Chapter = 09

Diversity Among Animals

DIVERSITY AMONG ANIMALS:

The classification or grouping of animals mainly based on their evolutionary relationships is called Taxonomy.

Major phyla of kingdom Animalia are as follows:

- Phylum Porifera (Sponges).
- Phylum Cnidaria (Coelenterata).
- Phylum Platyhelminthes (Flat worms).
- Phylum Aschelminthes (Nematoda/Round worm).
- Phylum Annelida (Segmented worms).
- Phylum Mollusca (Shelled Animals).
- Phylum Arthropoda (Jointed Appendages Animals).
- Phylum Echinodermata.
- Phylum Hemichordata.
- Phylum Chordata.

INTRODUCTION:

Besides there is great diversity in the animal kingdom, the animals can be distinguished from the other kingdoms by a set of characteristics, though other types of life may share some of these characteristics, anyhow it can provide a division from the other kingdoms.

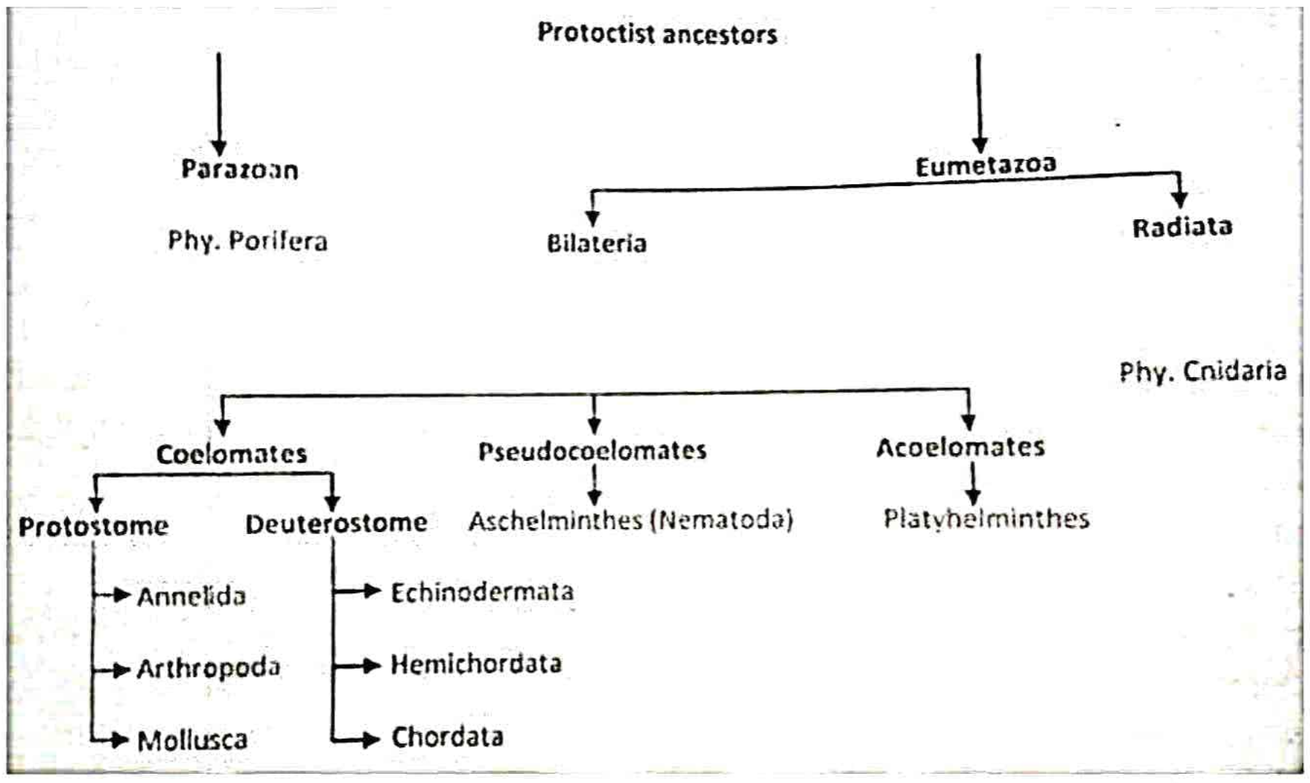
- Animals are multicellular.
- Animals are eukaryotes, having true nucleus.
- Animals are heterotrophic, obtaining their energy by consuming energy-releasing food substances.
- Animals typically reproduce sexually.
- Animals are made up of cells that do not have cell wall.
- Animals are capable of motion in some stage of their lives.
- Animals can respond quickly to external stimuli because of nerve cells, muscles or contractile tissues or both.

DEFINITION OF ANIMALS:

Animals are multicellular, heterotrophic eukaryotes with tissues that develop from embryonic layers.

CLASSIFICATION OF ANIMALS:

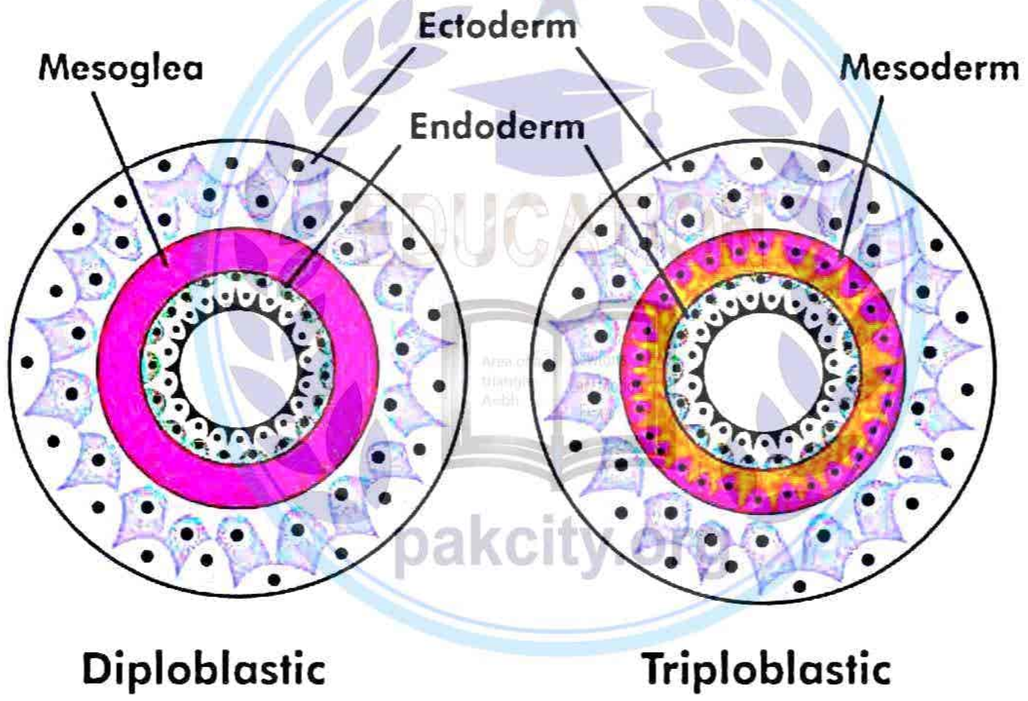
It is necessary to arrange the animals in groups. This arrangement offering a great deal to study animals in an orderly way. In the traditional two kingdoms system of classification the multicellular animals were referred to as "metazoan" to separate them from one celled "protozoan". In modern five kingdom classification scheme, protozoa belong to kingdom protoctista whereas the true animals or multicellular animals are placed in kingdom Animalia. Animals are divided into 33 groups called phyla. Out of these 33 phyla 9 are major phyla. Major phyla include phylum Porifera, phylum Cnidaria, phylum Platyhelminthes, phylum Aschelminthes, phylum Annelida, phylum Mollusca, phylum Arthropoda, phylum Echinodermata and phylum Chordata, while the rest of the groups are called minor phyla.



DIPLOBLASTIC AND TRIPLOBLASTIC ORGANIZATION:

Because of gastrulation, the embryo contains three germ layers, the ectoderm, endoderm and mesoderm which are outer, inner and middle layer respectively. On the basis of these germ layer animals are grouped into diploblastic and triploblastic categories.

1) Animals having two germs layer i.e. ectoderm and endoderm is called diploblastic organisms.
2) Animals having three germs layer i.e. ectoderm, endoderm and mesoderm are called triploblastic organisms.
3) The members of the phylum Porifera lack these tissue layers known as ablastic.
4) Cnidarians has two germs layer the ectoderm and endoderm is called diploblastic animals.
5) The rest of the seven major phyla have three germs layer the ectoderm, mesoderm and endoderm are called triploblastic.



GERM LAYERS

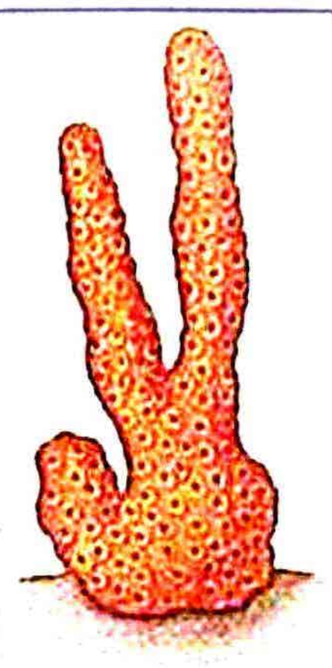
DIFFERENCE BETWEEN DIPLOBLASTIC AND TRIPLOBLASTIC ANIMALS

DIPLOBLASTIC ANIMALS	TRIPLOBLASTIC ANIMALS
Body develops from two germ layers i.e. ectoderm and endoderm.	Body develops from three germ layers i.e. ectoderm, mesoderm and endoderm.
Non-cellular gelatinous mesoglea is present in between ectoderm and endoderm.	Mesoglea is absent and mesoderm is present.
Coelom is absent in diploblastic animals.	Coelom is present in triploblastic animals.
Diploblasts are primitive metazoans.	Triploblasts are advanced metazoans.

Examples; Hydra, sponges	Examples; Platyhelminthes, Annelida, Arthropoda and Mollusca etc.

CELLULAR ORGANIZATION:

Animals are grouped into separate subkingdoms the parazoa and eumetazoa.



a) Parazoa:

Parazoans lack a proper tissue organization.

b) Eumetazoans:

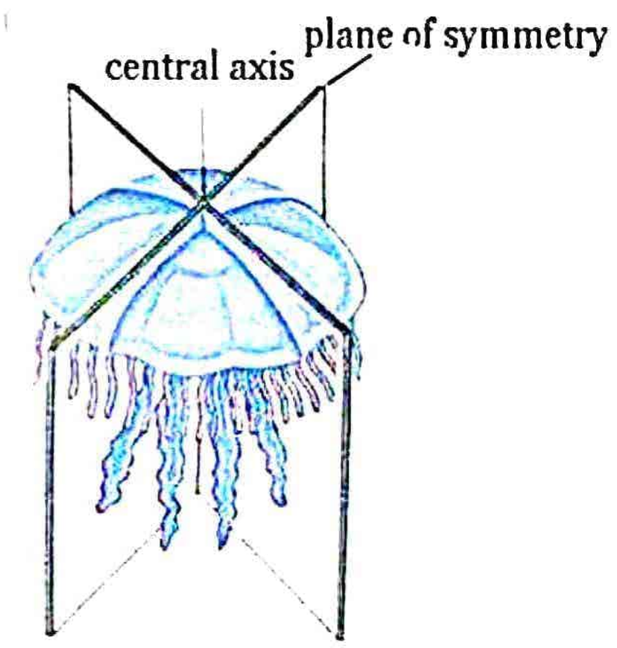
Eumetazoans have tissues organized into organs (in lower animals) and organs into organ system (in higher animals).

SYMMETRY:

Symmetry in biology is the balanced distribution of duplicate body parts. The body shapes of the most of the multicellular organisms exhibits some form of symmetry either radial symmetry or bilateral symmetry. A small minority exhibit symmetry and are called asymmetric organisms.

a) Radial symmetry:

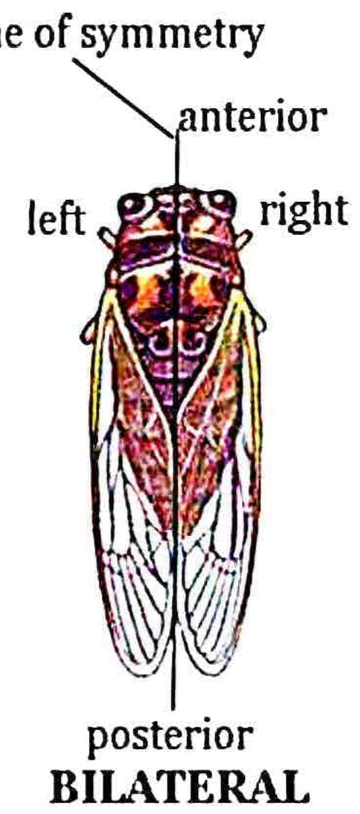
These organisms resemble a pie shape, where several cutting plans or suggestions produce roughly identical pieces. An organism with radial symmetry exhibits no left or right sides, although they have a top and bottom or dorsal and ventral surfaces only. These animals have one main axis around which body parts are arranged and the organism can be divided into two halves by any plan that passes through the main axis. Animals with radial symmetry are placed into the group radiata. Examples; phylum Coelenterata and Echinodermata.



