachea

3. CLASS DIPLOPODA)

i. Cylindrical body and simple eyes
ii. No poisonous claws
iii. Two pairs of legs/ segment

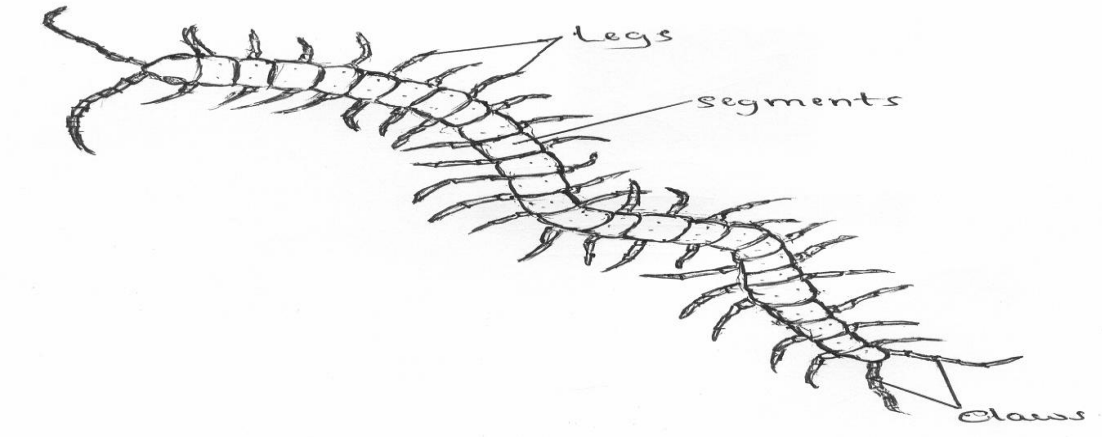


Structure of Millipede.

4. CLASS CHILOPODA

i. Mainly terrestrial and they have trachea for breathing
ii. They have numerous similar segment bearing limbs
iii. They have antennae in their head
iv. Clearly defined head and one pair of legs segment
v. Dorsal ventrally flattened body with distinctive head which bearing a pair of poisonous claws.
vi. Body consists of numerous leg bearing segment

Diagram



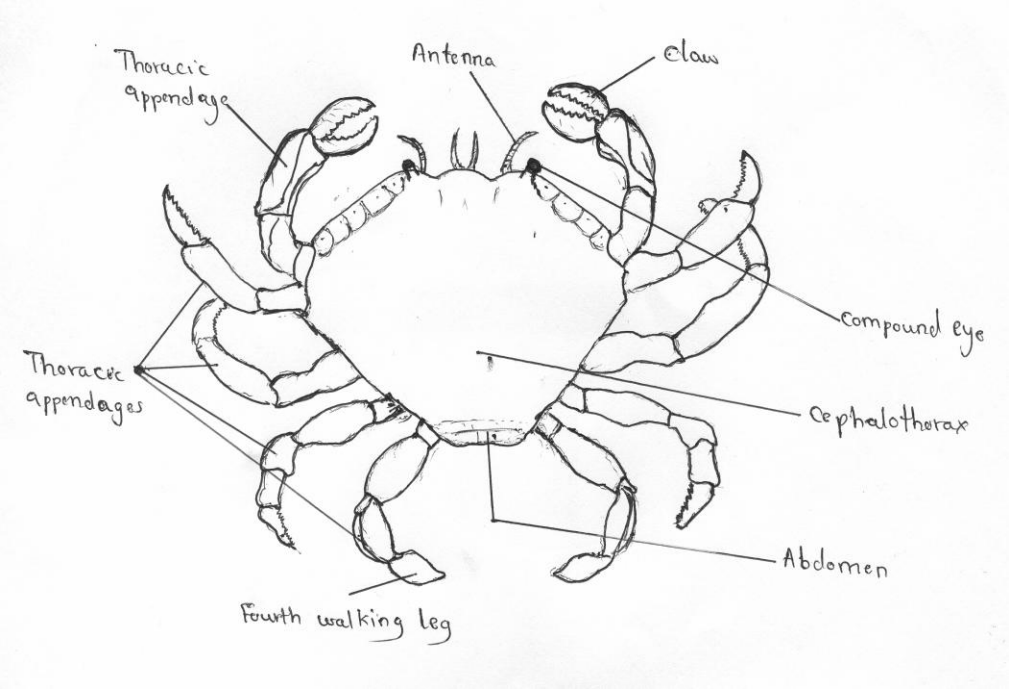
Adaptation features

i. Have trachea for breathing
ii. Poison gland for defense
iii. Antennae for sensing

