# BIOLOGY

## Chapter 4: Animal Kingdom

# ANIMAL KINGDOM

## Basis of classification

The classification of the animal kingdom is based on the different essential characteristics such as level of organization, habitat, symmetry.

## Levels of Organization

- Cellular Level of Organization
- Tissue Level of Organization
- Organ Level of Organization
- Organ system Level of Organization

## Patterns of organ systems

- Digestive System (Incomplete Digestive System and Complete Digestive System)
- Circulatory System
- Open Type
- Closed Type

## Body symmetry

- Bilateral Symmetry
- Radial Symmetry
- Asymmetrical

## Levels of Organisation

All members of Animalia are multicellular, heterotrophic eukaryotes. But, all of them do not exhibit the same pattern of organization of cells. The cells in their body are of several types. These are organized into several functional units of progressively increasing complexity.

## Cellular Level

In this level, the body shows some division of labour among cells. They are remarkably independent and can change their form and function. It is found in sponges. The body consists of many cells arranged as loose cell aggregates but, the cells do not form tissues.

## Tissue Level

Here, in coelenterates, the arrangement of cells is more complex. The cells performing

the same function are arranged into tissues, hence is called tissue level of organization.

## Organ Level

In Platyhelminthes and other higher phyla, tissues are grouped together to form organs, each specialized for a particular function, i.e., organ level organization is present.

## Organ System Level

In animals like annelids, arthropods, molluscs, echinoderms and chordates, organs have associated to form functional systems, each system concerned with a specific physiological function. This is called organ system level of organisation. Organ systems in different groups of animals exhibit various patterns of complexities.

Like the digestive system in Platyhelminthes has only a single opening to the outside of the body that serves as both mouth and anus and is thus, called incomplete.

A complete digestive system has two openings, i.e., mouth and anus.

## Symmetry

The symmetry refers to the arrangement of parts on the opposite sides of the body of a three dimensional animal.

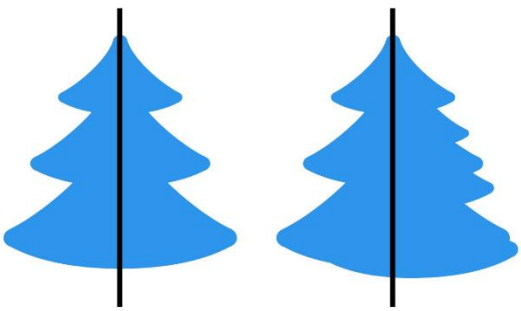
**On the basis of symmetry, animals can be of following types:**

**Asymmetrical:**

Animals in which, any plane passes through the center does not divide them into equal halves such animals are called asymmetrical, e.g., Sponges.

**Symmetrical:**

The body of some animals can be divided into two similar equal halves by one or more planes. Such animals are called symmetrical

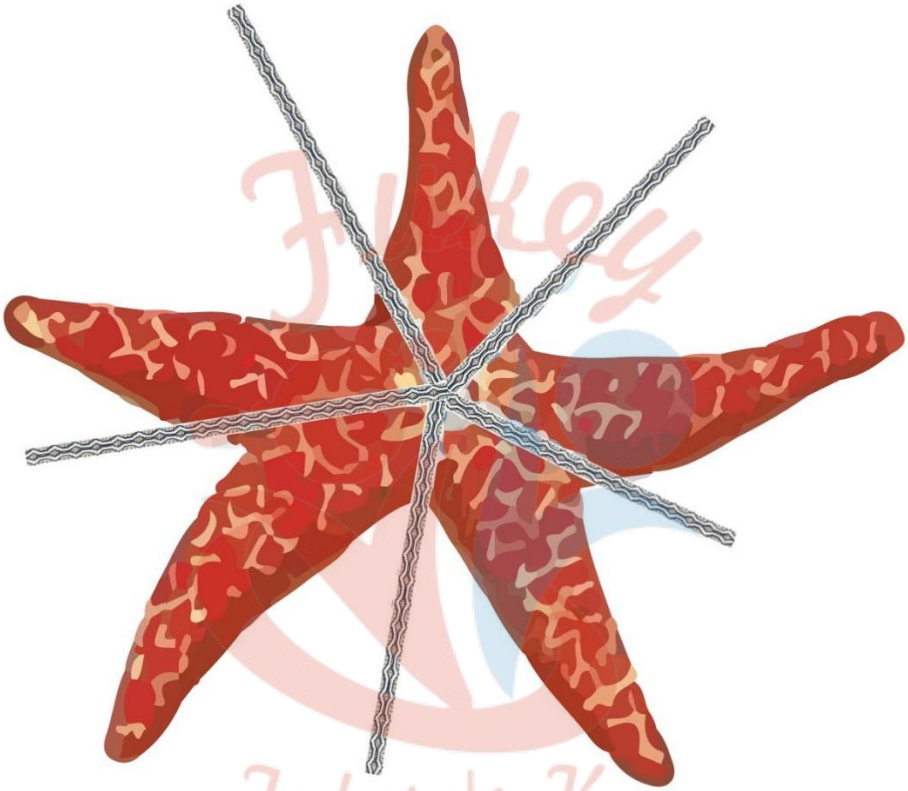


Symmetrical Asymmetrical

**The symmetry can be further divided as:**

**Radial Symmetry**

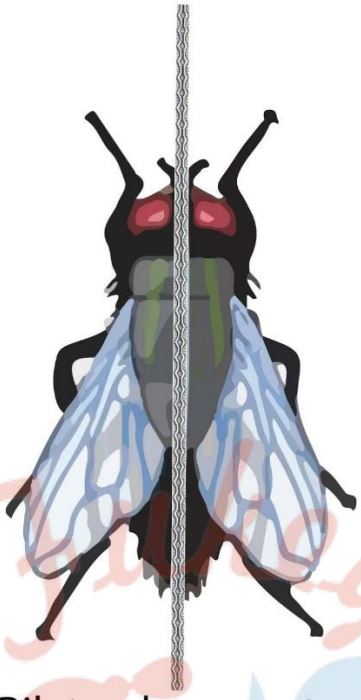
When any plane passing through the central axis of the body divides the organism into two identical halves, it is called radial symmetry, e.g., Coelenterates, ctenophores and echinoderms.



Radial symmetry

**Bilateral Symmetry:**

In some animals, body can be divided into identical left and right halves in only one plane. This is called bilateral symmetry, e.g., Annelids, arthropods, etc.

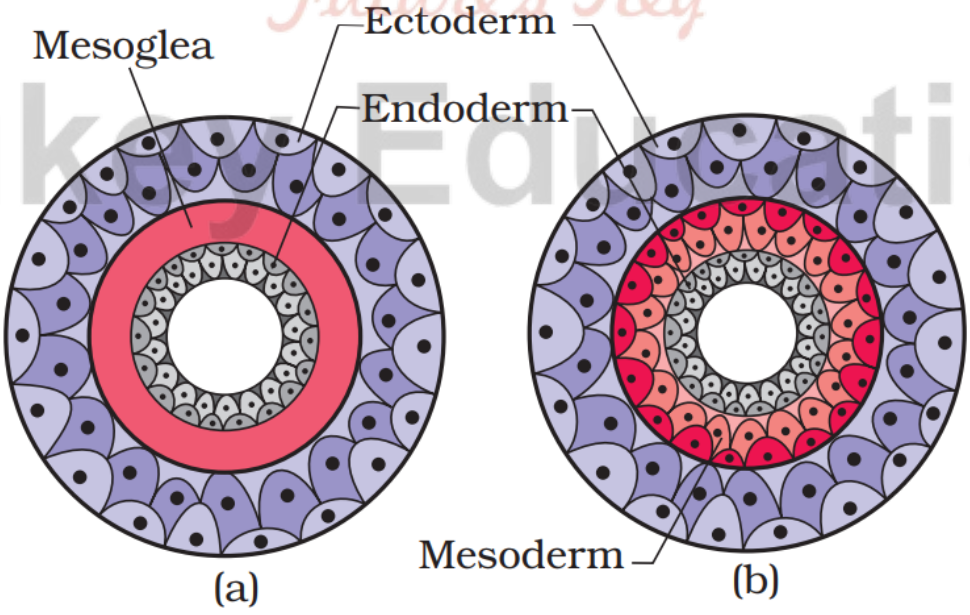


Bilateral symmetry

## Diploblastic and Triploblastic Organisation

Germ layers are group of cells behaving as a unit during early stages of embryonic development. It differentiate to give rise to all the tissues/ organs of the fully formed individuals.

**On the basis of germ layers animals are classified as follows:**

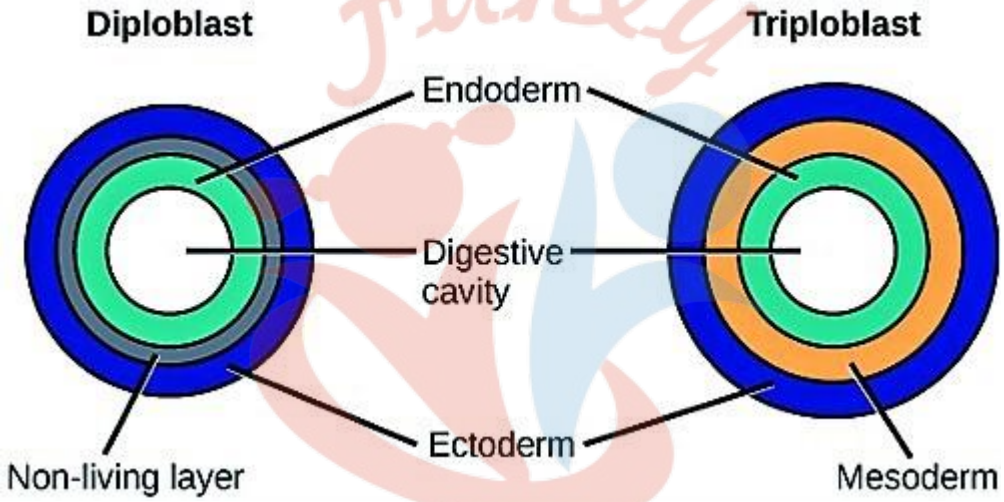


## Diploblastic

Animals in which the cells are arranged in two embryonic layers an external ectoderm and an internal endoderm, are called diploblastic animals. In addition, an undifferentiated layer, mesoglea is present in between the ectoderm and the endoderm. e.g., Coelenterates.