RADIAL

b) Bilateral symmetry:

In bilateral symmetry, only one plan called "sagittal plan" will divide an organism into roughly mirror image halves. Often the two halves can be referred to as the right and left halves so they have right and left sides. Animals that are bilaterally symmetrical are put in the group Bilateria. Examples; prawn, lizard and human.



BILATERAL

COELOM:

The coelom is epithelium lined fluid filled cavity formed within the mesoderm of some animals. It is a cavity or space between the body wall and digestive tract in many triploblastic metazoans. Functionally a coelom can absorb shock or provide a hydrostatic skeleton. It also allows muscles to grow independently off the body wall.

TYPES OF ORGANISMS BASED ON COELOM:

a) Acoelomates:

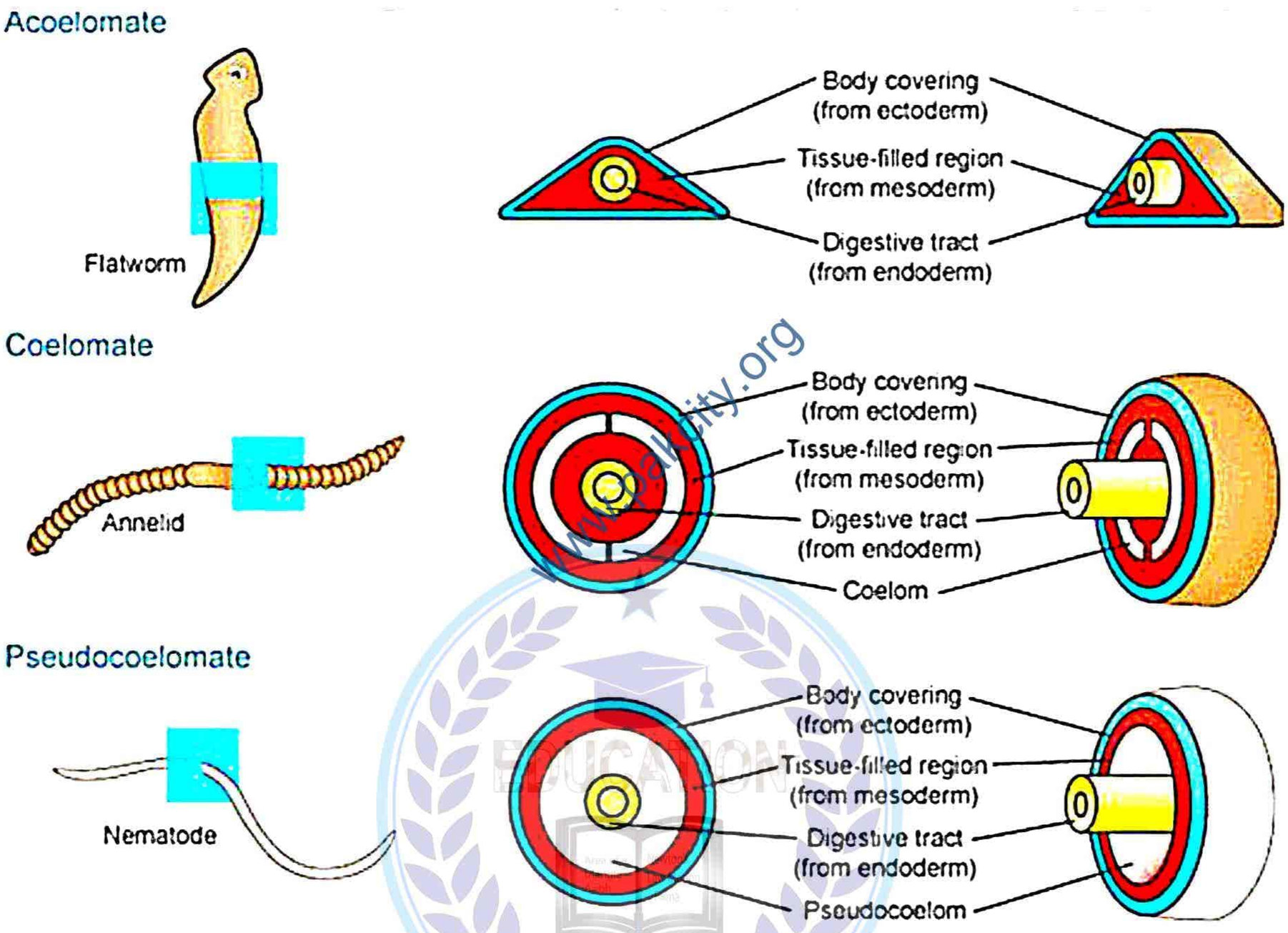
An animal that lack coelom is called acoelomate. Acoelomates exhibit bilateral symmetry and possess one internal space only called the digestive cavity. Example; liver fluke, tapeworm and ribbon worm.

b) Pseudocoelomates:

An organism that has false body cavity known as pseudocoel is called pseudocoelomate. Pscudocoel is not a product of gastrulation and it is not lined with a well-defined mesodermal membrane. Examples; nematode or rotifer

c) Eucoelomates:

A metazoan animal that has the true body cavity between the body wall and the digestive tract is called eucoelomate. The animals from Annelida to Chordata contain true body cavity hence called coelomates.



DIFFERENCE BETWEEN COELOM AND PSEUDOCOELOM

COELOM	PSEUDOCOELOM
It is a true body cavity.	It is a primitive body cavity and not a true body cavity.
It is formed by splitting of mesoderm.	It is not formed by splitting of mesoderm.
It encloses the intestine.	It enclose the all organs.
It is a product of gastrulation.	It is not a product of gastrulation.
It is lined by well-defined mesodermal membrane.	It is not lined by well-defined mesodermal membrane.
Example; Annelids, Arthropods, Chordates.	**Example;** Nematoda, Rotifers.

PROTOSTOME AND DEUTEROSTOME:

According to the expectations of the blastopore either form mouth or anus coelomates are of two types i.e. the protostome and deuterostome.

a) Protostome:

Protostome is a major group of triploblastic metazoans defined by its embryonic development in which the first opening in the embryo becomes the mouth. Major Protostome phyla include Annelida, Arthropoda and Mollusca.

b) Deuterostome:

Deuterostome is a major group of triploblastic metazoans defined by its embryonic development in which the first opening in the embryo becomes the anus and a second opening which develops later forms the mouth. Deuterostome means the mouth second. Most of the deuterostomes belongs to Echinoderms and Chordates.

PHYLUM PORIFERA (Sponges):

General characteristics of phylum porifera:

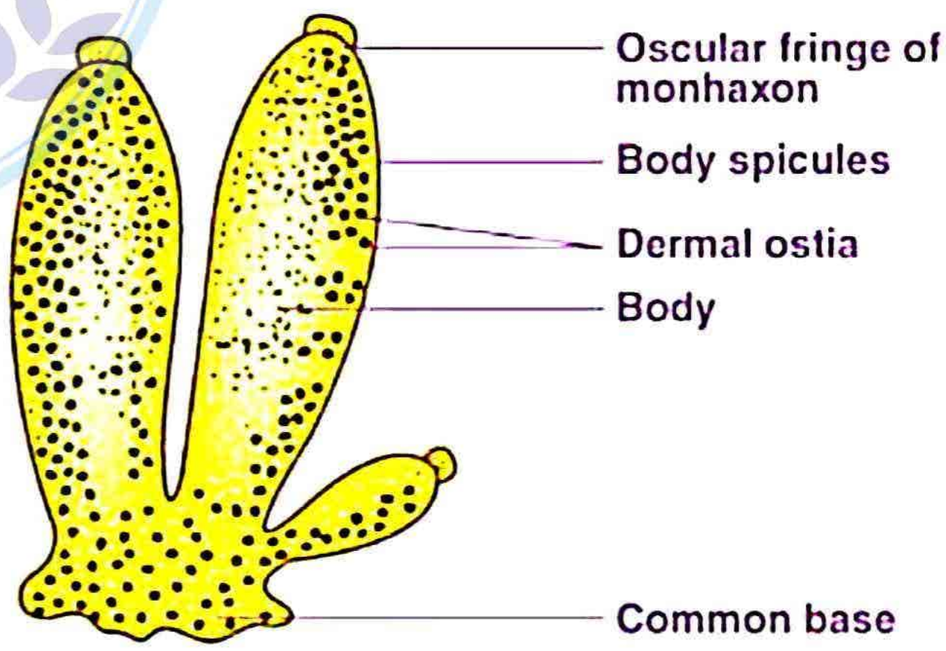
- Sponges show cellular differentiation but little or no coordination of cells to form tissues.
- They are mostly marine but few (about 150 species) are found in fresh water habitat.
- They are sessile i.e. living attached to rocks, coral and other hard surfaces.
- The body of poriferans is perforated by pores called ostia through which water enters the body and one or more large openings called oscula through which water leaves the body.
- Most of sponges contain following types of cell:

A. Pinacocytes: are contractile flattened cells forming the epidermis known as pinacoderm.

B. Porocytes: form pores of the body wall known as ostia.

C. Choanocytes: these are flagellated cells, form the internal lining of the body the choanoderm". These cells are prominently similar to the choano flagellates.

- The gelatinous mesenchyma is present in between pinacocytes and choanocytes which are made up of amoebocytes and spicules. Spicules constitute the skeleton of sponges. Spicule may be calcareous or siliceous.
- Body cavity is known as "Spongocoel".
- In sponges, reproduction is of both types i.e. asexual and sexual.
- Asexual reproduction is by means of Bud formation and or spore like Gemmules formation.
- Gemmule is a nutrient loaded amoeboid cell surrounded by a layer of epithelial cells. In unfavorable condition it becomes dormant and on the return of favorable condition it grows into a new sponge.
- Sexual reproduction is by means of sperm and ova formed by amoebocytes. The eggs retained just beneath the choanocytes where they are fertilized by sperm from another sponge brought in with the current of water.
- Fertilization is internal. After fertilization eggs develop into zygote. After cleavage, the larva escapes from the parent to the open sea as a free swimming "Amphiblastula larva". It finally becomes attached to the bottom by its anterior end.



Evolutionary adaptations in sponges:

- Sponges evolved from choanoflagellate protists that lived over 700 million years ago.
- **Digestion:** digestive system is absent in sponges. Sponges are filter feeder and digestion takes place within the cell i.e. intracellular digestion

- **Respiration:** gaseous exchange takes place by simple diffusion.
- **Excretion:** unnecessary substances removed by simple diffusion.
- **Transport:** in sponges substances (food) are transported from one place to another by diffusion.
- Nervous system: nervous system absent.

ECONOMIC IMPORTANCE:

Sponges with a skeleton of spongin fiber (protein) are of commercial value. These sponges are dried and used as a bathroom sponges. Sponge fishing and culture is common in the world.

PHYLUM CNIDARIA OR COELENTERATA:

General Characteristics of phylum Cnidaria:

- They are aquatic animals, mostly marine and few are fresh water forms. They are sedentary or free swimming and solitary or colonial.
- They have radially symmetrical body plan.
- Coelenterates are diploblastic having two germ layers, outer body wall is epidermis and the inner is gastrodermis (endoderm). In between the two layers lies the mesoglea, non-cellular jelly secreted by them. Cnidarians, due to their two layers body wall are termed as diploblastic animals.
- They have a central digestive cavity known as gastrovascular cavity or coelenteron. Thus, they are named as coelenterata.
- The development of enteron and primary network of nerve cells in the coelenterates is the first step towards the formation of organ system.
- They are carnivorous. With the help of stinging cells, they can kill the prey.
- The mouth is surrounded by a circle of tentacles which bear cnidoblasts or cnidocytes (stinging cells in the tentacles of a coelenterate). Thus, they are named as cnidarian.
- The Cnidarians are radially symmetrical and occur in two types of forms.

a) The polyp and b) The Medusa

a) Polyp:

The polyp like Cnidarians has a cylindrical body with a mouth directed upwards and surrounded by tentacles. The basal surface of the body is attached to the substratum.