5. CLASS INSECTA

i. Triploblastic coelomate
ii. Body divided into three segment, head, thorax and abdomen
Head 6 segment, thorax 3 segment and abdomen 2 segment
iii. Breath by trachea
iv. They have one pair of antennae
v. The heart is long tubular structure
vi. They have open blood system

Structure of Crab



Adaptation

i. Extra thickened exoskeleton protection
ii. Pairs of compound eye raised on stalk
iii. Have gills for breathing
iv. Modified limb for various function e.g. walking and catching prey

FACTORS CONTRIBUTES THE SUCCESS OF INSECTS

i. Small size enables them to occupy diverse and protected habit.
ii. Highly developed mechanism of gas exchanged via TRCHEA
iii. Have more highly organized sensory and neurons system than other invertebrates
iv. Flight, walking and hopping movement enable them to colonize places, escape attacks and finally mates.
v. High free and faster rate of development
vi. Body covered by exoskeleton
vii. Developed defensing mechanism stringing.
viii. High metabolic rate.

EXOSKELETON

ADVANTAGE

i. Support muscle attachment thus facilitates locomotion.
ii. Parent excessive water losses/ prevent dehydration.
iii. Protect internal parts which are shift from injury
iv. Reception of external stimuli as it has the most of the sense organs.

DIASDVANTAGES

i. Discontinuous growth.
ii. Soft after moulting thus vulnerable to changing weather.
iii. Shedding process may need a lot of energy and may cause dehydration

ECONOMIC IMPORTANCE

I. HARMFULL EFFECT OF ARTHROPODA

- Most of them are pest of various crops and trees.
- Most of them are vector of various disease e.g. mosquito transiting malaria, houseflies Glossina species transmitting Trypanosome in livestock.
- Poisonous string e.g. (scorpion, spider)
- Most of them can act as ecto – parasite of man and liver stock
- Bug sucking human blood.
- Destruction of article e.g. timber, clothes, carpets e.g. septera (termites)
- Dirtens walls of house e.g.periplanata e.g. American spider.
- Some insects makes noise e.g. butterflies.

II. BENEFICIAL IMPORTANCE

- Production of honey/ waxy e.g. honey bees (Apismelifera)
- In pollination e.g. butterfly

- Used in biological control of weeds and pests for weeds, months are used and pests entomorphagus insect.
- Food for man and livestock e.g. (grass hopper, crab)
- Have aesthetic / source of beauty of landscape e.g. butterfly carnion insects.
- Add soil fertility e.g. termite.
- Improve aeration soil structure and drainage.
- Importance in soil formation
- Source of fibers e.g. silk worm bombyciclea
- Used in biological control e.g. Drosophila
- Used in medicine.

5. PHYLUM CHORDATA

Distinguish features

1. NOTOCHORD
- In vertebrates (craniate) the notochord has been replaced by the Vertebral column.
- In lower chordates are not surely known to have a notochord is present only in larva form.
2. BRAINCHIAL CLEFT (Open slits)
- In chordates they occur in pair or perforations from pharynx to lateral parts of the body.
- For aquatic animals the position of visceral cleft has taken by gills.
- In terrestrial has been taken by gland e.g. thyroid glands
3. DORSAL TUBULAR FLUID FILLED
- Central cord nervous system differentiated into the brain and spinal cord.
4. CLOSED BLOOD SYSTEM
- In which blood flows from the heart ventrally and away from the heart dorsally.
5. HEART
- Have chambered heart.
6. POSTANAL TAIL (HAVE TRUE TAIL)
- True tail should be post –anal
- In most vertebrates it occurs as vestigial organ (has lost its function)
7. Bilateral symmetry
8. Metamerically segmented body that can be seen in embryos.
9. Contain coelom.