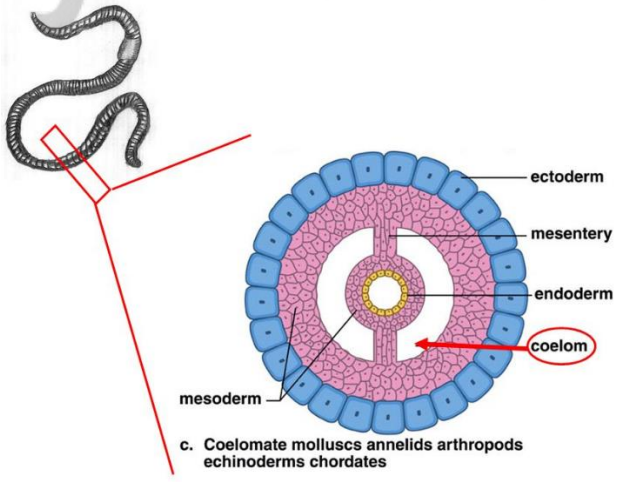
## Triploblastic

The animals in which the developing embryo has a third germinal layer mesoderm, in between the ectoderm and endoderm are called triploblastic animals, e.g., All animals from phylum-Platyhelminthes to phylum-Chordata.




## Coelom

The body cavity (between the body wall and gut wall) which is lined by mesoderm is called coelom. The presence or absence of coelom is very important in classification. On the basis of coelom, animals can be classified in three different groups.

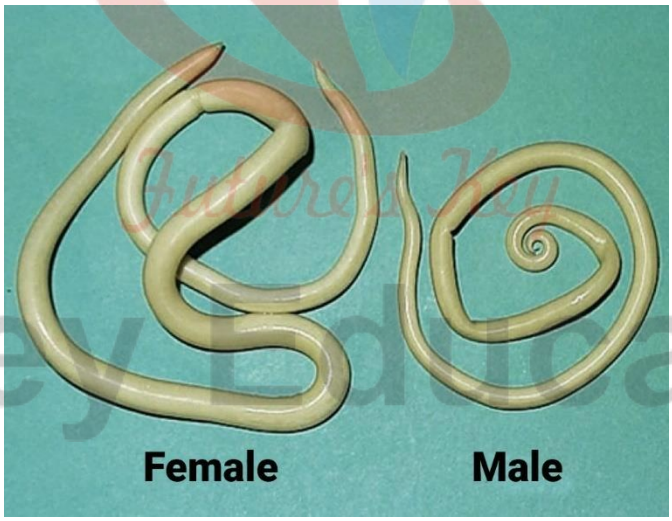


## Acoelomates

The animals in which the body cavity is absent are called acoelomates, e.g., Poriferans, platyhelminthes, coelenterates, ctenophors and flatworms.

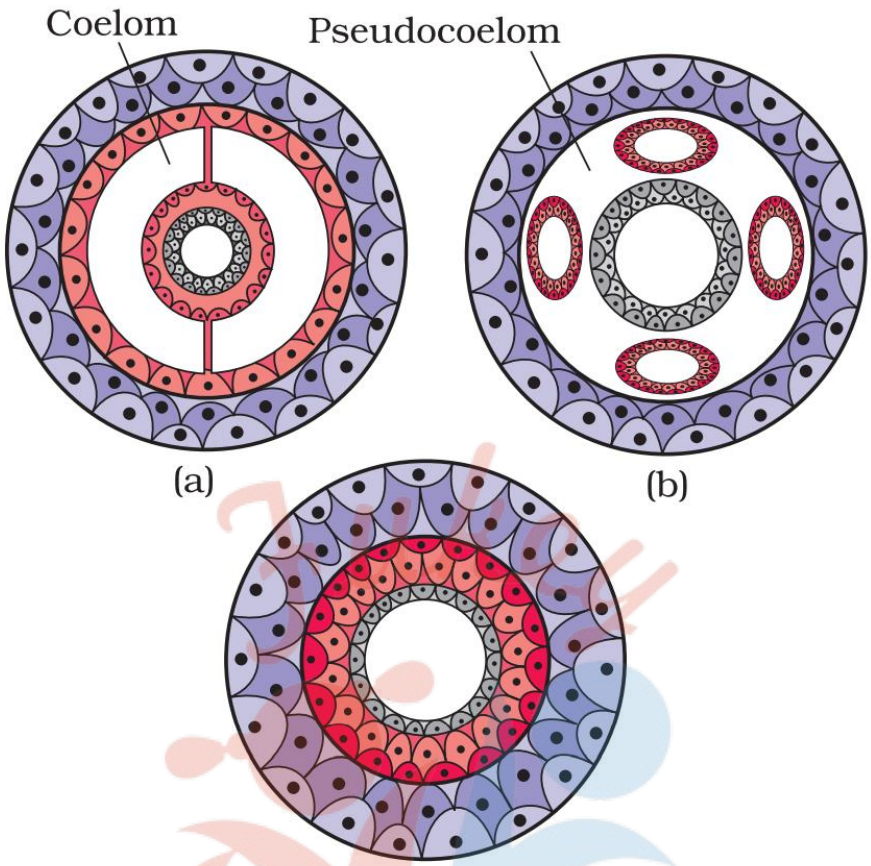
## Pseudocoelomates

In some animals, the body cavity is not lined by mesoderm. Instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocoelom and the animals possessing them are called pseudocoelomates, e.g., Aschelminthes.




## Coelomates

The animals having true coelom are called coelomates. A true coelom arises within mesoderm and is therefore, lined by mesodermal tissues, i.e., externally by parietal peritoneum and internally by visceral peritoneum.




**Diagrammatic sectional view of:**
(a) Coelomate (b) Pseudocoelomate (c) Acoelomate

**Body Plan**

Animals have three types of body plans. These are:

Cell aggregate plan: The body consists of a cluster or aggregation of cells which have rudimentary differentiation but are not organized into tissues or organs. The cells are specialized, organised into tissues and show division of labour. It is found in coelenterates and flatworms.

**Blind sac body plan**

A blind sac body plan is characterized by a digestive cavity that has a single aperture, which functions as mouth and anus. The cells are specialized and they have a division of labour. Digestion is both intracellular and extracellular. Coelenterates are diploblastic animals and possess a blind sac body plan. The body has a single aperture that functions as mouth and anus. The opening is guarded by tentacles which helps to catch the prey. The digestion takes place in the gastrovascular cavity.

**Tube Within a Tube Body Plan**

Overview of Tube Within A Tube Body Plan. Embryological development: Most of the metazoans possess tubes within the tube body plan and it mainly relies on the development of germ layers and the central cavity coelom.

## Segmentation

In some animals, the body is externally and internally divided into segments or somites with a serial repetition of at least some organs.

**There are two types of segmentation:**

**Metameric Segmentation:**

A segmentation that simultaneously divides body both externally and internally is called metamerism or metameric segmentation. This kind of segmentation is found in annelids, arthropods and chordates.

**Pseudometamerism:**

It is found in tapeworm, the body is divisible into parts or segments called proglottides. They develop from the neck but are not embryonic in or T n r a repetition which appears due to repeated budding as known as false segmentation or pseudometamerism.

## Notochord

It is a mesodermally derived rod-like structure formed on the dorsal side during embryonic development in some animals.

Animals with notochord are called chordates and those animals which do not form this structure are called non-chordates, e.g., Porifera to echinoderms.

## Cephalisation

It is the differentiation of head in anterior part of the body. It involves the concentration of nervous tissue and sense organs in the head.

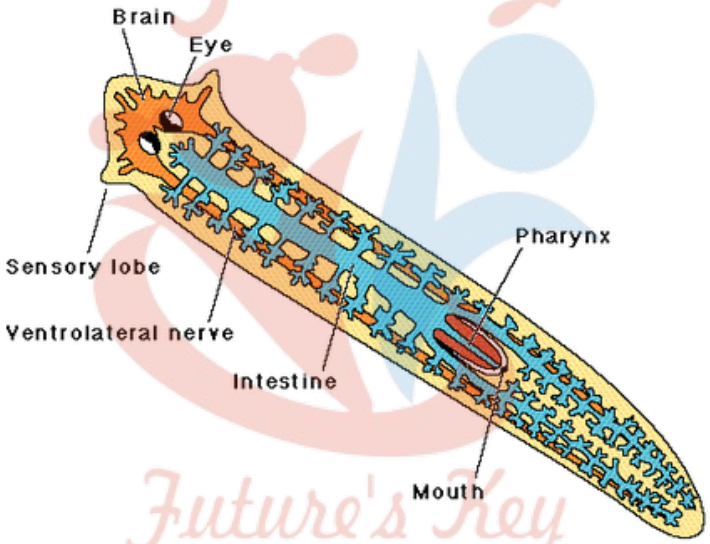
## Appendages

The projecting structures of the body that perform specific functions like locomotion, capturing of food, sensation, etc., are called appendages, eg., Wings, fins, limbs, tentacles, parapodia, setae, etc.

## Digestive System

Digestive tract is the passage through which food is taken for digestion, absorption and egestion. The digestive tract that has a single opening for both ingestion and egestion is called incomplete digestive tract, eg., in flatworms and coelenterates.

The digestive tract with two external openings, one for ingestion and other for egestion is called complete digestive tract. It is present in aschelminthes and higher animals.




## Respiratory System

**Respiration occurs in different ways in different animals:**

- The tiny aquatic animals like Amoeba, Hydra, etc., respire through the body surface. This is called body surface respiration.
- Larger aquatic animals have special organs called gills for respiration. This is called branchial respiration, e.g., In prawns, fishes and mussels.
- The land animals respire through lungs. This is called pulmonary respiration. It occurs in frogs, snails, lizards, birds, and mammals.
- Insects have tracheal respiration, which occurs through trachea i.e., an intercommunicating tube through which gas exchange occurs.
- In animals like earthworm, leech, frogs etc., moist skin acts as respiratory surface.

This is called cutaneous respiration.

- Scorpions have book lungs and king crabs have book gills for respiration.
- In frog, gas exchange also occurs through the lining of buccopharyngeal cavity. Hence, called buccopharyngeal respiration.
- Frogs have three modes of respiration, i.e., Cutaneous, buccopharyngeal and pulmonary.


## Excretory System

1. Excretory system is involved in the removal of nitrogenous waste products from the body of an organism with the help of excretory organs.
2. The excretion occurs in different ways in different organisms. Such as
3. The excretory organs are absent in those organisms where organization level is below the tissue level. Here, each individual cell takes part in excretion.
4. In animals like sponges, coelenterates, all the cells are in contact with water. Excretion occurs by general body surface.
5. In vertebrates, kidneys are the excretory organs.

**Based on excretory products animals can be classified into four categories as given below:**

- Aminotelic, excretory product is amino acids, e.g., Starfish, Unio, etc.
- Ammonotelic, excretory product is ammonia, e.g., most invertebrates and some molluscs.
- Ureotelic, excretory product is urea, e.g., Cartilaginous fishes, snail, prawn, mammals and aquatic reptiles.
- Uricotelic, excretory product is uric acid, e.g., Insects, terrestrial crustaceans, lizards, snakes, birds etc.