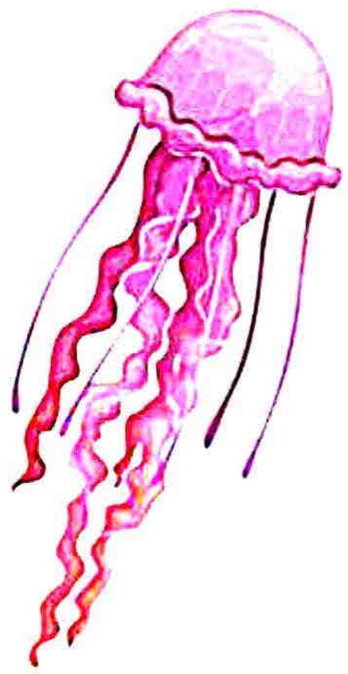
Examples; Hydra, Sea anemone and Corals.

b) Medusa:

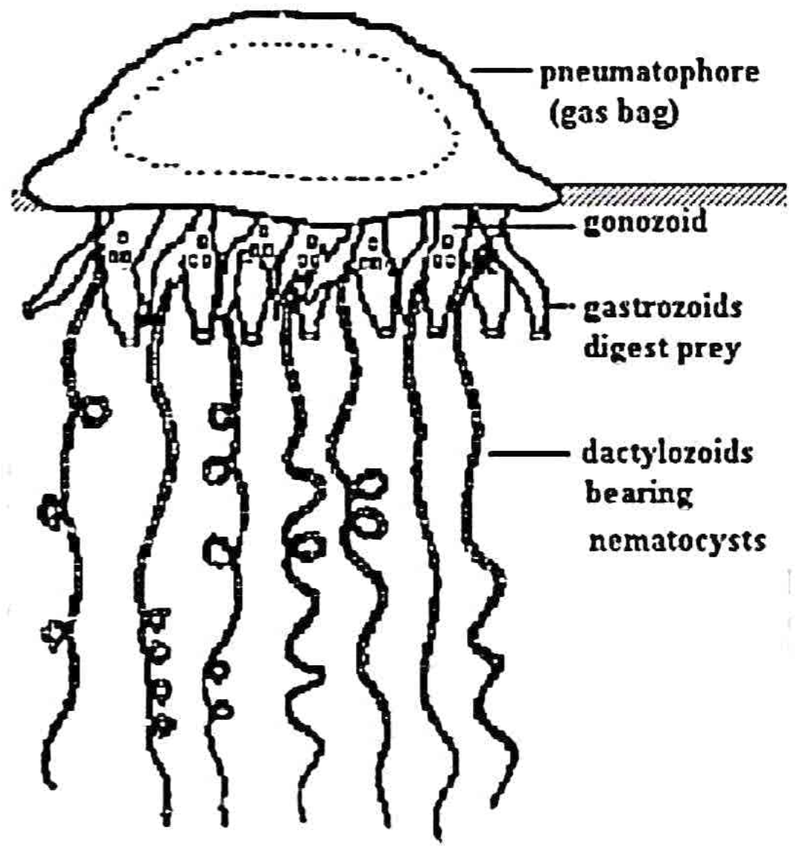
The medusa like Cnidarians is umbrella like in appearance. Their oral surface, bearing the mouth is directed downwards whereas the aboral surface is directed upward.

The medusoid Cnidarians are usually free swimming.

Example; Jelly fish.



9.37.6 Physalia, "Portuguese man-of-war"



• The Cnidarians reproduce by asexual as well as sexual methods. Polypoid Cnidarians possess a remarkable ability to regenerate.

(A) <u>Asexual Reproduction:</u>

A sexual reproduction takes place by budding and regeneration.

i. **<u>Budding:</u>**

Small outgrowth forms on the surface of body, that after separation develop into whole organism. E.g. Hydra.

ii. **<u>Regeneration:</u>**

Regeneration is the production of missing organ or part of the body. For example If the oral part of the body is lost the remaining part regenerates the new mouth and the whole of tentacles. E.g. polypoid cnidarians.

(B) **<u>Sexual Reproduction:</u>**

The sexual reproduction takes place through male or female gametes which are usually produced by different parents. The gametes develop in the interstitial cells and aggregate in gonads which are located either in the epidermis or in the gastrodermis. The fertilized egg gives rise to "Planula Larva".

<u>EVOLUTIONARY ADAPTATIONS OF CNIDARIAN:</u>

• Cnidarians have evolved from one of three evolutionary lines from protoctista and no one phylum evolved from cnidarians.

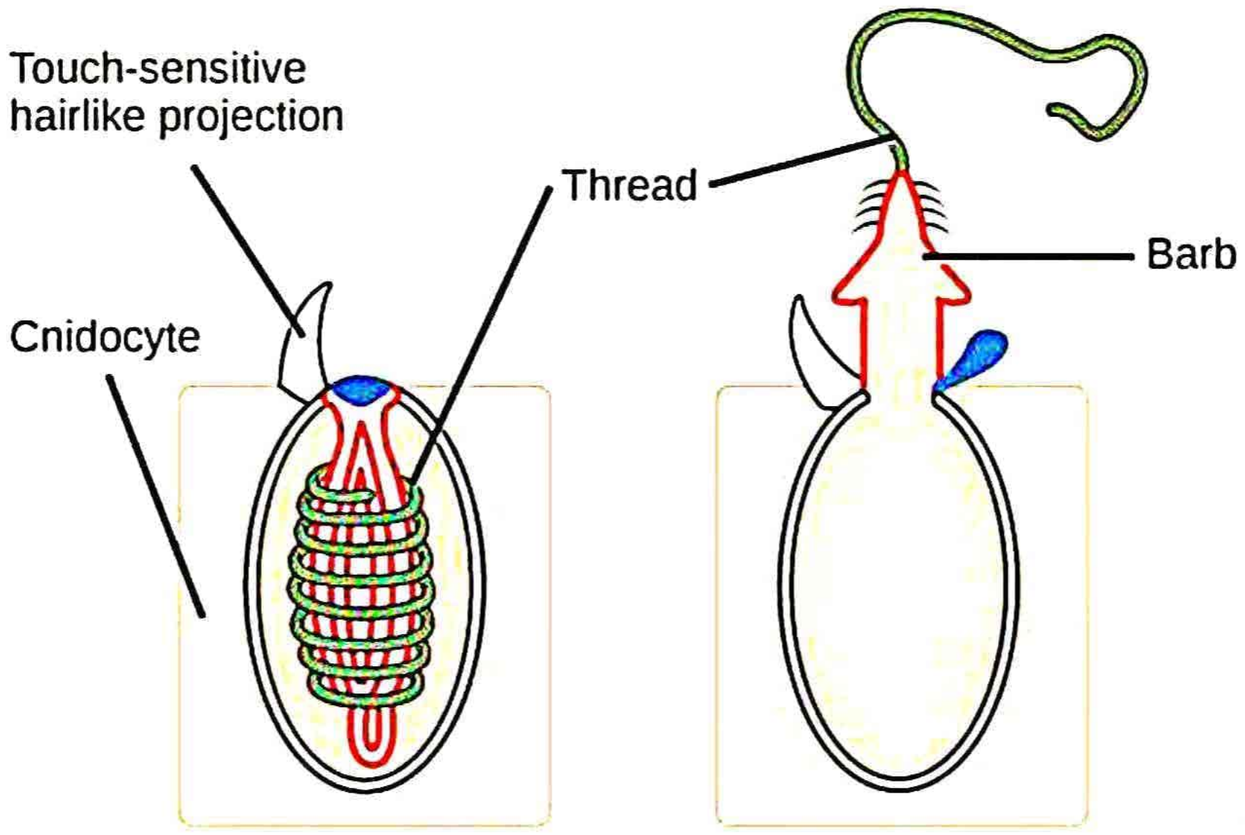
• **Digestion:** digestive system consist of coelenteron or gastrovascular cavity that opens to exterior through one opening that serves for both mouth and anus.

• **Respiration:** respiratory system absent, gases exchange through simple diffusion.

• **Excretion:** excretory system absent, nitrogenous waste substances removed through simple diffusion.

• **Transport:** special transporting system absent, gastrovascular cavity help in the transport of substances.

• **Nervous system:** not well developed, neurons organized into tissues nerve network.



(a) Nematocyst with stored thread and barb

(b) Nematocyst after firing

ECONOMIC IMPORTANCE OF CNIDARIA:

- Coral reefs are formed by the cnidarians that provide habitat for many marine species.
- Red corals are also used as jewelry and decorative items.
- Red corals (MARJAN) are also used as medicine by hakeem.

PHYLUM PLATYHELMINTHES (FLAT WORMS):

General characteristics of platyhelminthes

- Platyhelminthes body is dorsoventrally flattened.
- They are mostly parasitic and found in other higher animals but some animals are also free living.
- They are bilaterally symmetry, triploblastic and acoelomate.
- Body shape is generally worm like, ribbons like or leaf like.
- Flat worms are small to moderate in size and can vary from microscopic to 20 m in length.
- They have organs and organ system such as flame cell etc.
- They have head with a pair of eye spots that are used in light detection.
- Ventral epidermis has cilia that are used in the movement.
- Ventral surface bearing mouth and genital pores.
- Majority of animals are white or colorless, some derive color from ingested food such as green and brown color.
- Body is covered by cuticle or ciliated epidermis.
- Hard parts consist of cuticle, spines, and hooks etc.
- Platyhelminthes can reproduce by both asexual and sexual method. They are hermaphrodite so, cross fertilization as well as self-fertilization is present.

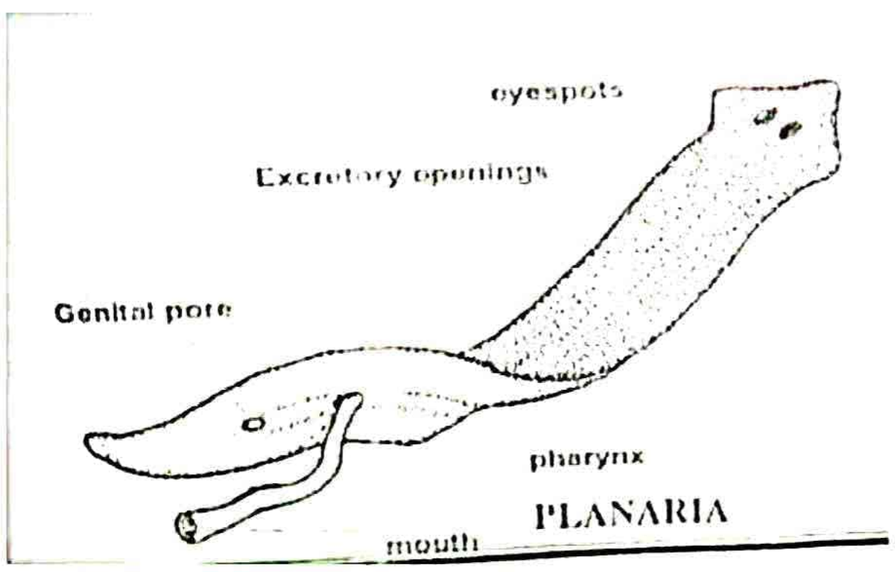
a) Asexual reproduction:

By regeneration, takes place in free living platyhelminthes.

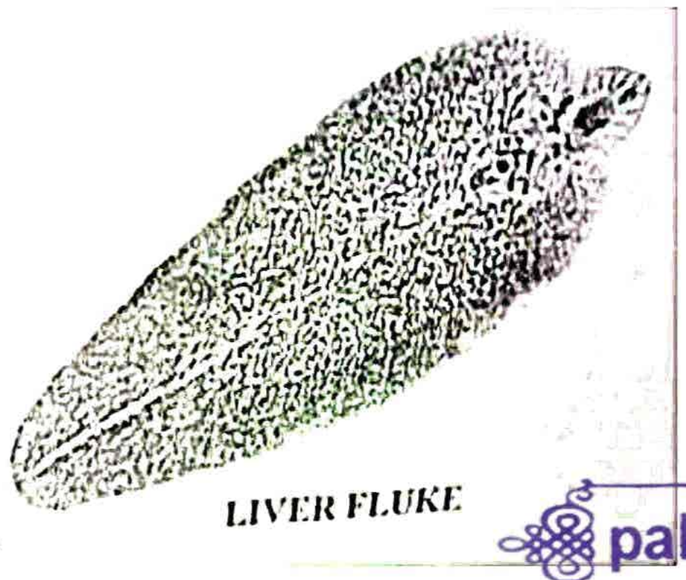
b) Sexual reproduction:

By the fusion of male and female gamete.

EXAMPLES: Planaria, Liver flukes, Schistosoma and Taenia Solium etc.