CLASSES OF CHORDATA

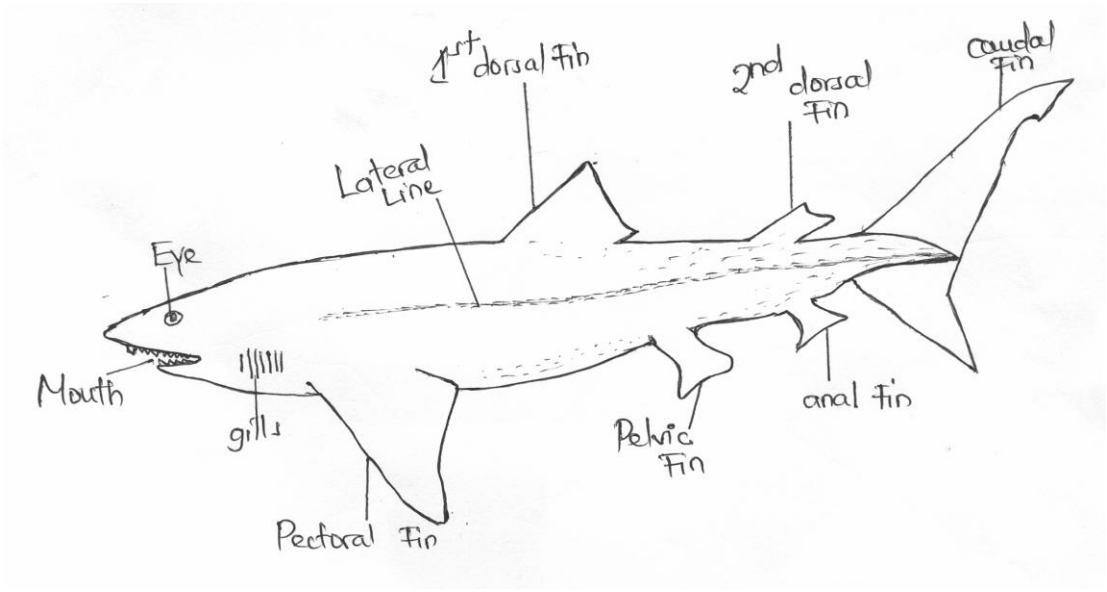
i. CLASS Chondrichthyes(Cartillegeous fish)
ii. CLASS Osteictytheyes(Bony fish)
iii. CLASS Amphibia e.g. Toad/ Frog

iv. CLASS Reptiliae.g Lizard
v. CLASS Aves (Bird)e.g Pigeon
vi. CLASS Mammalia e.g. Rat

A. **CLASS CHONDRYCHYTES** (Cartilaginous fish) e.g. shark, dogfish, Rays,

(i) They are cartilaginous endoskeleton.
(ii) Gills slits open directly outside and for gaseous exchange and they lack gill covers.
(iii) In male we have structure known as pelvic clasper (like limbs)
(iv) Fertilization is always internal and viviparous (embryo develop within organism)
(v) Have heterocercal caudal fine or tail (asymmetric in shape) help the organism from sinking in water because they have no swimming bladder
(vi) Have placoid type scale (teeth like scale) which cover their skin.
(vii) Have vertical moth.

Structure of Shark



B. **CLASS OSTEICHYTHES** (Bony fish)

i. Have skeleton made up of bony plates (includes scales)
ii. Have air bladder for swimming and helps them to rise and sink (buoyancy)
iii. Have lateral line for sensitive the currency of water and temperature
iv. Have operculum covering gills
v. Have terminal mouth
vi. Have cycloid scales made up of bone which are impermeable to water
vii. Possess (4) four pairs of gills slits covered by operculum
viii. Have tail fins which are homocercal (symmetrical)