## Nervous System

The nervous system is the aggregation of nerve cells that help in coordinating and controlling various activities of the body.

## Endocrine System

The endocrine glands are also called ductless glands. These secrete hormones. Endocrine glands occur in all vertebrates and in some invertebrates (like insects).

## Sensory System

This system consists of specialized cells, tissues and organs which can pick up a stimulus and transmit the same to the nervous system.

Sensory system consists of different structures in different organisms, e.g., Antennal (tactile and smell), tentacles (tactile), skin (tactile), statocyst (balancing), ear (hearing), olfactory epithelium (smell), taste buds (taste), eyes (vision), lateral line organs (current receptors), etc.

## Skeletal System

Skeletal system is a hard, internal or external framework that provides support and shape to the body. Some animals which are devoid of a skeleton have soft body, e.g., Platyhelminthes, aschelminthes, annelida.

**Skeleton system can be of following types:**

**Exoskeleton:**

It is the hard supporting and protective framework present on exterior of the body. It is made of non-living matter, e.g., External shells of molluscs, cuticle of arthropods, scales of fishes and reptiles, feathers of birds, hair, hoofs, nails, horns and claws of mammals.

**Endoskeleton:**

It is a hard supporting framework present in the interior of the body. In invertebrates such as sponges, it is made up of calcareous or siliceous spicules. In vertebrates, it is composed of hard living tissues called cartilages and bones. Endoskeleton supports whole body of an organism.

## Sex

Animals generally have sex organs to produce sexual reproduction. When both male and female sex organs are found in some individual, it is called hermaphrodite or bisexual or monoecious, e.g., Liver fluke, tapeworm, earthworm, leech, etc.

The animals with either female or male sex organ is known as unisexual or dioecious, e.g., Frog, lizards, birds, dog, etc. When male and female can be distinguished on the basis of external features, the condition is called sexual dimorphism, e.g., Lion and lioness, man and women, peacock and peahen, etc.

## Reproduction

Reproduction in organisms can be either asexual or sexual.

**Asexual Reproduction:**

This kind of reproduction does not involve fusion of gametes. It is found in lower animals like sponges, coelenterates, annelids, platyhelminthes. The common methods are budding, fission, fragmentation and regeneration.

**Sexual Reproduction:**

It involves formation and fusion of gametes. The male gametes called sperms are motile while, the female gametes called ova are generally non-motile.

## Fertilization

**External Fertilization:**

Animals such as many invertebrates, some marine fishes and most amphibians, shed both eggs and sperms into water, where fertilization and development occur. This is called external fertilization.

**Internal Fertilization:**

In land animals and some aquatic animals, the sperms are introduced by the male into reproductive tract of female during copulation. This is called internal fertilization.

Fertilization occurs in the genital organs of the female.

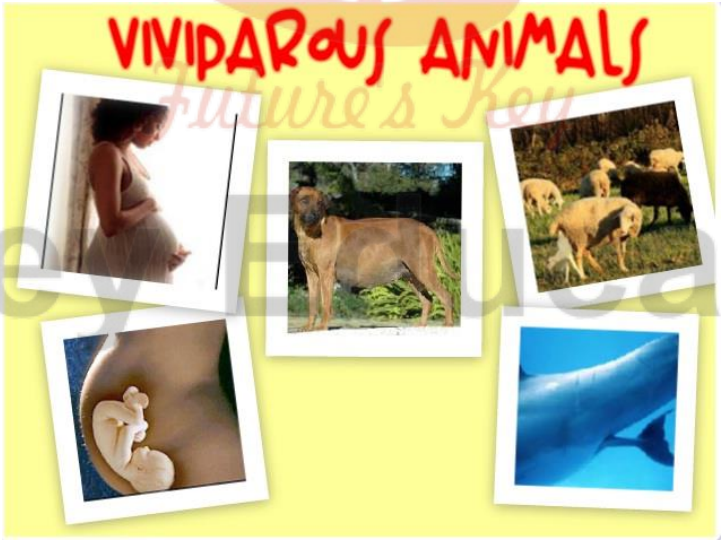
## Oviparous Animals

Egg-laying animals are called oviparous animals. In these animals' fertilization is internal, but embryonic development is external. In external embryonic development, the embryo develops outside the female body. In these animals, the females lay eggs, in which embryonic development takes place. The developing embryo gets nutrition from the reserve food. This condition is called oviparity. The young ones hatch out of eggs after full development.

## Viviparous Animals

Animals that give birth to young ones are called viviparous animals. In these animals both fertilization and embryonic development are internal. In internal embryonic development, the embryo develops inside the female body. The developing embryos get total nutrition and oxygen from the mother. This condition is called matrotrophy. In these animals, the young ones are delivered out of the female womb after full development.

Examples of viviparous animals are a few snakes and mammals except duckbill platypus and echidna.




## Non chordate

- They are cylindrical, triploblastic, coelomate, or pseudocoelomate animals.
- Respiration in these animals takes place through gills, trachea or body surface.
- Most of the times, sexes cannot be distinguished among the members.

- Modes of reproduction involve sexual and asexual Fertilization is external, though internal fertilization also occurs in.
- The body of non-chordates generally includes an open type of circulatory system.

**Characteristic Features of Phylum Porifera:**

1. They are generally marine aquatic organisms, with a few freshwater species.
2. Their bodies are asymmetrical.
3. Body shape can be cylindrical, vase-like, rounded or sac-like.
4. They are diploblastic animals with two layers, the outer dermal layer and the inner gastral layer. There is a gelatinous, non-cellular mesoglea, in between these two layers.
5. The body has many pores called the ostia and a single large opening called osculum at the top.

## Class Common Name of Some Sponges

| Biological Name | Common Name |
|---|---|
| Sycon | Crown Sponge |
| Spongilla | Freshwater Sponge |
| Euplectella | Venus flower basket |
| Euspongia | Bath Sponge |
| Cliona | Boring Sponge |
| Pheronema | Bowl Sponge |
| Haliclona | Finger Sponge |



## Phylum Coetentcrata (Cnidana)

There are about 9000 species of cnidarians. The name Cnidaria (Knide nettle or sting cells) is derived from the stinging cell or cnidoblasts present on the ectoderm of tentacles and body of these animals.

**Advancement Over Sponges**

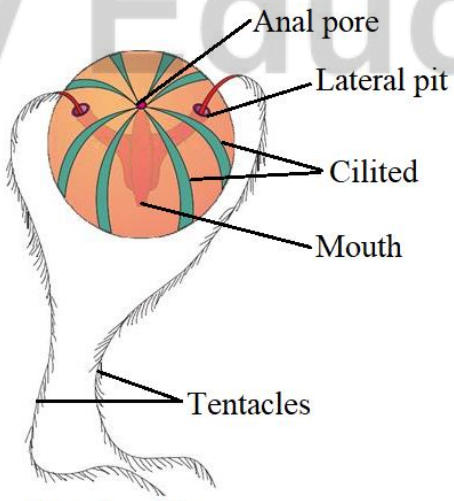
The cnidarians or coelenterates exhibit advancement over sponges, as they possess a tissue level of organization of the body with well defined layers of cells and a digestive cavity.

**Phylum Ctenophora**

Phylum-Ctenophora (Ketene comb; pores bearing) or comb jellies or sea walnuts are exclusively marine forms. The term 'Ctenophora' was coined by Georges Cuvier. It includes about 50 species.

**General Features important general features 'phylum Ctenophora are below:**

- Habitat and Habit These are of exclusively marine forms. They are found solitary; pelagic or free swimming.
- Body Organization They are diploblastic, acoelomate with tissue grade of organization. Body is soft, delicate, transparent and gelatinous, like jelly fishes without segmentation.
- Body Symmetry They are biradially symmetrical. The arrangement of comb plates gives the appearance of radial symmetry, the tentacles and branching of gastrovascular canals show bilateral symmetry.
- Digestive System Digestion is both extra cellular and intracellular. Skeletal, circulatory, respiratory and excretory systems are absent.




Pleurobrachia

**Example of Ctenophora**

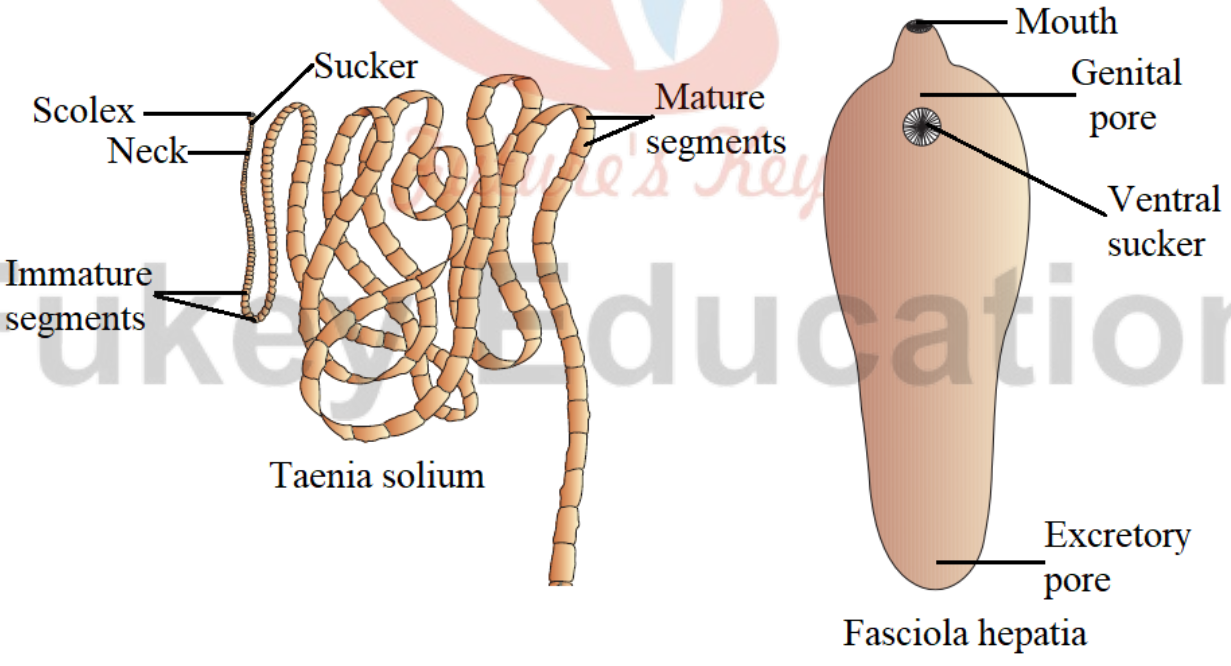
## Phylum Platyhelminthes

Phylum Platyhelminthes (Platy flat; helminth worm) include flatworms. The group include the first simplest triploblastic group of animals. Gegenbaur coined the term 'Platyhelminthes'. It includes about 12,000 species of animals. They have leaf like or ribbon like body.