PLANARIA



LIVER FLUKE

EVOLUTIONARY ADAPTATIONS:

• Flatworms and cnidarians are evolved from the common ancestors. They look different from each other but they share some common characters such as gastrovascular cavity.

• **Digestion:** Digestive system is poorly developed, food is digested in the branched gastrovascular cavity. Branched gastrovascular cavity helped in the supply of food to body cells.

• **Respiration:** Flatworms lack a respiratory system, gaseous exchange occurs through diffusion.

• **Excretion:** primitive type excretory system present in which excretion is controlled by flame cells located in Protonephridia.

• **Transport:** circulatory system is absent, substances are circulated through absorption.

• **Nervous system:** They have primitive cephalized nervous system consists of a pair of cerebral ganglion or brain and one pairs of longitudinal nerve cords, connected to each other by transverse commissures (A tract of nerve fibers passing from one side to the other) and look like ladder.

EVOLUTIONARY ADAPTATIONS IN ANNELIDS:

• **Digestion:** Alimentary canal is straight tube like extending from mouth to anus i.e. complete digestive tract.

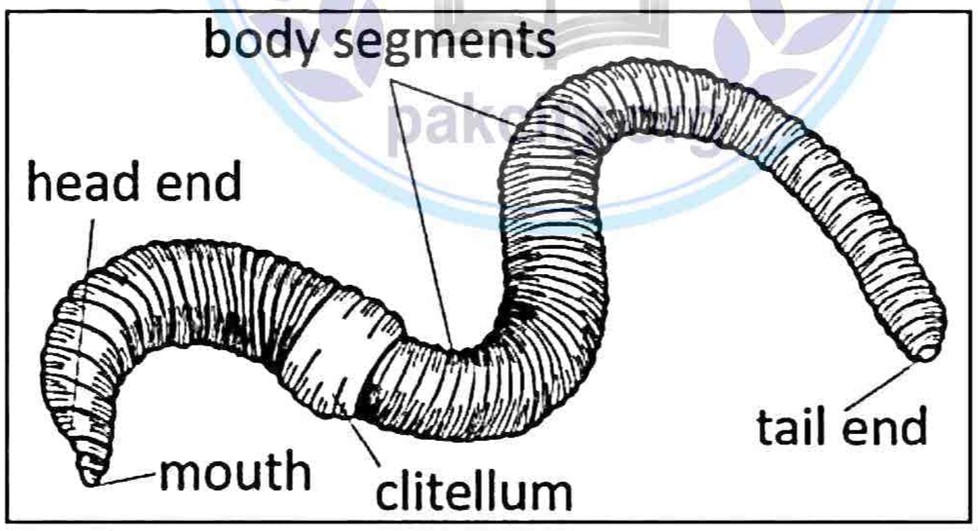
• **Respiration:** Respiration is either through skin or through gills and takes place through diffusion.

• **Transport:** Circulatory system is of closed type, blood is red due to haemoglobin.

• **Excretion:** Excretory organs are Metanephridia usually one pair in each segment.

• **Nervous system:** consists of nerve ring and fongitudinal double ventral nerve cord with segmental ganglia.

Example: Neries. Earthworm and Leeches etc.



EARTH WORM

ECONOMIC IMPORTANCE OF ANNELIDS:

i. Earthworms increase the fertility of soil by physically overturning it and adding nitrogenous bases in it.

ii. It is used in preparation of many fancy medicines.

Iii. It is used in laboratories for dissection and research.

Iv. It is used as a fish bait.
E.g. Pheritema (earthworm)

PHYLUM MOLLUSCA (SHELLED ANIMALS):

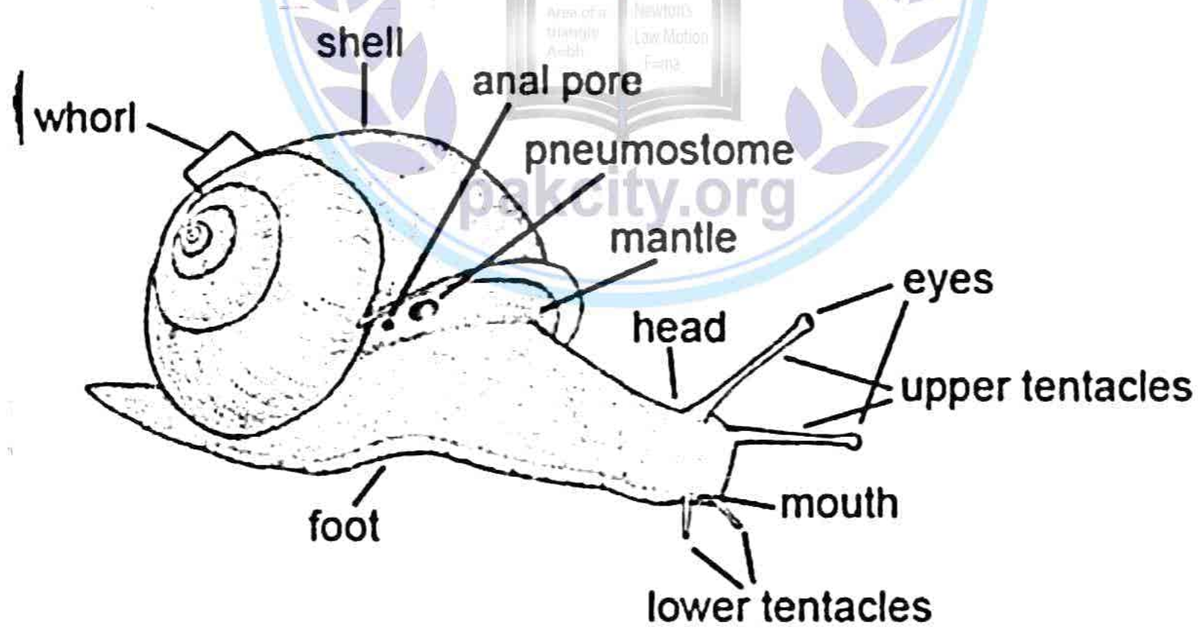
GENERAL CHARACTERS OF PHYLUM MOLLUSCA:

- Phylum Mollusca is the second largest phylum of the animal kingdom.
- Most of mollusks are aquatic while slugs are terrestrial,
- The body is soft, un-segmented and consists of head, foot, mantle and visceral mass.
- Visceral mass consist of internal organs.
- Body is commonly protected by an exoskeleton which is calcareous shell of one or more pieces, secreted by Mantle.
- Shell may be one-piece which is spirally coiled, two pieces (valves) hinged together or shell is reduced and overgrown by mantle in Squids and Cuttle fish and completely absent in Octopus.
- Mollusks are triploblastic soft bodied, basically bilaterally symmetrical shelled coelomates.
- Many species of mollusks possess radulla which is a tongue like structure that can be protruded out to scrape, tear or pull food.
- Mollusks may have separate sexes or they may be hermaphrodite.
- Fertilization is either external or internal.
- The development is either direct or with metamorphosis through larval stage called Trochophore, veliger and glochidium larva.

EVOLUTIONARY ADAPTATIONS IN MOLLUSCS:

- **Digestion:** Digestive system is simple with anterior mouth and posterior anus but in gastropods and cephalopods intestine becomes U-shaped bringing the anus to anterior position.
- **Respiration**: The respiration is by means of gills or lungs.
- **Transport:** Circulatory system is of open type except in cephalopods.
- **Excretion:** Excretory system consists of a pair of metanephridia which communicate to exterior through nephridiopore.
- **Nervous system:** nervous system consists of paired cerebral and visceral ganglion.

Examples: Snails, Mussels, Oysters, Nautilus, Squids (largest invertebrate), Cuttle fish, Octopus etc.



ECONOMIC IMPORTANCE:

a) Mollusks are important in paleontological studies.
b) Mollusks are used as a source of food such as oysters, clams, scallops, sea mussels and shell fish.
c) Oysters produce pearl which is used in pearl jewelry formation.
d) They are used as a decorative item such as shell lamp of Trochus sps.
e) The shells of various mollusks have been used as a form of currency such as cowries.

f) Cockle clam is supposed to be good for heart trouble. Raw mollusks can be used for sore throat and cough. Extract of clam's shell are the growth inhibitors of cancer in mice.

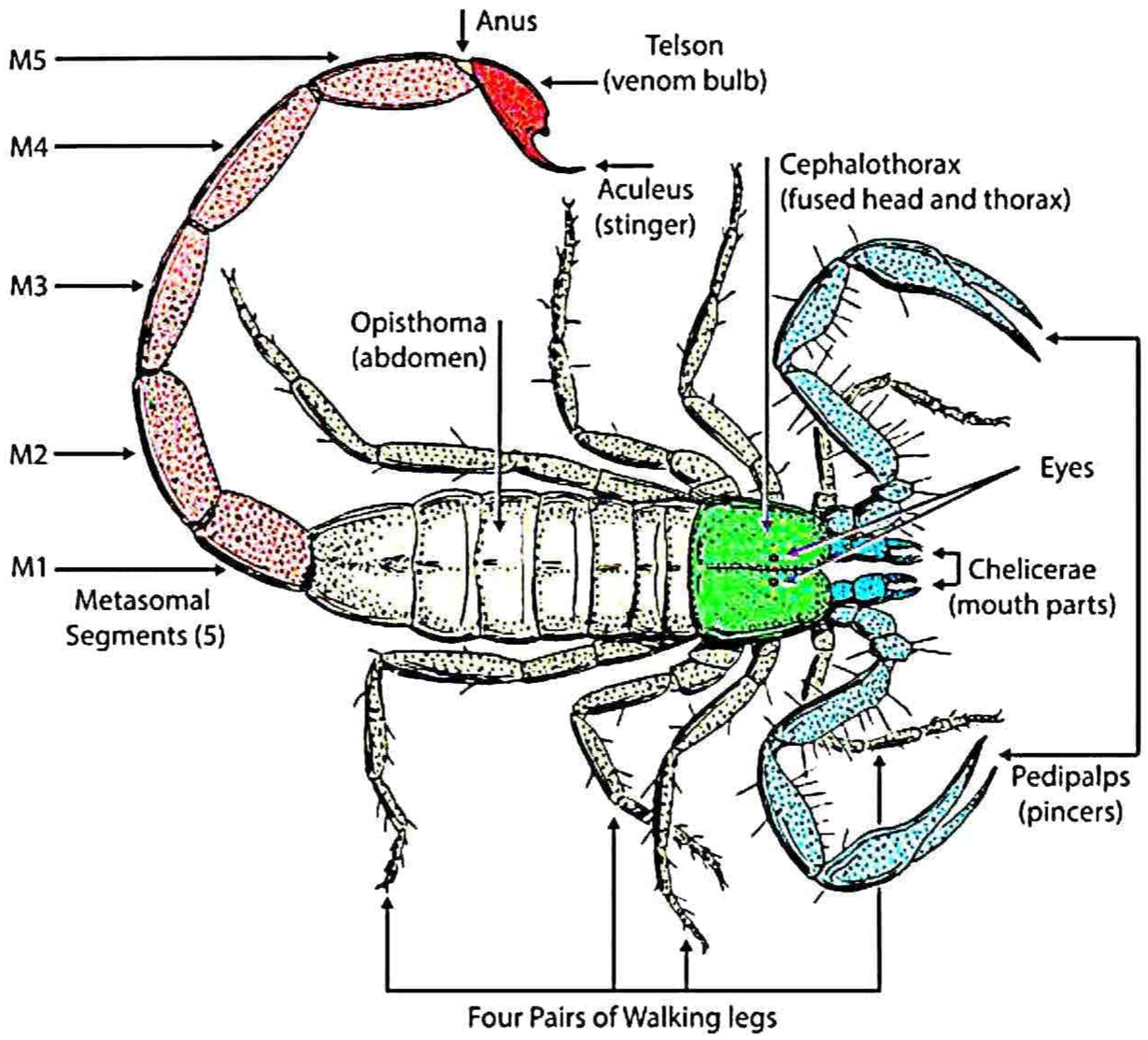
PHYLUM ARTHROPODA (JOINTED APPENDAGES ANIMALS):

GENERAL CHARACTERS OF ARTHROPODA:

- Arthropoda is the largest Phylum of the animal kingdom including 10, 00000 species of different types of animals.
- The word Arthropods is derived from Greek Arthros - Jointed and Podos - Foot.
- Arthropoda are triploblastic, bilaterally symmetrical, metamerically segmente coelomate metazoans.
- They are widely distributed in every place of the world. Arthropods are adapted to aerial, aquatic, terrestrial and parasitic environment.
- Their body is covered by cuticle which is the mixture of protein and chitin (Polysaccharide).
- Exoskeleton protects the body and provides the site of muscles attachment that help in the movement.
- They possess segmented body and paired jointed appendages.
- Body is divided into head, thorax and abdomen. The head is well developed with compound eyes and sensory organs.
- Sexes are generally separate and sexual dimorphism is often exhibited by several forms.
- Fertilization is external in aquatic habitat and internal in terres I habitat.
- Development is usually indirect through the larval stage,
- Oviparous except scorpion which is viviparous.