ix. Have fan like pectoral and pelvic fins

The structure of Tilapia, Nile perch

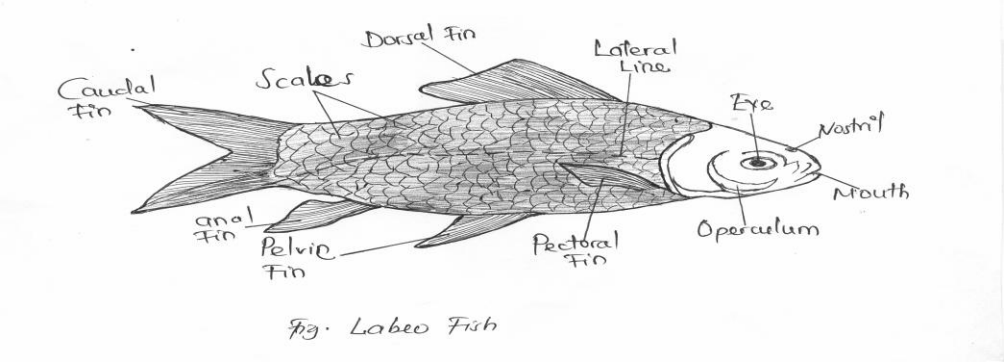


Fig. Labeo Fish

Structure of Tilapia fish

1) SHAPE- Have streamline body for easy movement in water and reduce resentence
2) BODY COVERING
3) EYE- large eye which move independently and have no eyelid

- Two pair of nostril not used in breathing but for smelling
- Tiny teeth, the jaw bone for griping the food during swallowing

4) FINS -fins Special organ for locomotion

They are of two types

i. The cranial fin at the end of tail
ii. The dorsal fins act as keel to keep it upright

- Other paired fines which are homologous to the paired limb of the other animal
- The pectoral fins – paired limbs (Front limbs)
- Pelvic fins (hind limbs) act as nose for breaking up and assist in steering
- Lateral line. A sense organ for touch consists of a raw of holes through the scales along this line nerve in the skin can feel water pressure and current (for balance)
- The air bladder at the top of the body cavity for sinking and rising

Adaptation features of tilapia to aquatic mode of life

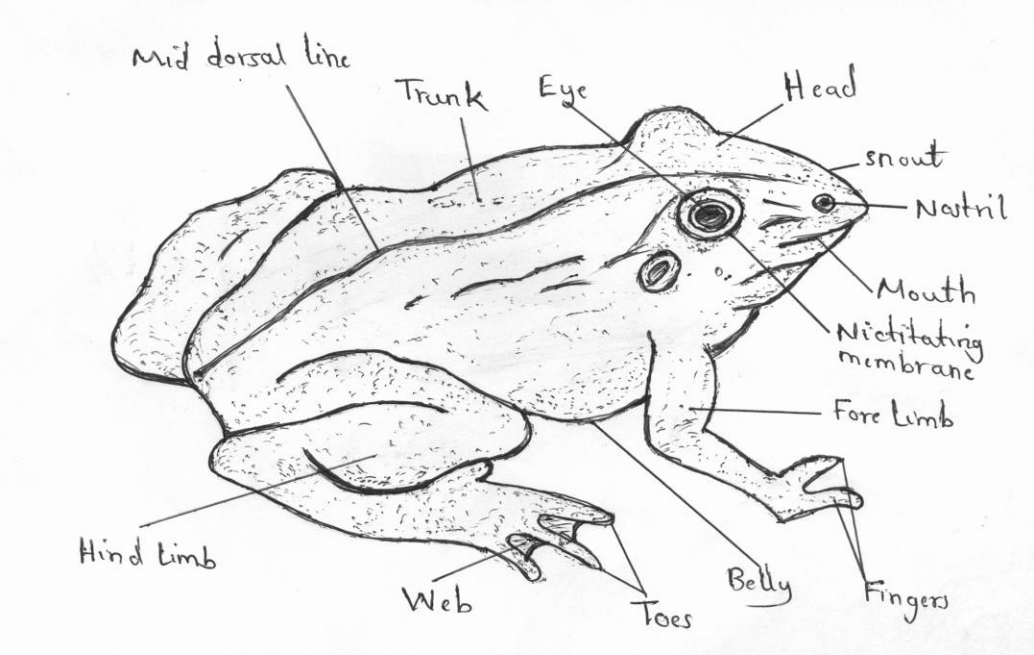
- Have gills which enable them to obtain oxygen dissolved in water
- Have air bladder for rising and sinking of the fish
- Have streamline body which enable the fish to swim easily
- Have lateral line which enable the fish to detect current and water pressure
- Scales which provide protection from water waves and other mechanical injury
- Neutral coloration which makes it invisible so it avoid predator
- Shinny body cover enable the fish to escape from enemy