**General Features:**

**Some important general features of phylum-Platyhelminthes are discussed below:**

- Habit and Habitat Majority of forms are parasitic (tapeworms, liver flukes, blood flukes), etc., and free-living forms (planarians). Hooks and suckers are present in parasitic forms.
- Symmetry The body is bilaterally symmetrical with definite orientation like anterior and posterior end.
- Cephalization Primitive cephalization is present in free-living flatworms.
- Germ Layers They are triploblastic.
- Body Cavity They are acoelomate. The space between the body wall and body organ is filled by.




**Examples of Platyhelminthes**

## Phylum Aschelminthes

Phylum Aschelminthes or Nemathelminthes or Nematoda (Nema thread; helminth worms)

includes roundworms. They are commonly called as nematodes.

**General Feature of Phylum Aschelminthes:**

**Some important general features of phylum- aschelminthes are discussed below:**

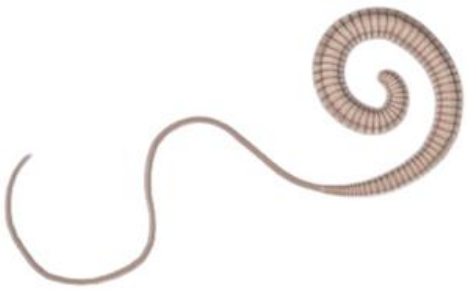
- Habitat and Habit They are mostly free living and may occur in water or within the soil. There are several parasitic species which live within the body of animals or plants, e.g., Guinea worms, whipworms, eyeworms, etc.
- Symmetry They show bilateral symmetry and have organ system level of organization.
- Germ Layers They are triploblastic animals and have tube within tube body plan.
- Body Walt The body wall contains an outer cuticle, syncytial epidermis and a muscle layer. Circular muscles are absent.

**Advancement Over Flatworms**

Aschelminthes show advancement over flatworms as they contain complete alimentary canal and sexes are separate.

**Disease Caused by Aschelminthes:**

- Ascaris lumbricoides or giant intestinal roundworm is an endoparasite of the small intestine of humans. It causes ascariasis.
- Wuchereria (filaria) or filarial worm is an endoparasite in the lymphatic vessels and lymph nodes of humans. It causes elephantiasis in the legs, arms, scrotum, etc.
- Ancyclostoma duodenale or hookworm is an endoparasite in the small intestine of humans. It causes ancylostomiasis disease.
- Loa loa the eyeworm lives in subdermal connective tissue of man. It causes loiasis disease characterised by subcutaneous smelling mosdy around the eyes.



Trichuris

Enterobius

Loa (eyeworm)

Trichinella

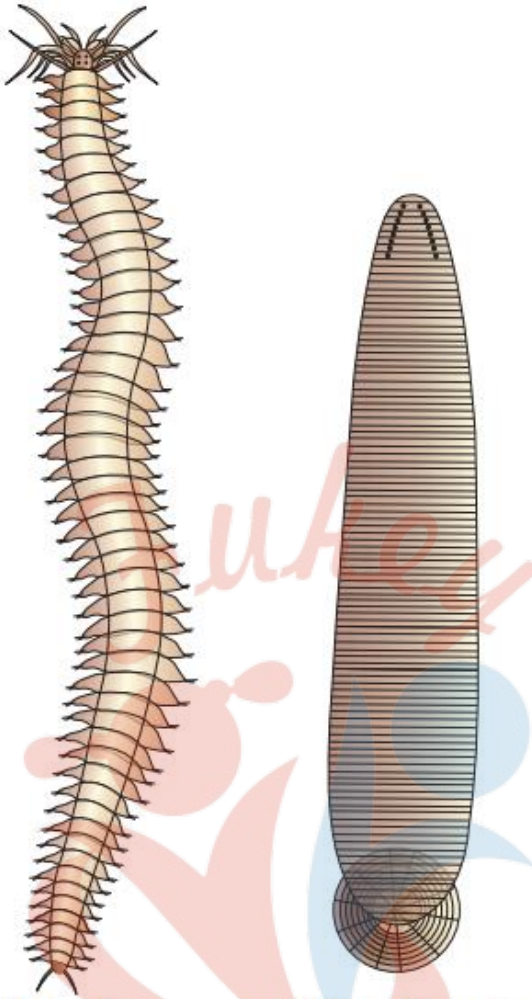
**Some Example of Aschelminthes**

## Phylum Annelida

Phylum—Annelida (Annulus — ring; lidos — form) includes segmented worms. The & term 'Annelida' was first coined by Lamarck (1809). It includes about 12,000 species of animals.

**General Features of Phylum Annelida:**

- Habit and Habitat They may be aquatic, terrestrial and free-living or parasitic.
- Body Wall The outermost covering of body is thin and moist cuticle secreted by the epidermis.
- Metamerism The body is divided into segments or metameres by ring like grooves-the annuli. It is called metameric segmentation. The segmentation is external as well as internal.
- Symmetry Annelids are bilaterally symmetrical.




**Some Examples of Annelida**

## Phylum Arthropoda

Phylum-Arthropoda (Arthron – jointed; podos — foot) include the first and simplest segmented animals. These are commonly called as jointed legged animals. It is the largest group of animals that include about 1,000,000 insect species, 1,02,248 spiders and scorpion species, 1,03,248 arachnoid species and 47,000 crustacean species representing about 80% of total known animal species.

**Some important general features of phylum Arthropoda are discussed below:**

- Habitat and Habit They may be aquatic or terrestrial. They may occur as free-living or parasitic forms e.g., Bed bugs, ticks, mosquitoes, etc.
- Body Parts Body is segmented externally. It has distinct head, thorax and abdomen. Head bears many fused segments and sense organs.
- Symmetry and Body Organization Arthropods are bilaterally symmetrical. They are

triploblastic with organ system level of organization.

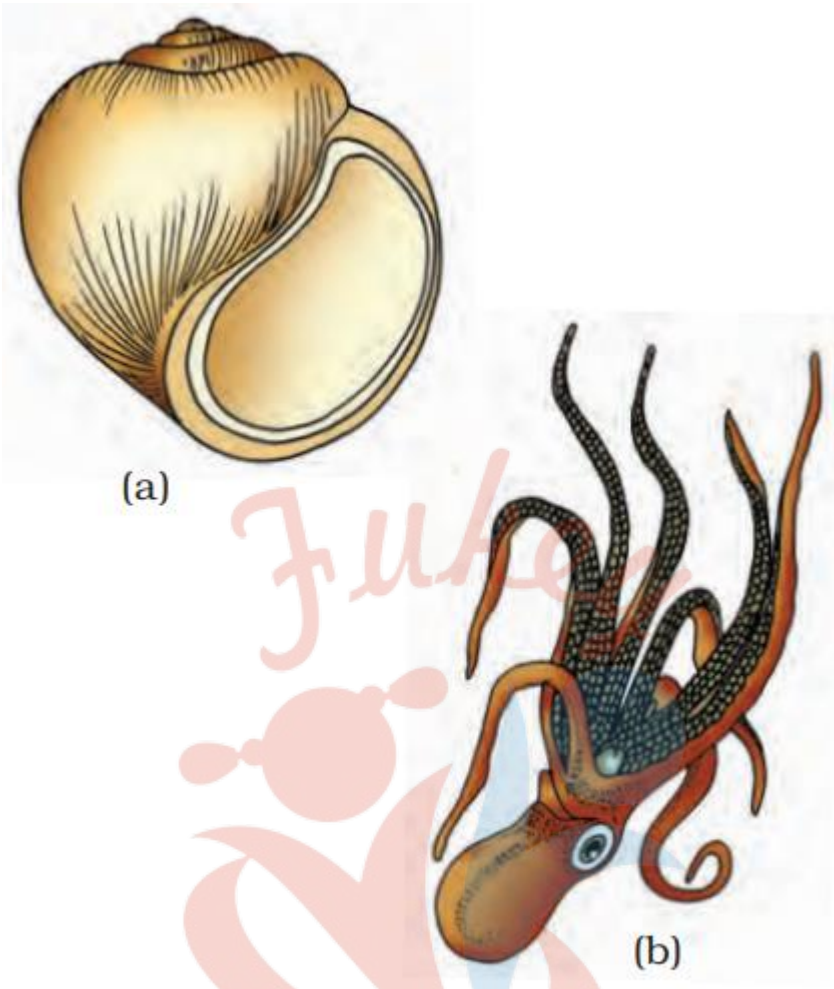
- Appendages They have jointed, paired appendages, which are present in some or all somite's or segments. These perform various functions like walking, clinging, jumping, feeding, etc.


## Phylum Mollusca

The phylum—Mollusca (Molluscs — soft bodied) includes the soft bodied, unsegmented, acoelomate animals. These are called molluscs or shelled animals. Johnston (1650) coined. the term 'Mollusca'. Mollusca is the second largest animal phylum and includes about 85,000 species. The study of molluscs is called 'Malacology'.

**Some important general features of phylum mollusca are discussed below:**

- Habit and Habitat Molluscs are mostly of marine forms (Sepia, Octopus, Chiton, etc.) Some are freshwater (e.g., Unio and Pila) and some are also terrestrial forms (e.g., Land snails). Few molluscs are parasites also, e.g., Glochidium larva, etc.
- Symmetry These are generally bilaterally symmetrical and some are asymmetrical due to torsion or twisting during growth.
- Germ Layers and Organization They are triploblastic and possess organ system level of organization.
- Body Form They have unsegmented, soft body covered by a calcareous shell, which is differentiated into head, muscular foot and visceral hump.




**Examples of Mollusca :**
**(a) Pila (b) Octopus**

## Phylum Echinodermata

Phylum—Echinodermata (Echinos—spines; derma—skin) includes the spiny skinned animals, which are exclusively marine. Jacob Klein (1734) coined the term 'Echinodermata'. It includes about 6,000 species.

**Some important general features of phylum—Echinodermata are discussed below:**

- Habit and Habitat These are marine forms and are bottom dwellers.
- Symmetry The adults have radial (pentamerous) symmetry but, the larval forms have bilateral symmetry.
- Germ Layers and Organization They are triploblastic and exhibit organ system grade of organization.
- Head It is absent in echinoderm and body also lacks segmentation.