EVOLUTIONARY ADAPTATION IN ARTHROPODS:

- **Digestion:** Digestive tract is complete with mouth and anus and mouth is supported by jaws.
- **Respiration:** through body surface and gills in aquatic forms, and by trachea or book lungs in terrestrial forms.
- **Transport:** is of open type with dorsal heart and arteries but without capillaries. Blood (hemolymph) passes through hemocoel.
- **Excretion:** takes place by green gland in aquatic environment and through Malpighian tubules in terrestrial environment.
- **Nervous system:** consists of dorsal anterior nerve ring (brain) and a double ventral nerve cord.
- **Example:** Scorpion, Prawn, Mosquito, Honey bee and House Fly.



ECONOMIC IMPORTANCE OF ARTHROPODS:

BENEFICIAL ARTHROPODS:

i. Arthropods are important source of food for many animals and plants.
ii. Apis mellifera (honey bees) produce honey and give wax.
iii. Insects bring about the cross-pollination.
iv. Bombyx and Eupterote are silk-moths and produce silk.
V. The larvae of Lucilla (green bottle fly) and Pharmia are used in wound healing of bones.
vi. Some insects feed upon harmful insects.
vii. Some insects are Scavengers.

HARMFUL ARTHROPODS:

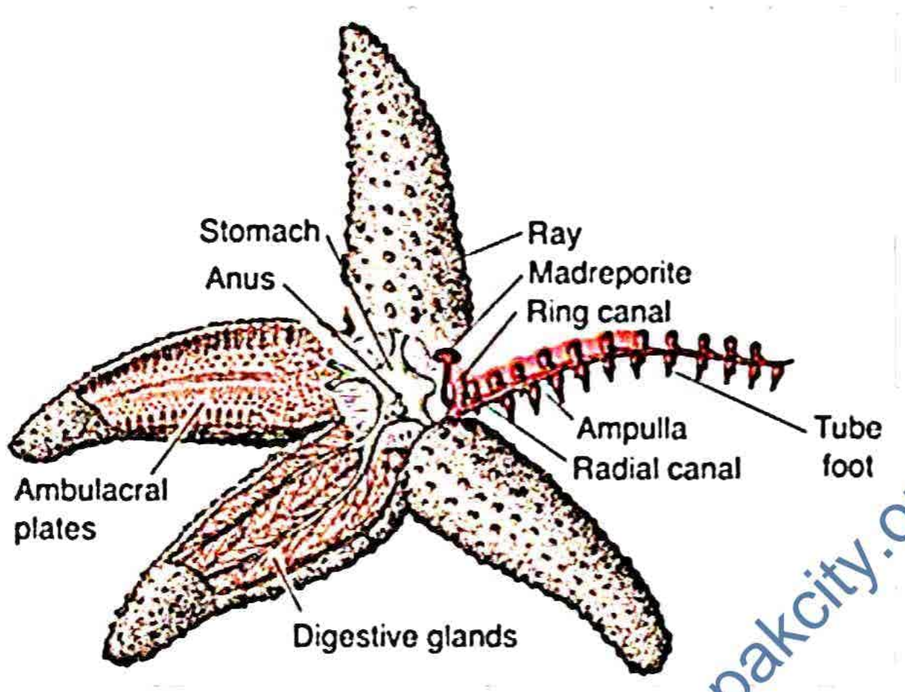
i. Many types of mosquitoes, flies, fleas, lice and bugs transmit diseases to man and animals such as malaria, cholera, plague and dysentery?"
ii. Human food is spoiled by cockroaches, ants and flies.
iii. Tinea and Teniola are cloth-moths and destroy cloths.
iv. Tenebrio is mealworm. They eat meal, flour and grains.
V. Lepisma (silver fish) destroy books.
Vi. Termites (Coptotermes formosanus) destroy books and wood.
vii. Many insects injurious to crops e.g. Tree hoppers, Leaf hoppers, wooly Aphids, White flies and bugs.

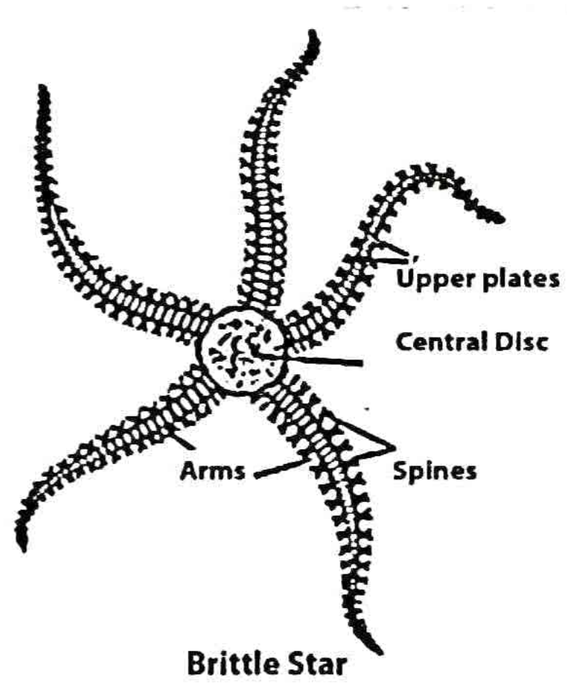
GENERAL CHARACTERS OF PHYLUM ECHINODERMATA:

• Echino means spine and dermatan means skin. Spines may be long or short. Spines are characteristic feature of this phylum.
• The echinoderms are exclusively marine, carnivorous, filter feeder and benthonic.
• Echinoderms are triploblastic, coelomates and deuterostomes.
• They are radially symmetrical as adults but its larva is bilaterally symmetrical.
• Head and brain is absent in adult echinoderms.

• Surface of the body is rough and body wall consists of an outer epidermis that stretches over endoskeleton.
• Endoskeleton consists of closely fitted fixed or moveable plates forming shell usually called theca may be composed of calcareous ossicles and with spines.
• Calcareous plates are perforated over certain areas through which tube feet projec out. helps in the locomotion, respiration
• Tube feet are part of water vascular system that and food capture.
• Sexes are usually separate, reproduction is usually sexual, fertilization is external, and development is indirect and passes through larval stage of Bipinnaria.

Examples: Star Fish, Brittle stars, Sea urchins, Sea-cucumbers, Sand-Dollar, Sea-lilies and Feather stars.





Brittle Star

EVOLUTIONARY ADAPTATIONS IN ECHINODERMS:

• **Digestion:** Alimentary tract is usually coiled and complete i.e. having mouth on lower side and anus on upper side.
• **Respiration:** takes place through dermal branchia.
• **Transport:** Circulatory system is open type having no heart and pigment.
• **Excretion:** Excretory system is missing in echinoderms.
• **Nervous system:** is primitive, consists of two nerve rings and ganglionated nerve cord.

ECONOMIC IMPORTANCE OF ECHINODERMS:

• Echinoderms are important seafloor scavengers.
• Sea urchins help in shoreline erosion of the rocks.

PHYLUM HEMICHORDATA:

• It is a small group of animals which include about 90 species.
• Hemichordates are worm like, soft bodied, un-segmented and bilaterally symmetrical, bilaterally symmetrical tubicolous coelomates.
• They may be solitary or colonial.
• Body is cylindrical or vase shaped divided into three parts proboscis, collar and trunk.
• Sexes are separate and fertilization is external. Development is direct or indirect and passes through larva stage called tornaria larva.

EVOLUTIONARY ADAPTATIONS IN HEMICHORDATES:

• **Digestion:** complete with mouth and anus.
• **Transport:** Circulatory system is open type.

• **Nervous system:** consists of primitive network of nerve fibrils. A dorsal and a ventral nerve cord are present. Nervous tissues are embedded in epidermis.
• Respiration: Respiratory organ is large number of gills pouches which open internally into pharynx by gill pores and to outside by gills slits. Numerous paired gill slits are present.
• **Excretion:** takes place through proboscis gland. Near buccal diverticulum blind tubular projections forms Glomerulus.
Examples: Balanoglossus (1.5 M long), Saccoglossus, Acorn worm etc.

GENERAL CHARACTERS OF PHYLUM CHORDATA:

• Chordates are triploblastic, bilaterally symmetrical, deuterostoms coelomates organisms.
• They have well developed coelom in which internal organs suspended.
• They reproduce sexually.
• All chordates have following four basic characters.

FUNDAMENTAL CHARACTERS:

The chordate animals at some time in their life history exhibit the following fundamental characters.

1. NOTOCHORD:

It is an elastic, solid, skeletal rod lying below the nerve cord and above the alimentary canal It serves as a primitive internal skeleton and provides the site for muscles attachment.

2. NERVE CORD:

It is a dorsal hollow, fluid filled string lies above the notochord and outside the coelom. Is anterior end expanded which later becomes brain.

3. GILL SLITS:

These are paired openings leading from the Pharynx to the exterior. Gill slits appear during the development of every chordate, but in aquatic forms they forms gills for respiration while terrestrial chordates never breathe by gills so, gill slits disappear.

4. POST ANAL TAIL:

All chordates embryos have post anal tail.

CLASSIFICATION OF PHYLUM CHORDATA:

Phylum chordata is divided into two groups which are invertebrate chordates and vertebrate chordates.

INVERTEBRATE CHORDATES/ACRANIATA/PROTOCHORDATA:

• They are first or simple chordates.
• Brain box (Cranium) is absent and hence brain is not prominent.
• Notochord does not transform into vertebral column.
• This group is further divided into two sub-phyla, which are as follows:
a) Sub-Phylum Urochordata (Notochord in tail).
b) Sub-Phylum Cephalochordata (Notochord head to tail).

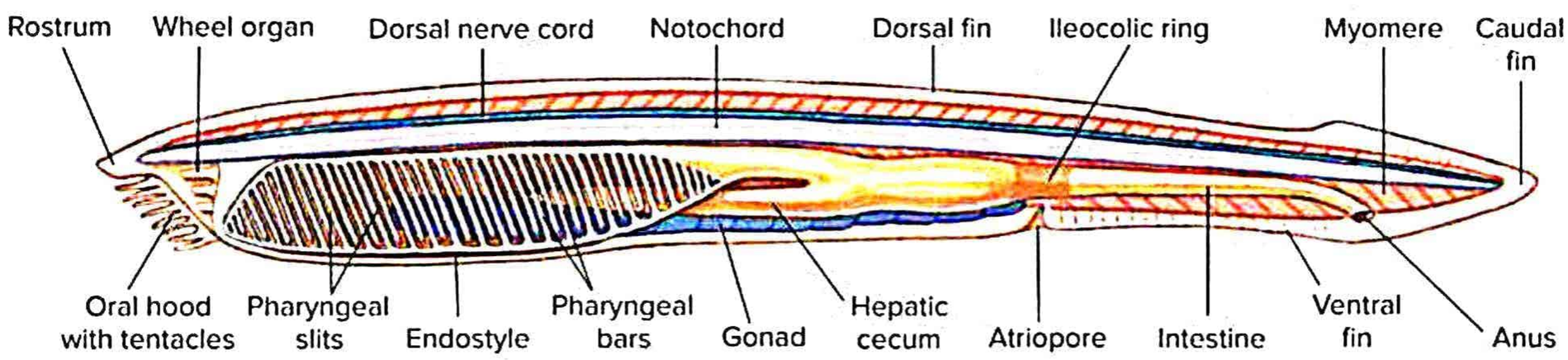
a) SUB-PHYLUM UROCHORDATA (NOTOCHORD IN TAIL):

• They are also known as Tunicates because their body is enclosed in a sac called Tunic.
• All members are marine and sessile.

• Urochordates body possesses two openings an incurrent or buccal siphon and an excurrent or Atrial siphon, for exchange of gases, food and waste material.
• Its larva is motile and show chordate characters
E.g. Ascidia, Herdmania etc.

b) SUB-PHYLUM CEPHALOCHORDATA (NOTOCHORD FROM HEAD TO TAIL):

• This is a small group of motile marine animals, with pointed ends body.
• Usually live buried in shallow waters sand with anterior end protruded out.
• They are filter feeder organisms.
E.g: Branchiostoma (Amphioxus) etc.



Amphioxus

2. VERTEBRATE CHORDATES/CRANIATES:

• In these chordates brain is protected inside a skeletal brain box called "CRANIUM.
• Also, known as "Vertebrates" because notochord is replaced by a vertebral column.
• They have advance characters hence are successful land vertebrates such as paired appendages.
• Appendages modify according to the mode of existence such as fins, legs and wings.
• Fins are used for swimming in fishes, legs are used for walking in terrestrial mode of life and wings are used for flight in insects and birds.
• They are large organisms, having complex nervous system.