C. **CLASS AMPHIBIA** e.g. toad, frog, salamander,

Double life, young stage live in water, adult live on land

i. Have pentdactyl limb (limbs with five digits)
ii. Have got soft and moist skin with no scale used for gaseous exchange
iii. Have got three chambered heart which pump mixed blood
iv. Have external gills in tadpole and lungs in adult
v. Have long and sticky tongue
vi. Have protruding eyes which enable them to see wider or every direction
vii. Some have back side limbs used for jumping or hopping or gluing
viii. Have metamorphosis in their life cycle where there is larvae stage called tadpole
ix. The temperature is variable with the temperature of environment
x. The adult are aquatic life in moist places

Structure of a frog



ADAPTATIVE FEATURES OF TOAD/ FROG

- Have patterns of pigments which makes it to be invisible in water
- Have teeth with sharp backwards points render escape of large prey difficult
- Have got protruding eyes which gives a wider field of view and have a necessary function surface
- Hibernation with considerably reduced metabolism enables survival when there is no food available.

- Provision for survival of the race by the comparative certainty of fertilization by the protection of embryo's in jelly and by large number of organism offspring produced.
- Modified limbs and girdles enables the frog to swim or holding its prey
- Poisonous glands which protect from their enemies
- Have lungs gills and skin for gaseous exchange which enable them to live in water and terrestrial environment
- Lay large number of eggs which covered with jelly material which increase survivability
- Have long and sticky tongue for insect capturing and feeding
- Have sharp and backward pointing teeth for seizing or holding its prey.

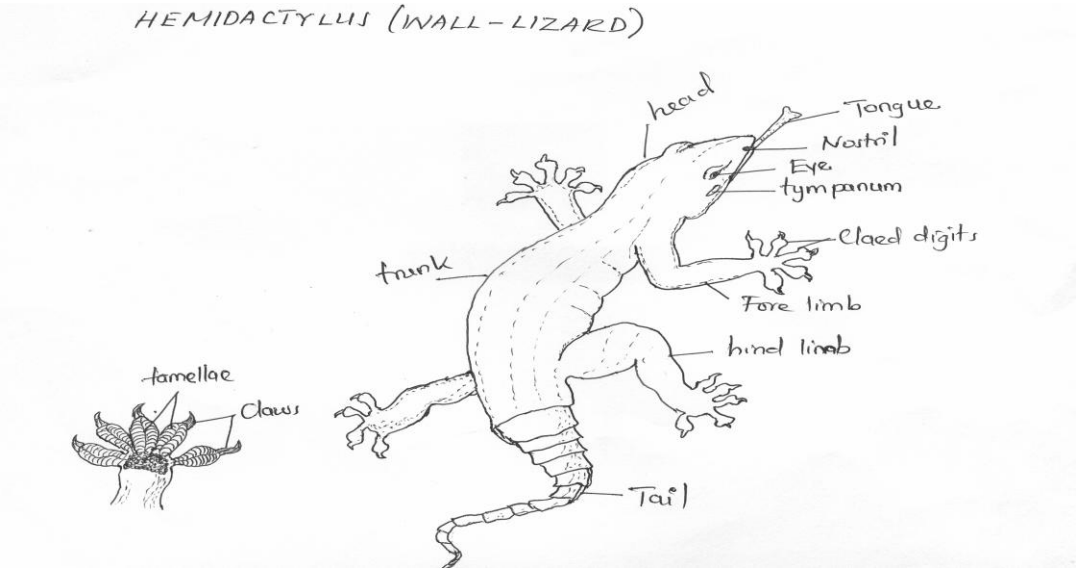
D. CLASS REPTILIA

i. They are true terrestrial organism and their gaseous exchange is by using lungs
ii. Their body is covered with scales and they have long tails
iii. No larva stage and the embryo develop inside eggs
iv. Have three chambered heart
v. They lay amniotic eggs with thick leathering shell
vi. Have homodont dentition i.e. they have same arrangement size and shape of teeth

Adaptive features of lizard to its mode of life

i. The dry skin covered with scales give them protection and prevent desiccation
ii. They have color pattern which makes them resembles their environment which make them to be invisible to their enemies
iii. Have protruding eye which gives them wide field view
iv. They excretes uric acid less poisonous and does not need large amount of water and enable them to live on a dry condition (environment)
v. Feed in various small animals especially insects
vi. They hibernates in adverse condition
vii. Have nails and wrinkled skin in their limbs which enables them to climb on stones house walls and trees