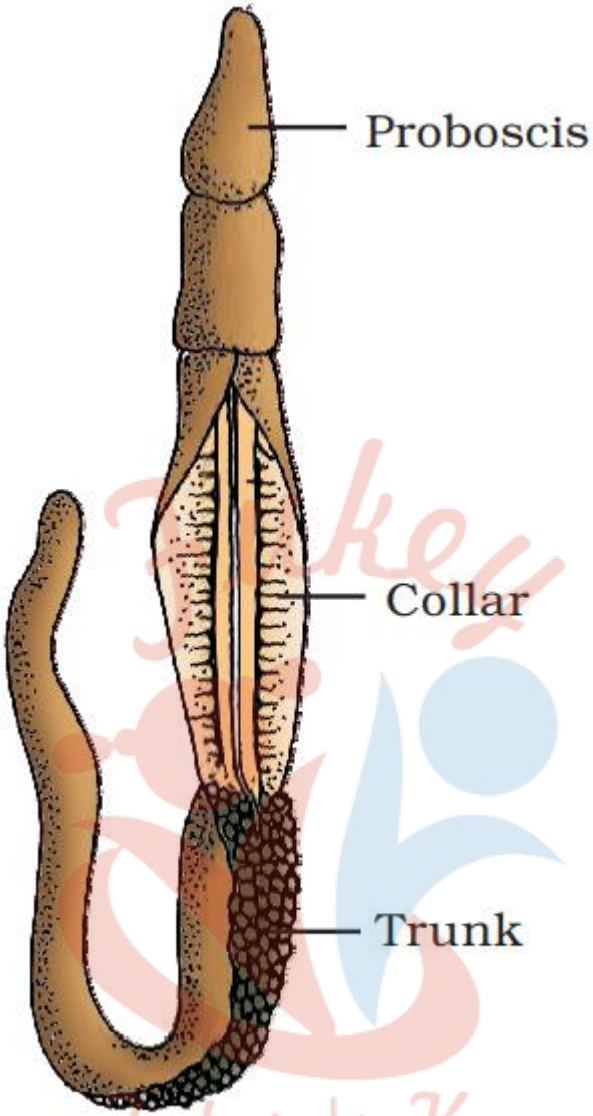

**Examples of Echinodermata: (a) Asterias (b) Ophiura**

## Phylum Hemichordate

Hemichordate (Hemi – half; chordate- notochord) was earlier placed as a sub-phylum under Phylum-Chordata. But, now it is considered as a separate phylum under Non-chordate. These are also called half chordates. This phylum consists of a small group of worm-like animal.

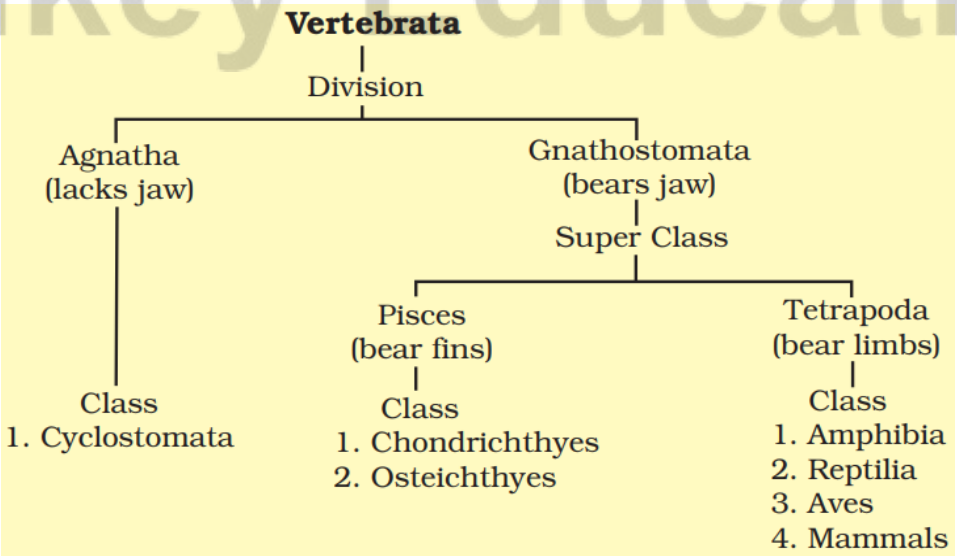
**Some important general features of phylum—hemichordate are discussed below:**

- Habit and Habitat They are exclusive marine and mostly live in burrows.
- Symmetry and Body Organization They are bilaterally symmetrical and triploblastic. They have organ system level of organization.
- Body Form They are soft-bodied, cylindrical and unsegmented body is divisible into proboscis, collar and trunk. The body cavity is true coelom. A true notochord is absent.
- Digestive Systems Digestive system is complete.




*Balanoglossus*

**The subphylum Vertebrata is further divided as follows:**



## Class Cyclostomata

- Cyclostomata are ectoparasites on some fishes.
- Elongated body & The presence of 6-15 pairs gills sites.
- Cyclostomes have a sucking and circular mouth without jaws.
- Scales on body and paired fins.
- Circulation is of closed type.
- They are marine but migrate for spawning to fresh water.

**Examples:** Petromyzon (Lamprey) and Myxine (Hagfish).

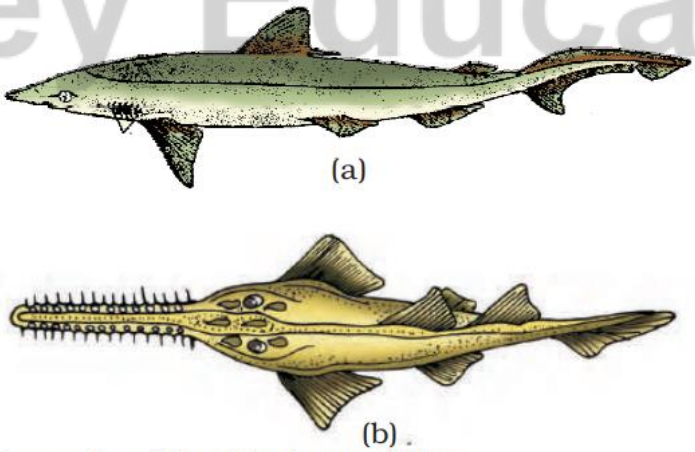
A jawless vertebrate - Petromyzon

## Class – Chondrichthyes

- Marine and streamlined body endoskeleton is cartilaginous.
- The skin is tough ventrally mouth gills are separated.
- Heart is two-chambered one auricle and one ventricle.
- They are Cold blooded, Sexes are separate & having internal fertilization many of them are viviparous.

**Examples:** Scoliodon (Dog fish), Pristis (Saw fish), Carcharodon (Great white shark), Trygon (Sting ray).






Example of Cartilaginous fishes:
(a) Scoliodon (b) Pristis

## Class – Osteichthyes

- Both marine and fresh water fishes with bony endoskeleton.
- Body is streamlined, terminal mouth, four pair of gills.
- Skin is covered with cycloid scales.
- Heart is two-chambered one auricle and one ventricle.
- cold-blooded animals, Sexes are separate, having external fertilization & mostly oviparous and development is direct.

**Examples:** Marine – Exocoetus (Flying fish), Hippocampus (Sea horse); Freshwater – Labeo (Rohu), Catla (Katla), Clarias (Magur); Aquarium – Betta (Fighting fish), Pterophyllum (Angel fish).

(a) (b)

Examples of Bony fishes :
(a) Hippocampus (b) Catla

## Class – Amphibia

- They can live in aquatic and terrestrial habitats, two pair of limbs.
- Body divide into head and trunk, tail may be present in some, skin is moist without

scales, A tympanum represents the ear.

- Alimentary canal, urinary and reproductive tracts open into a common chamber called cloaca.
- Respiration by gills, lungs and through skin, heart is three chambered two auricles and one ventricle.
- Cold blooded, Sexes are separate, fertilization is external oviparous and development is indirect.

**Examples:** Bufo (Toad), Rana (Frog), Hyla (Tree frog), Salamandra (Salamander), Ichthyophis (Limbless amphibia).


Examples of Amphibia: (a) Salamandra (b) Rana

## Class – Reptilia

- The mode of locomotion is creeping or crawling terrestrial animals body is covered by dry skin, epidermal scales or scutes.
- Do not have external ear openings Tympanum represents ear, Limbs when present is two paired, heart is three chambered but four chambered in crocodiles.
- Snakes and lizard's scales on skin, Sexes are separate. Fertilization is internal oviparous and development is direct.

**Examples:** Chelone (Turtle), Testudo (Tortoise), Chameleon (Tree lizard), Calotes (Garden lizard), Crocodilus (Crocodile), Alligator (Alligator). Hemidactylus (Wall lizard), Poisonous snakes – Naja (Cobra), Bangarus (Krait), Vipera (Viper).

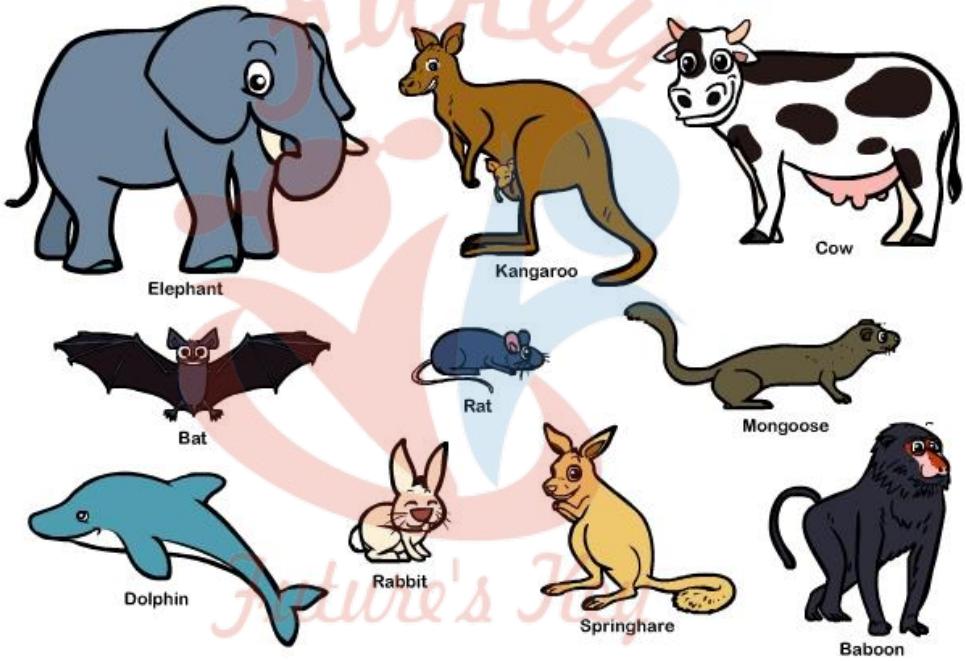
## Class – Aves

- Aves (birds) are the presence of feathers, They possess beak forelimbs are modified into wings, hind limbs have scales and are modified for walking, swimming or clasping.
- Endoskeleton is fully ossified (bony) and the long bones are hollow with air cavities (pneumatic). digestive tract of birds has additional chambers crop and gizzard.
- Heart is four chambered, warm-blooded respiration by lungs Sexes are separate. Fertilization is internal. They are oviparous and development is direct.