DIFFERENCE BETWEEN ACRANIATA AND CRANIATA:

Acraniata	Craniata
They are simple chordates.	They are complex and advanced chordates.
Brain box absent.	Brain box present.
Brain not prominent in acraniates.	Brain prominent in craniates.
Notochord doesn't transform into vertebral column.	Notochord transform into vertebral column.
They are also known protochordates.	They are also known as vertebrates.
Example; Ascidia, Amphioxus.	Example; hag fish, lamprey.

CLASSIFICATION OF VERTEBRATES:

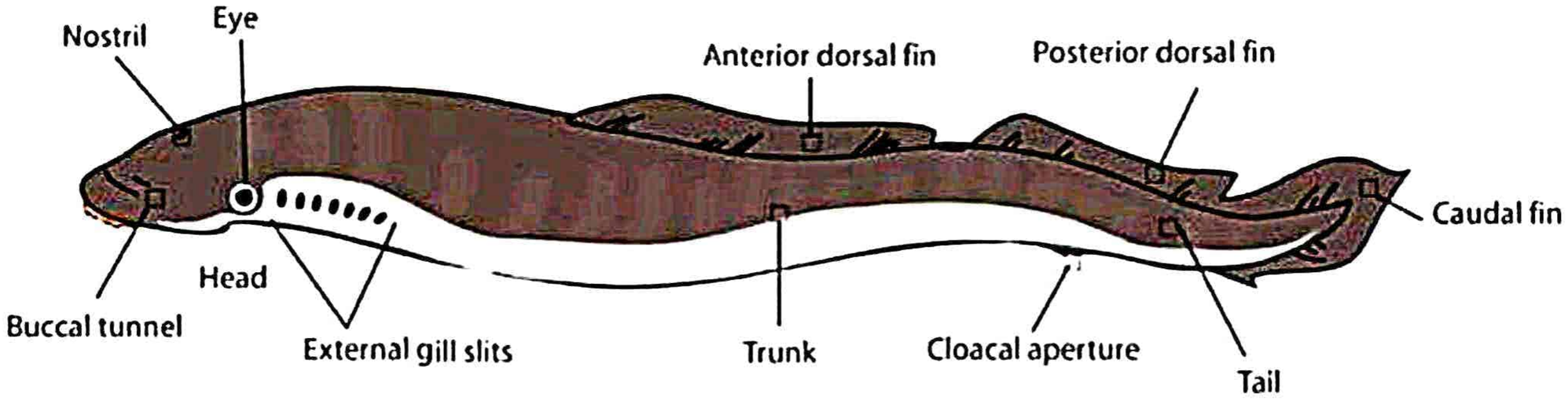
This group is sub-divided into seven major classes which are as follows:

1) CLASS JAWLESS FISH (AGNATHA):

•This is a small group of marine vertebrates.
• Superficially they resemble the fish but lack the jaw so they are often, known as Jawless Fishes.
• They have rounded suctorial mouth with many rings of teeth hence called cyclostomes.

- Paired fins and scales on body are absent. Unpaired fins located on the midline of the body.
- Seven pairs of round gill slits present on the anterior lateral side.
- They are usually parasitic in nature.

E.g. Hagfish and Lamprey.

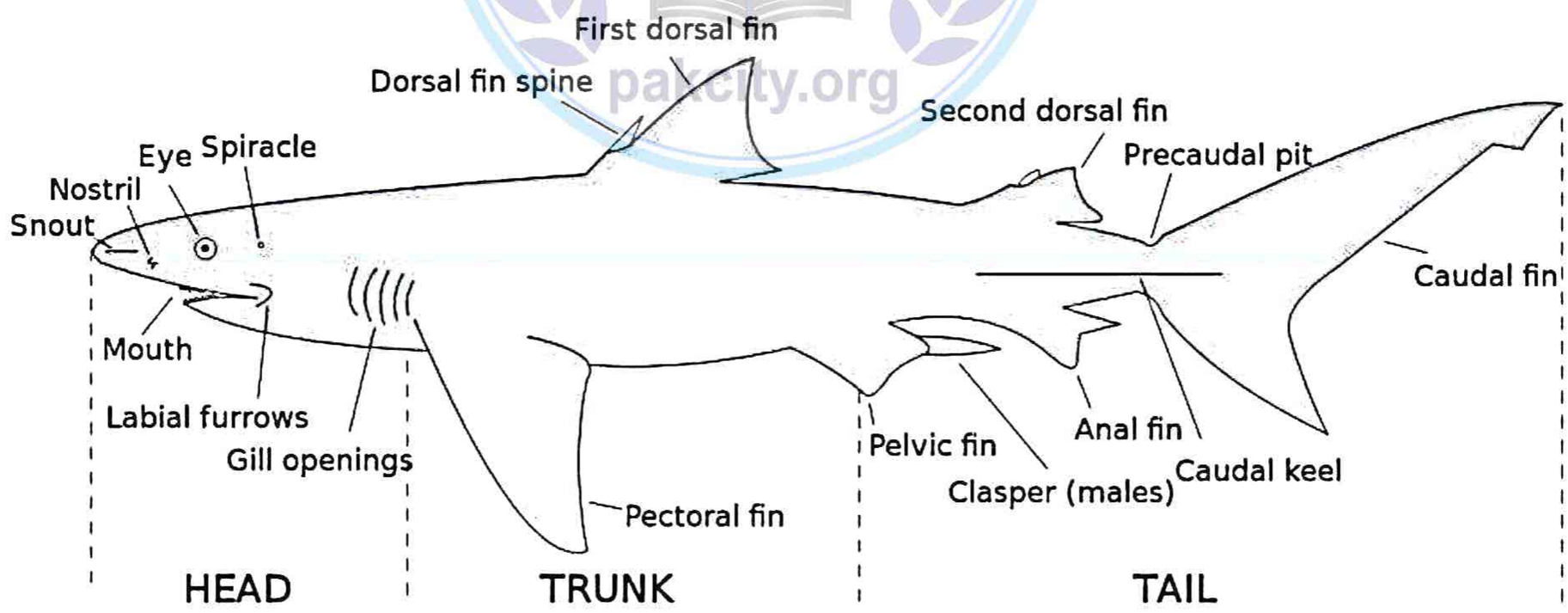


EVOLUTIONARY ADAPTATIONS IN AGNATHA:

- Mouth is sucker like and surrounded by teeth.
- Teeth are pincer like present around the tongue that helps in the ingestion of preys soft organs.
- They respire through gill openings.

2) CLASS CARTILAGINOUS FISHES (CHONDRICHTHYES):

i. Class Elasmobronchi is alternate name of this class.
ii. They usually include marine fishes with endoskeleton of cartilage.
iii. Skin of cartilage fishes contains sharp tiny enamel (hard, glossy substance that covers the scale) coated denticles called Placoid Scales, which form exoskeleton.
Iv. Mouth is ventral in position.
V. Tail fin is Heterocercal.
vi. Five exposed gill slits, which are not covered over by a gill cover.
Examples: Skates, Sharks, Rays and Scoliodon (Dog Fish)- a small Shark etc.



SHARK

3) CLASS BONY FISHES (OSTEICHTHYES):

i. Alternate name is Teleostomi, which is the largest class of chordates.
ii. They include marine and fresh water fishes with endoskeleton of bone.
iii. Skin of bony fishes contains Cycloid and Ctenoid scales which form exoskeleton.
iv. Mouth is present at anterior tip of head.
V. Tail fin is usually Homocercal or Diphycercal.
vi. Gills are covered over on each side by a gill cover called Operculum.
Examples: Eel, Sea-Horse, Flying Fish, Globe Fish etc.

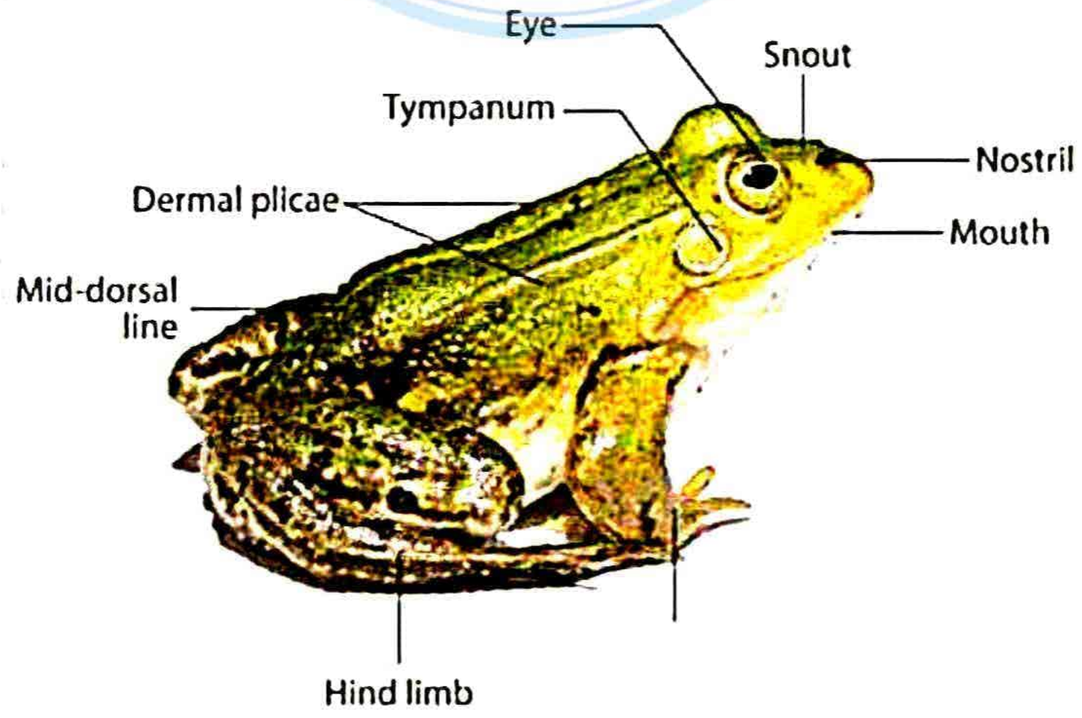
DIFFERENCE BETWEEN CHONDRICHTHYES AND OSTEICHTHYES

CHONDRICHTHYES	OSTEICTHYES
They are marine fishes with cartilaginous endoskeleton.	They are marine and fresh water fishes with bony endoskeleton.
Exoskeleton consists of sharp tiny enamel coated denticles known as placoid scale.	Exoskeleton consists of cycloid and ctenoid scales.
Mouth is ventral.	Mouth is at the tip.
Tail fin is heterocoercal.	Tail fin homocoercal or diphycoercal.
Gills slits are five, which are not covered by operculum.	Gills slits are covered by operculum.

4- CLASS AMPHIBIA

- They can live at both places water and land.
- They remain close to water by developing lungs and limbs.
- Limbs are modified for different modes of movement such as crawling in salamander and diving in frogs.
- They have close type of circulatory system and show three chambered heart with two atria and one ventricle.
- Breathing is mostly by means of skin, lung , and by lining of buccal cavity.
- They lack any sort of exoskeleton and their skin is soft, moist and permeable that help in gaseous exchange.
- They are cold blooded (poikilotherms), cannot maintain their body temperature at constant level hence their body temperature vary with environment.
- Due to cold blooded nature and lack of exoskeleton they cannot tolerate extreme temperature and hence, they adopt Hibernation and Aestivation mechanism.

Examples: Frog, Toads, Salamanders, Newts, Mudpuppies etc.