Structure of Lizard



E. CLASS AVES

i. Warm blooded craniate with pentdactyl limbs
ii. The front pairs of legs are modified into wings
iii. The skin bears feathers except on legs where there is shiny scales
iv. Lungs are used in gaseous exchange
v. They produce large yolky eggs in limestone shells
vi. There is no larva stage and embryo development in amnion and allantois
vii. They lay eggs with calcified shell
viii. Have light and hollow bones
ix. Their mouth are modified into beaks or bill
x. Have no pinna but have middle and internal ear.
xi. Have large sternum for muscle attachment
xii. Have sacs in their lungs
xiii. Have one salivary gland. The unipygial producing oil.
Mouth has a projecting horny beak with no teeth or bill
xiv. Have four chambered heart, have complete double circulation

Adaptation feature of pigeon (birds)

i. Have wings for flying to search for food, mating and escaping from enemies.
ii. Have beak or bill for feeding
iii. Sternum is enlarged to form a structure called keel which bears strong muscle for flight
iv. Have tight and hollow bones which reduce weight during flight
v. Have gizzard that grinds food, it act like teeth.
vi. Have excellent respiratory system in which lung is with air sacs
vii. Have cledick development where large shelled eggs provide with food an insoluble nitrogenous and other waste product which lack little storage space in eggs

viii. Have excellent muscular circulatory and coordination system

ix. They are able to regulate their temperature more or less constant by having high metabolic rate body covering of feather and no gland on the skin prevents heat loss.

x. Have streamlined body which avoid air resistance during flying

Features of flight

i. Flight

a) skeletal modification – fronts limbs from wings

- Thin bones where flat surface are used for protection e.g. Skull
- Hollow bones and slender spring bones –

b) Large air sacs

c) Excellent respiratory and muscular system

d) Very good vision

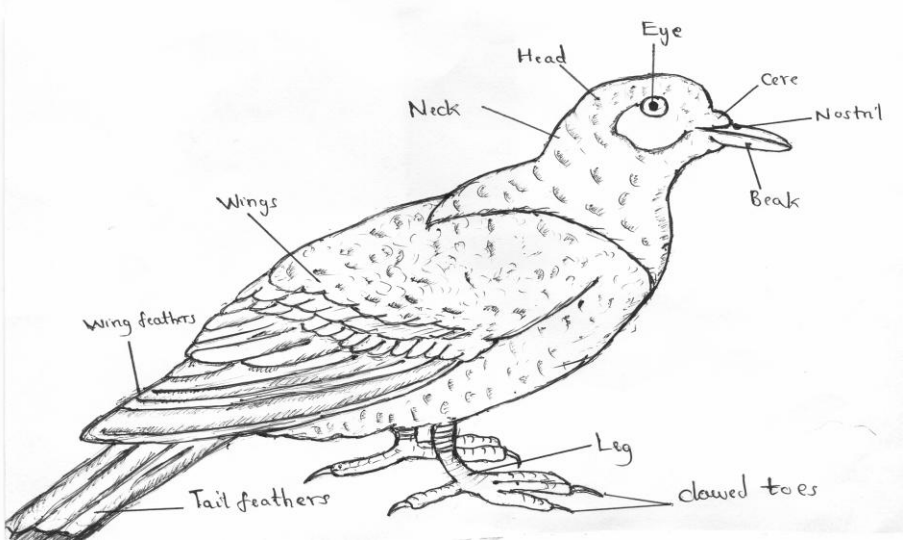
e) Remarkable muscular co ordination

ii. cleicdoic development

- Large shelled eggs provided with food
- The allantois and other embryonic development
- An insoluble nitrogenous and product which takle little storage space in the eggs

iii. Temperature regulation

- High metabolic rate
- Body covered with feathers
- Lack of sweat gland on the skin, this prevent heat loss



F. CLASS MAMMALIA

i. Are warm blooded animals (Homoithermic)
ii. Skin bears hair/ fur, gland/ subviporous as sebaceous glands
iii. Have external ear called pinna
iv. They are viviparous i.e. internal fertilization and internal embryo nourishment
v. Have diaphragm i.e. wall which separate thoracic cavity abnormal cavity
vi. Female (mothers) have mammary glands which produce milk for feeding new young ones.
vii. Have high developed brain and other sensory organs
viii. Have four chambered heart complete closed double circulation system