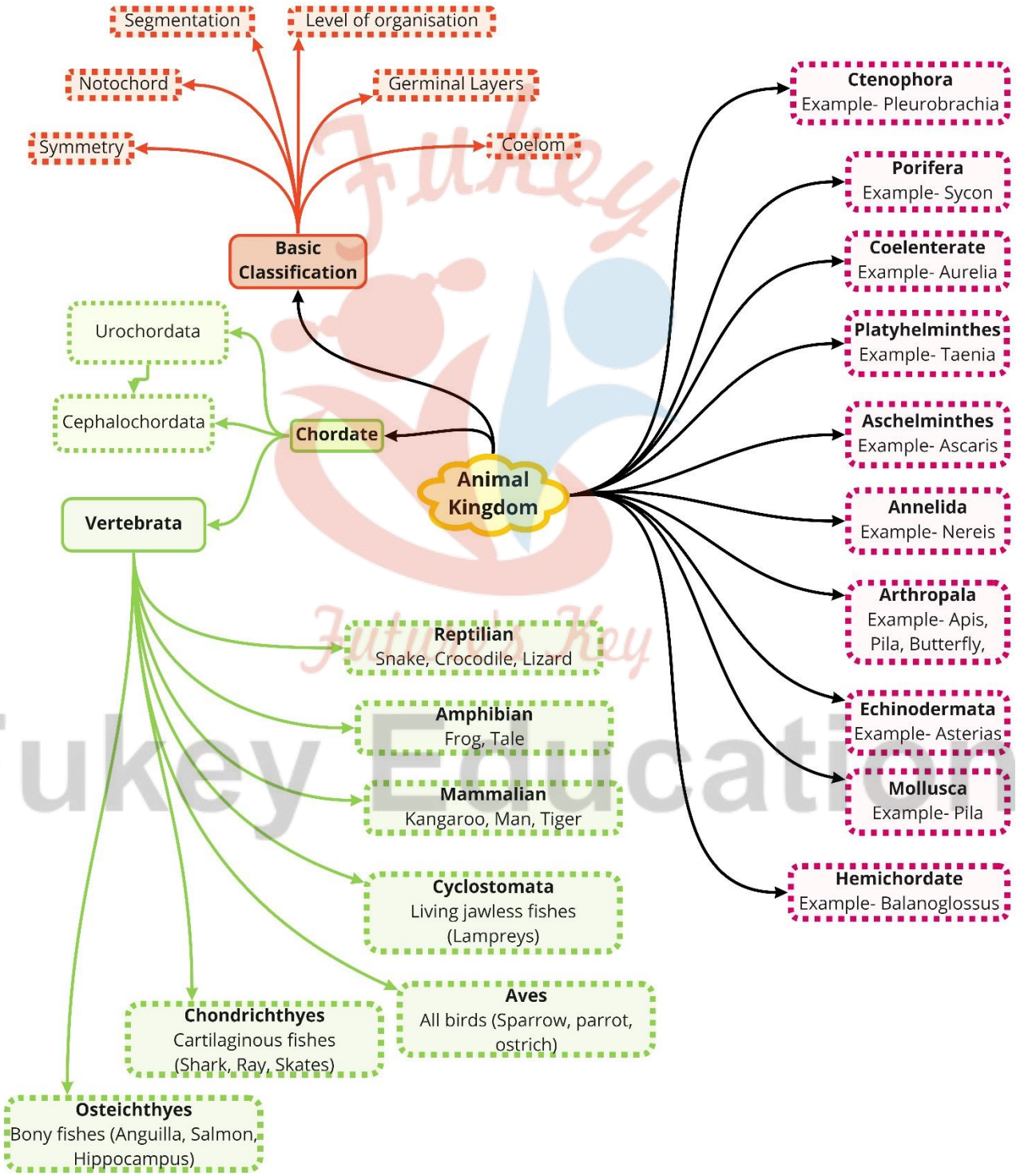
**Examples:** Corvus (Crow), Columba (Pigeon), Psittacula (Parrot), Struthio (Ostrich), Pavo (Peacock), Aptenodytes (Penguin), Neophron (Vulture).

## Class – Mammalia

- Presence of mammary glands milk producing glands by which young ones is nourished, two pairs of limbs, Skin is hairy, External ears or pinnae are present, Heart is four chambered, They are homoiothermous.
- Respiration is by lungs, Sexes are separate and fertilization is internal. They are viviparous with few exceptions and development is direct.
- Examples: Oviparous-Ornithorhynchus (Platypus); Viviparous - Macropus (Kangaroo), Pteropus (Flying fox), Camelus (Camel), Macaca (Monkey), Rattus (Rat), Canis (Dog), Felis (Cat), Elephas (Elephant), Equus (Horse), Delphinus (Common dolphin), Balaenoptera (Blue whale), Panthera tigris (Tiger), Panthera leo (Lion).



Class : 11th Biology
Chapter- 4 : Animal Kingdom



# Important Questions

## ➢ Multiple Choice Questions:

Question 1. Body cavity in arthoropods is

(a) Coelom

(b) Haemocoel

(c) Psuedocoel

(d) Coelenteron

Question 2. Digestion is sponges occur in

(a) Spongocoel

(b) Osculum

(c) Ostium

(d) Food Vacuoles

Question 3. Classification of Porifera is based on

(a) Branching

(b) Spicules (skeleton)

(c) Reproduction

(d) Symmetry

Question 4. Excretion in flatworms occurs by

(a) Nephridia

(b) Flame cells

(c) Malpighian tubules

(d) Green glands

Question 5. Bladder worm (cysticercus) is the larva of

(a) Liver fluke

(b) Tape worm

(c) Nereis

(d) Mussel

Question 6. A parasite having no intermediate host is

(a) Tape worm

(b) Liver fluke

(c) Ascaris

(d) Plasmodium

Question 7. Pair of hearts present in earthworm are

(a) One

(b) Two

(c) Three

(d) Four

Question 8. Mollusc group in which eye resemble the vertebrate eye is

(a) Bivalvia

(b)Gastropoda

(c) Scaphopoda

(d) Cephalopoda

Question 9. A phylum that includes exclusively marine animals is

(a) Porifera

(b) Coelanterata

(c) Protozoa

(d) Echinodermata

Question 10. Sea Star belongs to the class

(a) Crinoidea

(b) Echinoidea

(c) Asteroidea

(d) Qphiuroida

Question 11. Besides Annelida and Arthropoda, the metamerism is exhibited by

(a) Acanthocephala

(b) Chordata

(c) Mollusca

(d) Cestoda

Question 12. Which of the following is an egg laying mammal?

(a) Kangaroo

(b) Rattus

(c) Ornithorhvnchus

(d) Oryctolagus

Question 13. Which of the following is not a true amphibian?

(a) Salamander

(b) Frog

(c) Toad

(d) Tortoise

Question 14. Metamerism is a characteristic feature of the phylum

(a) Porifera

(b) Annelida

(c) Mollusca

(d) Platyhelminthes

Question 15. Animal without respiratory, circulatory and excretory systems are

(a) Liverflukes

(b) Tapeworms

(c) Sponges

(d) Thread worms

## ➢ Fill In the Blanks:

1. The body cavity, which is lined by mesoderm is called ……. Animals possessing coelom are called …….
2. An …….. digestive system has only a single opening to the outside of the body that serves as both mouth and anus.
3. A …….. digestive system has two openings …….. and ……..
4. The cicrulatory system may be of two types (i) ……, (ii) ……
5. Some sponges are ……..
6. Animals, in which the cells are arranged into two embryonic layers, an external …… and an internal endoderm, are called …….. animals.

## ➢ True or False:

1. Some Mammalia have even adapted to fly or live in water.

2. The digestive tract of birds has additional chambers, the crop and gizzard.
3. Reptiles are cold-blooded animals. Excretory organ is kidney.
4. The amphibian skin in moist
5. Osteichthyes body is streamlined. Mouth is mostly terminal in position.
6. Chondrichthyes skin in tough, containing minute placoid, scales, which are embedded in it. These animals are predatory and have powerful jaws with teeth.

## ➢ Very Short Question:

1. List the levels or grades of the organization
2. Define the term incomplete digestive system.
3. Define the term complete digestive system.
4. Define the term open-type circulatory system.
5. Define the term closed type circulatory system.
6. Define radial symmetry.
7. Define the bilateral symmetry
8. What is the diploblastic organization?
9. What is the triploblastic organization?
10. Define the coelom.

## ➢ Short Questions:

1. Discuss the level or grades of the organization.
2. Discuss the types of patterns in the organ system.
3. Define radial symmetry and bilateral symmetry.
4. Define the diploblastic and triploblastic organization.
5. Outline the role of body cavity and coelom in animals.
6. Define metamerism.
7. Draw the diagram broad classification of Kingdom Animalia based on common fundamental features.
8. Describe the phylum Cnidaria.

## ➢ Long Questions:

1. Describe the phylum Arthropods.
2. Describe the phylum Porifera.

## Assertion Reason Question-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

   (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

   (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

   (c) If Assertion is true but Reason is false.

   (d) If both Assertion and Reason are false.

   **Assertion:** Radial symmetry in animal helps in detecting food and danger.

   **Reason:** It enables the animal to respond to stimuli from any direction.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

   (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

   (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

   (c) If Assertion is true but Reason is false.

   (d) If both Assertion and Reason are false.

   **Assertion:** Animals that have an exoskeleton, lacks an endoskeleton.

   **Reason:** Skeleton cells in the embryonic stage migrate to either stage and produce exoskeleton or endoskeleton but never both.

## Case Study Based Question-

1. Direction Read the following and answer the questions that follow

   The water vascular system in echinoderms is a unique and defining characteristic that acts as a vital part of whole animal's body. It consists of hundreds to thousands of tubefeets that are found in the ambulacral grooves. Due to this, this system is also called ambulacral system. The water vascular system controls the tubefeets hydraulically through a complex of fluid-filled canals and reservoirs. In response, tubefeets perform various functions. Echinoderms also possess special structures for respiration.