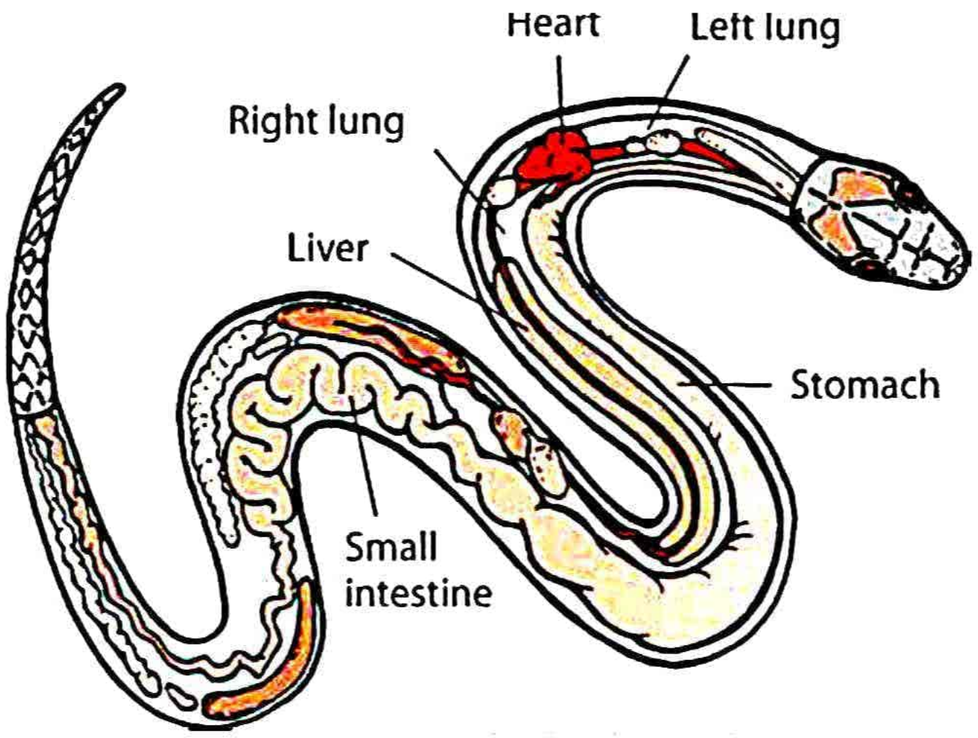


5) CLASS REPTILIA:

• The word reptile comes from Latin means 'one who crawl and creeps'.
• Reptiles evolved from amphibian about 250 million years ago. In Mesozoic era dinosaurs reptiles dominate the planet and lived up to 150 million years.
• All reptiles are oviparous and cold-blooded animals.
• Reptiles are generally well adapted to live on land, in semi-dry, completely dry and even desert habitat, while some found in aquatic habitat.
• They possess dry skin which is covered with epidermal scales that protect the animal's body and prevent the water loss.
• They reproduce sexually and fertilization is internal in most reptiles.
• Egg is large and covered by shell that protect embryo from water loss.
• Embryo is enclosed in amnion membrane hence they are also known as amniotes.
• Respiration takes place exclusively through lungs.
• Excretion takes place through meta-nephric kidneys.
• Heart is three chambered including two auricles and one incompletely divided ventricle except crocodiles.
• Limbs and skeleton is built on the same plane as that of amphibians, but is much stronger to support their body weight.
Examples: Alligators, Crocodile, Snake, Turtle and Gecko etc.

c) CLASS AVES (BIRDS):

• Birds and reptiles share some features such as amniotic eggs and scales on legs so, we can declare that birds evolved from a group of dinosaurs that ruled the Mesozoic ecosystems.
• A bird can be defined as a feather covered bipedal flying vertebrate possessing wings.
• Feathers differentiate birds from all other vertebrates but some species lack feathers such as penguin.
• Birds are warm blooded vertebrates, and they can manage internal body temperature by physiological and behavioral mechanism.
• Feathers can also play an important role in the thermoregulation of birds.
• High metabolic rate is the demand of continuous energy and oxygen requirement in birds.
• Fore limbs modified into wings.
• Bones are pneumatic and thin.
• Beak replaces teeth in birds.
• Circulatory system consists of four chambered heart with two auricles and two ventricles.
• Lungs of birds are small, spongy and in contact with many air sacs.
• Digestive system of birds is compact but can house large quantity of food.
• Syrinx or sound-producing organ is found in no other vertebrate except the birds.
• Birds are oviparous, eggs are large in size and covered by shell.
• Example: Tortoise, Turtle, Lizards, Snake, Crocodiles and Alligators.



SUB-CLASSES OF AVES:

I) SUB CLASS RATITAE (FLIGHTLESS BIRDS):

- Large size and heavy weight.
- Wings vestigial or rudimentary.
- Flight muscles are poorly developing.
- They have a flat sternum without keel.
- The distribution of these birds is restricted to few areas of the World.

E.g. Ostrich , Rhea, Emu, Cassowary, Kiwi and Penguin.

OSTRICH

ii) SUB-CLASS CARINATAE (FREE FLYING BIRDS)

> Small size and light weight.

> Their wings are highly developed and feathers with interlocking system.

> Flight muscles are highly developed and strong.

> They possess sternum with a crest like keel to accommodate the highly developed pectoral flight muscles.

> The flying birds are distributed all around the World.

E.g. Sparrow, Pigeons, Myna, Bulbul, Hoopoes, Crow, Doves, Parrots, Fowls, Cuckoo and Ducks etc.

D) CLASS MAMMALIA:

- The word "mammal" is derived from the mamma which means "teat" or mammary gland.
- Mammals evolved about 250 mya and become dominant after dinosaurs extinction around 70 mya.
- Mammals can maintain a high body temperature, heat is generated by high metabolic rate of their body.

- Respiratory and circulatory system is well developed which support the high metabolic rate.
- A thick muscular septum the Diaphragm is present between abdom and thoracic cavity.
- Hairs on body and fats under the skin regulate the body heat.
- Embryo is protected inside the uterus except monotremes.
- Mammals give birth to young ones (Viviparous), except Prototherians that lay eggs (oviparous).
- Heart is four-chambered and RBCs are non-nucleated.
- Kidney is metanephrous.

OUTWARD FEATURE:

- All mammals possess hair on skin.
- Sweat glands and sebaceous glands are present on skin.
- Mammary glands secrete milk in females.
- External ears (Ear Pinna) are present.
- Teeth are heterodont i.e, not uniform. The different types of teeth are Incisors, Canine, Premolars, Molars.

CLASSIFICATION OF CLASS MAMMALIA:

Mammals are divided into three sub-classes, prototheria, metatheria and eutheria.

1. SUB-CLASS PROTOTHERIA:

i. Includes the egg laying mammals (oviparous).
ii. Mammary glands without nipples.
iii. Testes inside abdomen.
Iv. Ear pinnae absent.
V. Eggs are macrolecithal.
Vi . Toothless but present in childhood (monophyodont).
Examples; Ornithrhynchus (Duck-billed platypus), Echidna (Spiny anteater).

2. SUB-CLASS METATHERIA:

i. Metatherians includes pouch or marsupium in its abdomen.
ii. Also known as Marsupial mammals.
iii. Viviparous.
iv. Young ones born immature, complete development inside the marsupium.
v. Mammary glands with nipples open in marsupium.
vi. Ear pinnae present.
vii. Eggs are macrolecithal.
viii. Testes are extra abdominal.
ix. Toothed but monophyodont.
Examples; Macropus (Kangaroo), Koala Bear and Didelphus (Opossums) etc.

3. SUB-CLASS EUTHERIA:

i. Includes true placental mammals.
ii. Viviparous.
iii. Mammary glands with nipples,
iv. Ear pinnae present,
V. Testes extra abdominal,
Vi. Eggs alecithal.
vii. Embryo completes its development inside uterus by forming placenta connection.
Examples, Monkey, Cow, Elephant, Cat, Dog, Bat, Whale, Zebra and Human being etc.

DIFFERENTIATE B/W POIKILOTHERMS & HOMOIOTHERMS

POIKILOTHERMS	HOMOIOTHERMS
These are cold-blooded animals i.c. their body temperature is changed according to their environment.	They are warm-blooded animals i.e. their body temperature remains constant.
They show hibernation during winter season.	They do not show hibernation during winter season.
They show aestivation during summer season.	They do not show aestivation during summer season
Their body is either smooth or covered by scales.	Their body is covered by feather or hairs.
E.g. Fishes, Amphibians, Reptiles.	E.g. Birds, Mammals.

DIFFERENTIATE B/W CLASS RATITAE & CLASS CARINATAE

CLASS RATITAE	CLASS CARINATAE
These are non-flying birds.	These are flying birds.
They are big-sized, heavy birds.	They are small-sized with light weight.
Their wings are vestigial or reduced and functionless	Their wings are highly-developed.
Their sternum is flat without keel.	Their sternum has a crest like keel to support the flight muscles.
Their flight-muscles are poorly developed.	Their flight muscles are well developed.

DIFFERENTIATE B/W ACRANIATA & CRANIATA

ACRANIATA	CRANIATA
They are commonly called protochord.	They are commonly called choradata or vertebrates.
The cranium is absent.	The cranium is present.
The brain is not prominent.	The brain is prominent.
Their notochord does not change into vertebral column.	Their notochord change into vertebral column.
E.g. are tunicate and amphioxus.	E.g. are lamprey, fishes, reptiles etc.

DIFFERENTIATE BAY POLYP AND MEDUSA

POLYP	MEDUSA
Fixed, rarely, free found near water attached to rock.	Free swimming found in water.
Body is cylindrical with a long stalk.	Body is umbrella shaped with reduced stalk.
Sense organs are absent.	Sense organs are present.
Velum is absent.	Velum is present.
Concerned with asexual reproduction.	Concerned with sexual reproduction.
E.g. is hydra.	E.g. is jelly fish.

DIFFERENTIATE B/W OVIPAROUS AND VIVIPAROUS

OVIPAROUS	VIVIPAROUS
Female lay fertile or unfertile eggs.	Female give birth to young ones.
The development of zygote take place outside the female body.	The development of zygote take place inside the body of female.

Female lay egg in safe places in environment but chances of survival is less.	Female lay the young ones and chances of survival i more.
E.g. are most of reptiles, egg laying mammals.	E.g. all mammals except egg laying ones.

DIFFERENTIATE B/W HIBERNATION AND AESTIVATION

HIBERNATION	AESTIVATION
It is winter sleep in which animals passes the winter season period indormant condition.	It is summer sleep.
The animals rest in warm places.	The animals rest in cool, dry, shady places.
It is of longer duration and lasts for the whole duration of winter.	It lasts for hot dry day time as night cooles.
E.g. is frog etc.	E.g. is snake etc.

DIFFERENTIATE B/W AMPHIBIANS & REPTILES

AMPHIBIANS	REPTILES
They respire through gills and lungs.	They respire through lungs.
Their egg is without any shell.	Their eggs are with shell.
They have smooth skin.	They have scales on their body.
frogs and toads.	snakes and lizards.

Difference between Vertebrate & Invertebrates

VERTEBRATES	INVERTEBRATES
They have an internal skeleton.	No internet skeleton.
A backbone is present.	Backbone is not present.
A tail is usually present.	Tail is absent (anus at the tip of the back end of of the body)
Heart is on the ventral side of the body.	Heart when present, is on the dorsal side of the body.
Nerve (Spinal) cord is dorsal, and hollow.	Nerve cord is ventral and solid.
Arthropods, Sponges	Mammals, Fish, Reptiles, Amphibians, Birds.

SHORT QUESTION

Q1 : How animals are classified?

The kingdom Animalia is divided into 33 groups called phyla. But we consider in depth only nine major phyla. These major phyla are Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Mollusca, Arthropoda. Echinodermata and chordate whereas rest of the group are minor phyla.

1. Classification based on presence or absent of tissues.
2. Classification based on number of tissues layer.
3. Classification based on symmetry.
4. Classification based on coelom.

Q2: Why sponges placed in animal kingdom, when it lacks tissue organization?

Sponges are the simplest animals lacking true tissues and organs. All sponges are equatic filter feeders. The body of a simple sponge. Water is drawn through the pores (ostia) into a central cavity the spongocoel then flows out of the sponge through a large oponing called the osculum. A sponge is an animal and not a plant because it is classified under phylum porifera of the Animal Kingdom, they are holozoic in nature and so capture food to eat.

Q3: Difference between invertebrate chordates and vertebrates?

GROUP INVERTEBRATE CHORDATES:

The invertebrate chordates lack a head and backbone that is defining feature of vertebrate they are classified into sub-phyla (i) Sub-phylum urochordata and (ii) Sub-phylum cephalochordates.

GROUP VERTEBRATE CHORDATES:

In the vertebrates notochord is usually replaced during development backbone or vertebral column, Vertebrates show other adaptations that have contributed to their successful invasion of most habitats. One is presence of paired appendages.

Q4: Why diploblastic animals are different from the triploblastic?

• Some animals only have two germ layers: ectoderm and endoderm called diploblastic example: cnidarians.

• Animals with three germ layers ectoderm, mesoderm and endoderm called triploblastic example: Platyhelminthes to chordate.

Q5: Why echinoderms are placed in bilateral when adults are radially symmetrical?

Echinoderms posses bilateral symmetry in embryonic stage and radial symmetry in adult. The larvae of echinoderms have bilateral symmetry but this is lost during metamorphosis when their bodies are reorganized and develop the characteristics radial symmetry of the echinoderms.

Q6: Classify the animals on the basis of symmetry?

The eumetazoan animals are divided into two group.