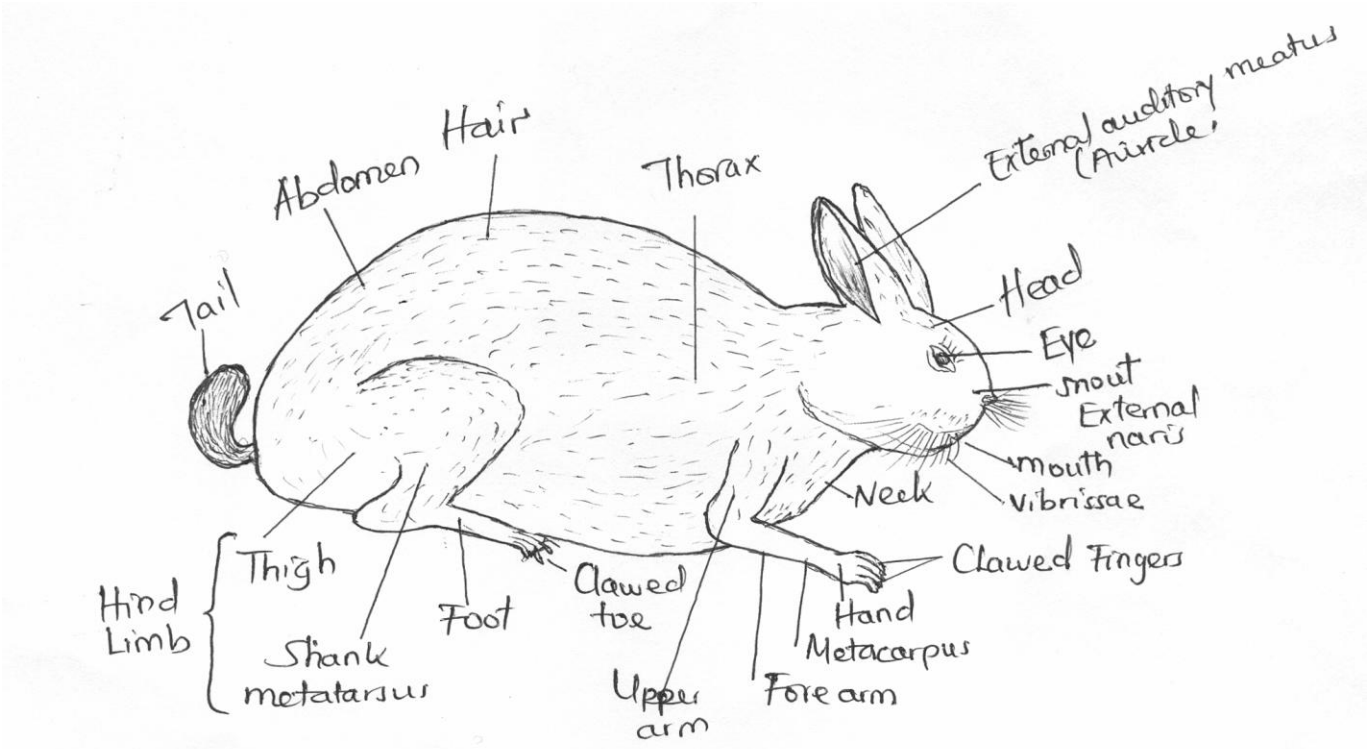


Fig: Rabbit

Adaptation of mammals e.g. rat / mouse

1. The great length of the gut enables maximum absorption food nutrients.
2. Viviparous entails internal fertilization of provision for attachment of the embryo by placenta, through which it receives all necessary supplies.
3. In the reproductive organs, the mechanism of internal fertilization is present of coordinated to occur at the heat periods (at the right time)
4. Possession of placenta which provides an ideal means of exchange between the mother's and embryo's blood with the necessary safeguard against dangerous materials.
5. Parental care,the birth process and lactation at the correct period, show further adaptation for care of the young until they are able to fend for themselves

6. Possession of nictating membrane which protect the eye in dust condition by washing it.
7. Presence of vibrissae for gauge the width of the burrow in its darkest depths.
8. Possession of natural colour for camouflage from predators.
9. Possession of great efficiency in respiratory and circulatory systems and the structure of the skin admirable adapted to control heat loss.
10. Possession of large Iscor teeth in the upper lip for chiseling action
11. presence of ear or pinna used to reflect sound waves into the canal and determine the direction of the sound