   (i) The ambulacral system is ..... in origin.

   (a) ectodermal

   (b) mesodermal

   (c) coelomic

(d) endodermal

(ii) In echinoderms, tubefeet help in

(a) locomotion and food capture

(b) paralysing the prey

(c) the formation of leucocytes

(d) All of the above

(iii) The respiratory structure in echinoderms is

(a) dermal branchiae

(b) bursae

(c) tubefeet

(d) All of the above

(iv) The haemal system in echinoderms

(a) contains myoglobin pigment

(b) is of open type

(c) contains two-chambered heart

(d) All of the above

(v) **Assertion (A)** Tubefeet expand or contract due to the hydrostatic pressure within it.

**Reason (R)** They help to filtere the water that enter the water vascular system.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true, but R is not the correct explanation of A

(c) A is true, but R is false

(d) Both A and R are false

2. Direction Read the following and answer the questions that follow

Coelenterates are aquatic, mostly marine organisms exhibiting tissue level of organisation. Their body is characterised by tentacles, stinging cells and horny or calcareous exoskeleton. They possess well-defined gastrovascular cavity having single opening, polymorphism is one of the major characteristic of coelenterates. In this, the organism exists in different forms out of which one is sessile, while the other is free-swimming. These forms exhibit division of labour and alternation of generation. Major representative animals of this group are Adamsia, Physalia, Gorgonia, etc.

(i) A freshwater coelenterate is

(a) Hydra

(b) Obelia

(c) Aurelia

(d) Physalia

(ii) The exoskeleton of corals is composed of

(a) pectins

(b) keratin

(c) calcium carbonate

(d) calcium sulphate

(iii) Medusae form is seen in

(a) Hydra

(b) Aurelia

(c) Adamsia

(d) Both (b) and (c)

(iv) The comon name of Adamsia is

(a) sea fan

(b) jellyfish

(c) sea fur

(d) sea anemone

(v) One of the special character of Coelenterata, only is the occurrence of

(a) polymorphism

(b) flame cells

(c) hermaphroditism

(d) nematocysts



## ✓ Answer Key-

### ➢ Multiple Choice Answers:

1. (b) Haemocoel
2. (d) Food vacuoles
3. (b) Spicules (skeleton)
4. (b) Flame cells
5. (b) Tape wrom

6. (c) Ascaris
7. (d) Four.
8. (d) Cephalopoda
9. (d) Echinodermata
10. (c) Asteroidea
11. (d) Cestoda
12. (c) Omithorhynchus
13. (d) Tortoise
14. (b) Annelida
15. (c) Sponges

## ➢ Fill In the Blanks:

1. coelum, eucoelomates
2. incomplete
3. complete, mouth, anus
4. open type, closed type
5. asymmetrical
6. ectoderm, diploblastic

## ➢ True or False:

1. True
2. True
3. True
4. True
5. True
6. True

## ➢ Very Short Answers:

1. Answer:
   i. Cellular level
   ii. Tissue level
   iii. Organ level
   iv. Organ- system level
2. Answer: An incomplete digestive system has only a single opening to the outside of the

body that serves as both mouth and anus.

3. Answer: A complete digestive system has two openings, mouth, and anus.
4. Answer: Open type, with the blood being pumped out of the heart and bathing the cells and tissues.
5. Answer: Closed type, in which the blood is circulated through a series of tubes of varying diameters (arteries, veins, and capillaries)
6. Answer: When any plane passing through the central axis of the body- divides the organism (like spokes of a bicycle wheel) into halves that approximately mirror images, it is called radial symmetry:
7. Answer: Animals like annelids, arthropods, etc., where the body can be divided into identical left and right halves in only one plane, exhibit bilateral symmetry.
8. Answer: Animals, in which the cells are arranged into two embryonic layers, external ectoderm and internal endoderm, are called diploblastic animals.
9. Answer: Those animals in which the developing embryo has a third germinal layer, mesoderm, in between the ectoderm and endoderm are called triploblastic animals.
10. Answer: The body cavity is lined by a mesoderm is called coelom.

## ➢ Short Answer:

1. Answer: The kingdom Animalia includes multicellular heterotrophic animals, which exhibit different levels of organization as given below.

   Cellular LevelAnimal such as sponges, which are loose associations of cells, fall into this group. Some division of labor (activities) occurs among the cells, but these cells do not organize themselves into a definite tissue.

   Tissue Level Animals that have certain cells grouped together to form specific tissue are placed in this group, e.g. cnidarians and ctenophores.

   Organ Level This is observed in animals that have different kinds of tissues organized into distinct organs each specialized for a particular function, e.g. some platyhelminths.

   Organ-system Level Animals that have organs grouped together into functional systems, each system primarily concerned with a specific function are placed in this group, e.g., some platyhelminths, annelids, mollusks, arthropods, echinoderms, and chordates.

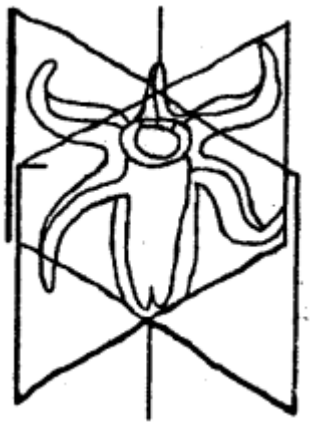
2. Answer: Various patterns of the complexity of organ systems serve as one of the useful criteria in classifying animals. For example, the digestive system may be absent, incomplete, or complete. An incomplete digestive system has only a single opening to the outside of the body that serves as both mouth and anus. A complete digestive system has two openings, mouth, and anus.

   Similarly, the circulatory system may be of two types

i. Open type, with the blood being pumped out of the heart and bathing the cells and tissues directly or,

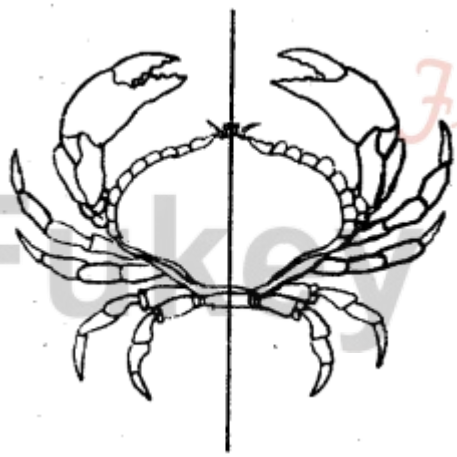
ii. Closed Type, in which the blood is circulated through a series of tubes of varying diameters (arteries, veins, and capillaries).

3. Answer: Animals can be grouped into two categories based on symmetry. When any plane passing through the central axis of the body divides the organism (like spokes of a bicycle wheel) into halves that approximately mirror images, it is called radial symmetry. Cnidarians, ctenophores, and echinoderms have this kind of body plan (a).



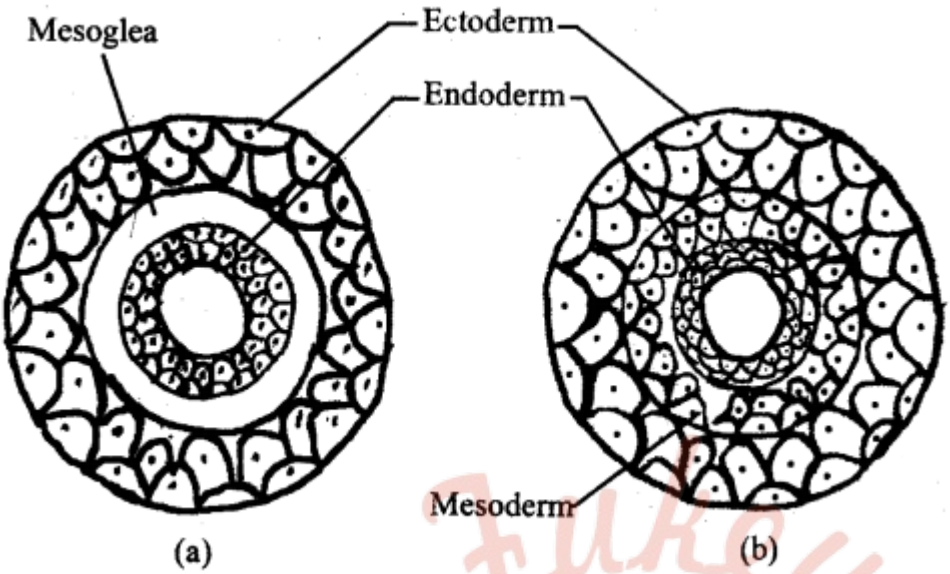
(a) Radial symmetry

Animals like annelids, arthropods, etc (b), where the body can be divided into identical left and right halves in only one plane, exhibit bilateral symmetry.



(b) Bilateral symmetry

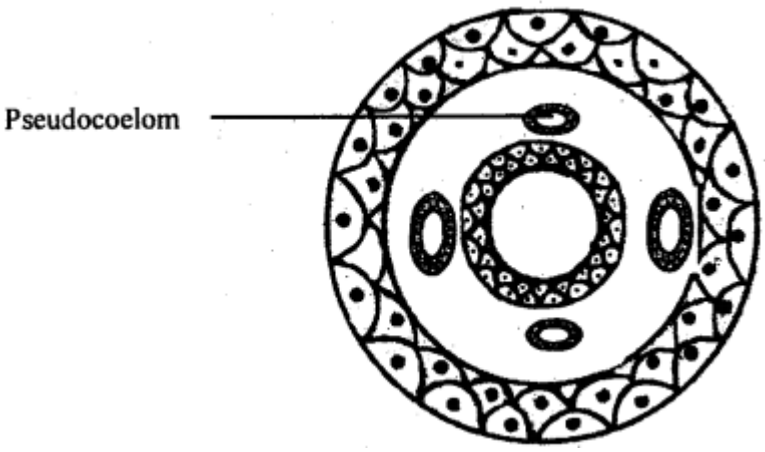
4. Answer: Animals, in which the cells are arranged into two embryonic layers, external ectoderm and internal endoderm, are called diploblastic animals in the below figure. Those animals in which the developing embryo has a third germinal layer, mesoderm, in between the ectoderm and endoderm are called triploblastic animals.