RADIAL SYMMETRY:

These animal base top and bottom, or an oral & aboral side, but no head end rear end no left & right, Their body divided into half by they are collectively called Radiata any axis.

e.g: jeily fish,

BILATERAL SYMMETRY:

These animal has dorsal top and ventral bottom side, & also have anterior head end and posterior (toil) end and a left & right side. They are collectively called bilateria.

e.g: Insects, Human.

Q7: Classify the animals on the basis of coelom?

COELOM:

The internal body cavity of animals is called coelom.

According to the coelom the bilaterally symmetrical animals are divided into three groups.

a) Acoelomates.

b) Pseudocoelomates.

c) Eucoelomates.

TYPES OF ORGANISMS BASED ON COELOM:

d) Acoelomates:

An animal that lack coelom is called acoelomate. Acoelomates exhibit bilateral symmetry and possess one internal space only called the digestive cavity.
Example; liver fluke, tapeworm and ribbon worm.

e) Pseudocoelomates:

An organism that has false body cavity known as pseudocoel is called pseudocoelomate. Pseudocoel is not a product of gastrulation and it is not lined with a we defined mesodermal membrane.
Examples; nematode or rotifer.

f) Eucoelomates:

A metazoan animal that has the true body cavity between the body wall and the digestive tract is called eucoelomate. The animals from Annelida to Chordata contain true body cavity hence called coelomates.

Q8: Classify the coelomates on the basis of opening?

Coelomates divided into two groups.

i. Protosome:

When blastopore is associated with mouth, the animal is protosome.
E,g Annelids, Molluscs & Arthropoda.

ii. Deutrosomes:

When blastopores is associated with anus and second opening become mouth, the animal is deutrosomes.
E,g: Echinodermates, hemichordates, chordates.

Q9: Why sponges are called master filter?

Sponges are master filter. They can filter an amount of water 100,000 times their size each day. That means a basketball-sized sponge could filter an entire residential pool in one day. Sponges often use chemicals to deter predators from eating them.

Q10: Write down the evolutionary Adaptation in sponges?

From notes.

Q11 ; Why oyster is Ambisexual?

Oyster are ambisexual b/c, it begins life as a male and then become a female. It may go back and forth many time.

Q12: Why Arthropodes are successful land animal?

The reasons for the success of arthropods are as follow: jointed legs that allow more mobility on land. Hard exoskeleton made of chitin that protects the body. The hard exoskeleton also reduces water loss from the body of arthropods making them more adapted to terrestrial conditions.

Q13: Write down the Economic importance of Arthropodes?

From Notes.

Q14: Write down the Fundamental features of chordate?
From Notes.

Q16: Why flate worms are name so?
The flatworms can either be extremely tiny or can grow to become several inches long. They are pointed on both ends are characterized by eyes spots on the head. Their colors may vary from being translucent white, green as well as brown.

Q17: What adaptation in vertebrates for successful habitats?
Adaptation makes by vertebrates are
i. Presence of pained appendages first fins in fishes, then modified into legs for crawling & wings for flying.
ii. Second adaptation is increase in size & well develop brain & Sensory organs.

Q18: Difference between chondrichthyes & Osteichthyes?
From Notes.

Q19: Differentiate B/W Polyp And Medusa?
From Notes.

Q20: What is the function of vomerine teeth of amphibians?
Unlike reptiles and mammals, amphibians don't have the ability to chew their food. They are also poorly equipped dentally, with only a few primitive" vomerine teeth" in the front upper part of the jaws that allow them to hold onto wriggling prey.

Q21: Name the fastest is the salfish and slowest fish is a seahorse?
The fastest fish is the salfish. It can swim as fast as a car travels on the highway. The slowest fish is a seahorse. It swims so slowly that a person can barely tell it is moving.

INTRODUCTION OF DIVERSITY AMONG ANIMALS:

In this chapter we trace the long evolutionary history of the animals, int and are several kinds of worms. These animals are important ecologically and we encounter the simplest members of this kingdom-sponges, jellyfish illustrate the advent of the major characteristics that are important in the advanced animal phyla. These characteristics include the development of tissues and organs, the use of internal digestion, the appearance of radial and then bilateral body organization and the appearance of internal body cavities.

Q1. How are animals classified?
Ans. Animals are divided into two main groups. Animals that have a backbone are called vertebrates. Animals that don't have a backbone are invertebrates. Vertebrates and invertebrates are divided into smaller groups.

Q2. Why are sponges placed in the animal kingdom, when they lack tissue organization?
Ans. The sponges and the cnidarians represent the simplest of animals. Sponges appear to represent an early stage of multicellularity in the animal clade Although they have specialized cells for particular functions, they lack true tissues in which specialized cells are organized into functional groups

Q3. Why are flatworms named so?
Ans. Animals in the phylum Platyhelminthes are called flatworms because they are dorsoventrally flattened from head to tail.

Q4. Differentiate between invertebrate chordates and vertebrates? Ans.

INVERTEBRATE CHORDATES	VERTEBRATES
• Chordates refer to an animal phylumthat contains a notochord and a dorsally situated central nervous system • Consist of both primitive and advanced chordates • Possess a notochord at some point of their life • Invertebrate chordates do not have a vertebral column • Invertebrate chordates lack a cartilaginous or bony skeleton • Invertebrate chordates are limbless	• Vertebrates refer to a large group ofanimals which consist of a backbone • Consist of advanced chordates • Possess a notochord as well as a braincase • Have a vertebral column surrounding the nerve cord • Vertebrates possess a cartilaginous orbony skeleton • Vertebrate possess limbs or fins

Q5. Differentiate between cartilage fishes and bony fishes?
Ans:

CARTILAGINOUS FISHES	BONY FISHES
• Their endoskeleton is primarily madeof cartilage. • Their exoskeleton is made of placoids. • The position of their tail isheterocercal.	• Their endoskeleton is entirely madeof bone. • Their exoskeleton is made up ofcycloids or thin bony plates. • Their tail fin is homocercal.

• They have 5 gills that are overlyexposed (no operculum). • In them the fertilization is throughinternal mechanisms. • Eg- dogfish, electric ray torpedo andsharks.	• They have an operculum on eitherside of their gills. • They fertilize their eggs externally. • Eg-flying fish, globe fish andseahorses.

Q6. Why are protostomes named so?

Ans. The protostomes were so named because it used to be thought that in their embryos the dent formed the mouth while the anus was formed later, at the opening made by the other end of the gut.

Q7. Why are diploblastic animals different from triploblastic?

Ans. The key difference between diploblastic and triploblastic animals is that diploblastic animals produce two germ layers excluding mesoderm and triploblastic animals produce all three germ layers.

Q8. Why are echinoderms placed in bilateria When adults are symmetrical? Ans. Echinoderms are a phylum of marine animals. There are 2 symmetries present in echinoderms. They have bilateral symmetry at the larval stage and in the adult stage they show radial symmetry. The adults in echinoderms are characterized by their radial symmetry like in starfish, sea urchins, sand dollars and sea cucumbers.

Long Questions Answer

Q1. Discuss the basic factors which help in classification of animals?

Ans. The kingdom animalia is divided into 33 groups called phyla. But we consider in depth only nine major phyla. These major phyla are porifera, Cnidaria, Platyhelminthes, Aschelminths, Annelida, Mollusca, opodo, Echinodermata and chordata whereas rest of the groups are minor phyla. This classification or grouping of animals is called taxonomy or systematics. It is carried out primarily on the basis of their evolutionary relationships. Clues to these relationships are found in (1) Comparative morphology and (ii) internal architecture which includes presence and absence of tissues, number of tissue layers, symmetry and the embryological developmental pattern of their coelom and blastopore.

Q2.Write down evolutionary adaptations of phylum annelida?

Ans. These are supposed to have evolved from a primitive flat worm like ancestona the sea.

Digestion:

Tabular digestive system with both mouth and anus complete system.

Respiration:

Respiratory system is not found in diffusion is sufficient for gas exchange.

Transport:

Closed type circulatory system with blood confined to the heart and blood vessels.

Excretion:

Excretory organs are nephridia which are found in most system segments.

Nervous system:

Nervous system consists of a simple ganglionic brain in the head.

General characters of Phylum Annelida:

PHYLUM ANNELIDA (SEGMENTED WORMS)

Annelids are commonly called segmented worms, have the most complex body Structures among all the worms, they live on land, in moist soil, in freshwater or in sea. Many annelids are active free- swimming predators, some are equal filter feeder mud whereas leeches are ectoparasites, they are all triploblastic bilaterally symmetrical, coelomate and protostomes with an organ system level of body organization. Chitinous chaetae also called setae with or without parapodia are usually present in the most of annelids and help in locomotion Reproduction is usually sexually, most of annelids are hermaphrodite in few sexes an separate, development through trochophore larvae Common Annelids: Earthworm Neries,Leech

Q3. Write down the general characters of phylum arthropoda?

Ans. ***General characters of phylum Arthropoda:***

Arthropoda is the largest phylum of the animal kingdom, they are found everywhere on earth wherever the life is possible, even in the oil wells Arthropods are bilaterally symmetrical, triploblastic, coelomates and protostomes The diversity and success of arthropods are largely related to heir segmentation hard exoskeleton, and jointed appendages. The body of arthropods is covered with an exoskeleton made up of protein and chitin.

The exoskeleton protects the animals and provides a point of attachment for the muscles that move the appendages. Sexes are usually separate and metamorphosis is a common occurrence. Common Arthropods: Scorpion, prawn, mosquito, honey bee and Housefly etc .

Q4.Describe the general characters of phylum Mollusca?

Ans. ***PHYLUM MOLLUSCA (SOFT BODIED)*** General characters of phylum Mollusca

1) Molluscs are soft bodied animals, but most are protected by hard shells made of calcium carbonate, slug, squids and octopus have reduced shell, most of which are internal, or they have lost their shell completely during evolution.
2) All the molluscs are triploblastic, bilaterally symmetrical, coelomates and protostomes with system grade of organ body organization.
3) All molluscs have a similar body plan with three main parts, Muscular foot usually used for movement, visceral mass containing most of the internal organs and a mantle, a fold of tissue that drapes over the visceral mass and secretes a shell.
4) Many molluscs feed by using a strap-like rasping organ called a radula to scrape food.
5) Reproduction is always sexual, some species have separate sexes and others are hermaphrodite
6) They all pass through a trochophore larvae stage.
7) Common Molluscs: Unio Octopus and pearl oyster.

Q5. What are mammals? Name its subclasses. Give the characters and examples of each subclass?

Ans. Animals belonging to class Mammalia are referred to as mammals. Mammals have vertebrae. They exhibit advanced characteristics which set them apart from all one of the most evolved species in the animal kingdom categorized under other animals. They are characterized by the presence of mammary glands through which they feed their younger ones.

Characteristics Of Mammals

Following are a list of distinct characteristics of mammals that separates them from other classes:

1. Mammals are warm-blooded animals who give birth to their younger ones.
2. They are the most dominant form of animals found in almost all types of habitats

3. They have mammary glands that help them produce milk to feed their younger ones
4. Presence of region of the brain known as Neocortex
5. Their skin possesses oil glands (sebaceous glands) and sweat glands (sudoriferous glands).
6. The fur of hair throughout the body helps animals adapt to their environment.

Classification Of Mammals:

Mammalia has the largest class in the animal kingdom. Based on their reproduction, they are classified into three subclasses:

- Eutheria,
- Metatheria,
- Prototheria,

Eutheria:

Mammals under this subclass give birth to young ones. The young ones are developed inside the mother and derive nutrition through the placenta from the mother. Furthermore, it consists of 19 orders, few of which are:

Order	**Examples**
Proboscidea	Elephants
Rodentia	Rats
Artiodactyla	Cows

Metatheria:

Mammals belonging to this subclass give birth to immature young ones, hence they stay in their mother's pouch until they mature. For eg., Marsupials and Kangaroos. They are divided into seven different orders:

Order	**Examples**
Notoryctemorphia	Marsupial modes
Diprotodontia	Kangaroo
Microbiotheria	Colocolo
Didelphimorphia	New world opossum
Dasyuromorphia	Dasyurids
Peramelemorphia	Bandicoots
Paucituberculata	South American rat opossum

Prototheria:

Also known as Monotremes, the subclass Prototheria consists of egg-laying mammals. It has one order having 6 species

Order: Monotremata

Example: Duck Billed platypus, Echidna

General Classification of Mammals:

The scientists have also classified the mammals on a general basis which makes it easy to learn about the mammals and their distinguishing characteristics.

Classification	**Examples**
Animals	Lion, Tiger, Dog
Marsupials	Kangaroo, Koala, Womba

Primates Chimpanzee, Gorilla, Monkey
Rodents Squirrel. Mouse, Porcupine
Cetaceans Dolphins, Whales
Other mammals Seal, Walrus, Sea-lion