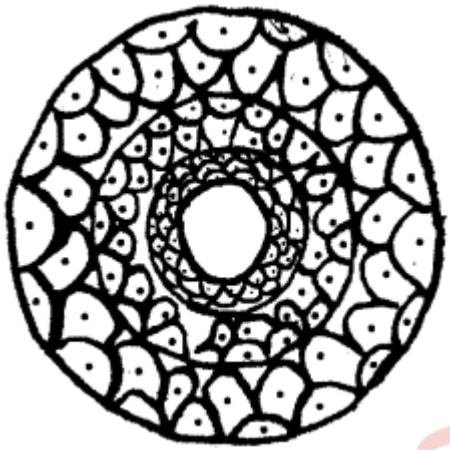

Showing germinal layers: (a) Diplobiastic (b) Triploblastic

5. Answer: The nature of the space (body cavity) between the body wall and alimentary canal is very important in the classification. The body cavity, which is lined by mesoderm is called a column. Animals possessing coelom are called coelomates (e.g. annelids, mollusks, arthropods, echinoderms,


(a) Diagrammatic sectional view of Coelomate



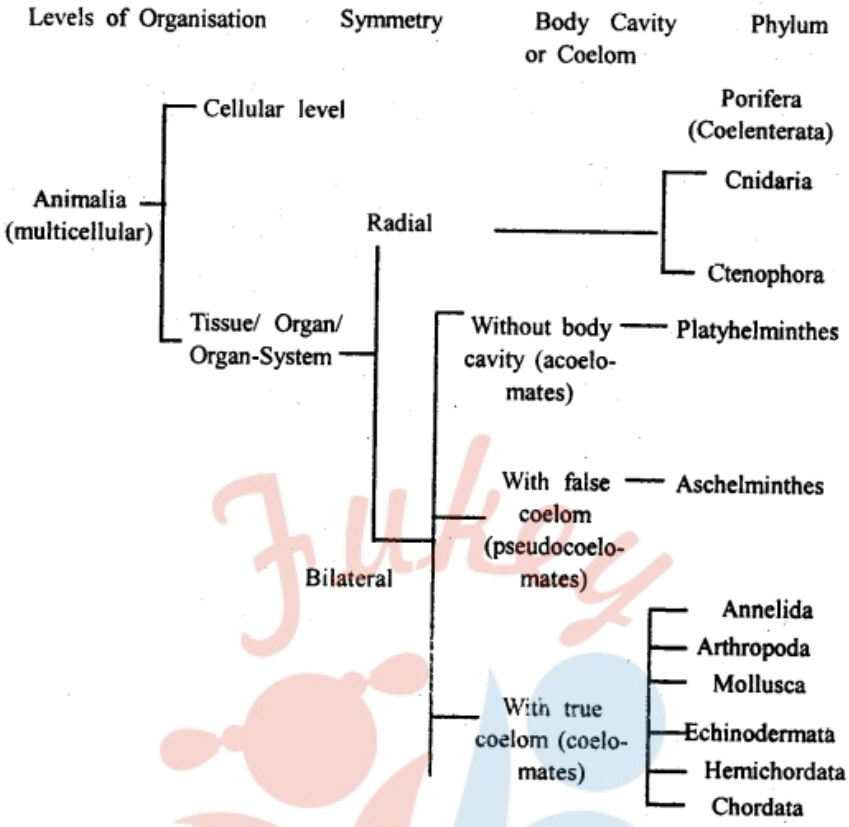
(b) Diagrammatic sectional view of Pseudocoelomate



(c) Diagrammatic sectional view of Aceolomate

hemichordates and chordates) (a). The animals in which the body cavity is absent are called acoelomates (e.g., platyhelminths) (c). In some animals, the body cavity is not lined by mesoderm. Instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocolor and the animals possing them are called pseudocoelomates (e.g., as helminths) (b)

6. Answer: In some animals (e.g., earthworm), the body has many segments, which show serial repetition of parts (like railway compartment). This kind of segmentation is called metameric segmentation, and the phenomenon is known as metamerism.
7. Answer:

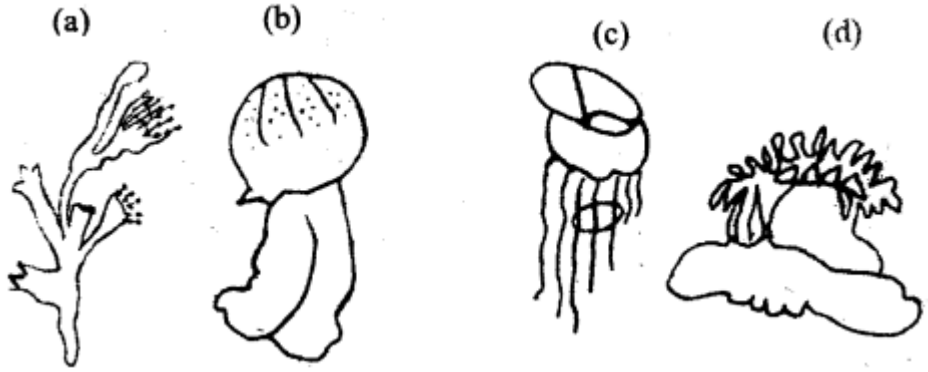



8. Answer: Cnidaria is aquatic, mostly marine, sessile, or free-swimming animals. The phylum name is derived from the stinging cells (nematocysts) or cnidoblasts present on the ectoderm of tentacles and on the body of these carnivorous animals. Cnidoblasts are used for anchorage, defense, and for capture of prey. Cnidarians exhibit tissue level of organization and exhibit radial symmetry. They are diploblastic.

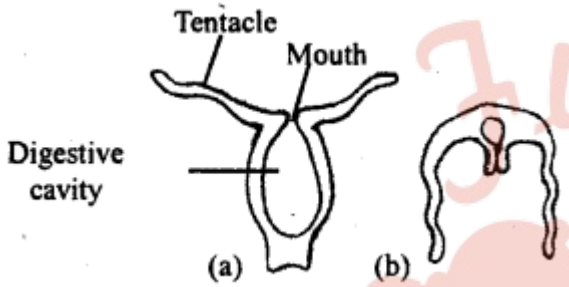
   The digestive system is incomplete. They have a central gastro-vascular cavity with a single opening, mouth. Digestion is extracellular and intracellular. Some of the cnidarians, e.g., corals, have skeletons composed of calcium carbonate.

   Cnidarians exhibit two basic body forms called a polyp (e.g., Hydra) and medusa (e.g., Auralia). The former, a sessile and cylindrical form, whereas, the latter, umbrella-shaped and free-swimming. Those cnidarians which exist in both forms exhibit alternation of generation, i.e. polyps asexually produce medusae and medusae forming the polyps sexually (e.g., Ophelia)

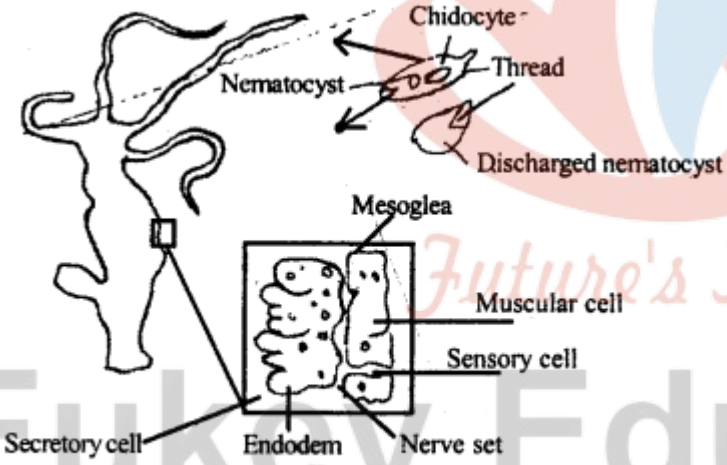
   Examples of cnidaria: Hydra, Porpita, Vellala, Physalia (Portuguese man-of-war), Aurelia (Jellyfish), Adamisia (Sea anemone), Pennatula (Sea- pen), Gorgonia (Sea-fan), and Meandrina (Brain coral).




Some cnidarians (a) Obelia (b) Jellyfish (c) Physalia (d) Sea anemone




Polyp and medusa body from (a) sessile poy (b) swimming medusa




Structure of Hydra

## ➢ Long Answer:

1. Answer: The phylum Arthropoda is the largest phylum of the animal kingdom consisting of more than 900,000 species, which include many economically important insects.

   i. They have an organ-system level of body organization. They are bilaterally symmetrical, triploblastic, segmented, and acoelomate animals.

   ii. The body of arthropods is covered by a chitinous cuticle which forms the exoskeleton. The body segments are fused to form the head, thorax, and abdomen.

iii. They have jointed appendages. The appendages are variously modified to form antennae, mouthparts, pincers (chelicerae), or walking legs.

iv. The digestive system is complete.

v. Respiratory organs are gills, book gills, book lungs, or tracheal system.

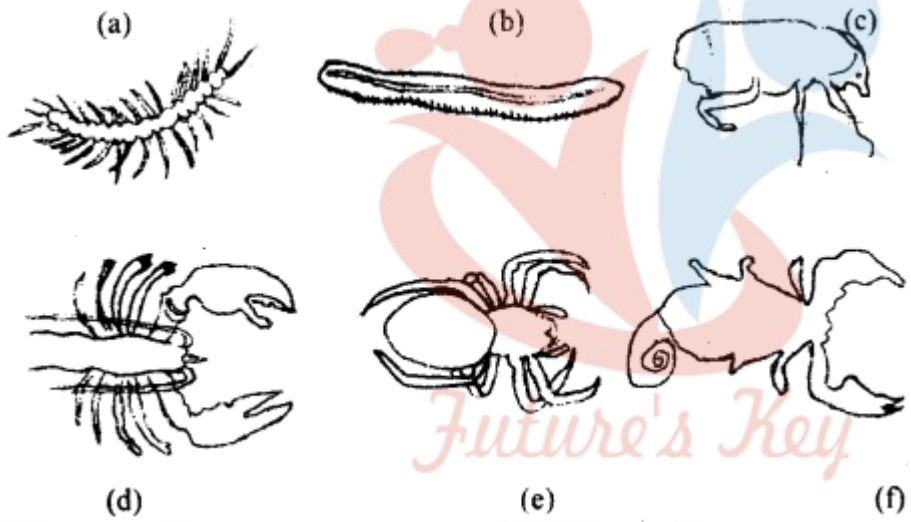
vi. The circulatory system is open type.

vii. The nervous system is almost similar to that of the annelids. Sensory organs include antennae for perceiving odor, receptors for taste, eyes (compound and simple), statocysts or balance, organs, and sound receptors.

viii. Excretion takes place through green glands or malpighian tubules.

ix. They are mostly dioecious. Reproduction is sexual. Fertilization is usually internal. They are mostly oviparous.

Development may be direct or indirect, passing through many larval stages. The process of transformation of a larva into an adult is called metamorphosis.




Some common arthropods (a) Centipede (b) Millipede (c) Beetle (d) Prawn (e) Spider and (f) Scorpian

Examples of Arthropoda: Araneus (Garden spides), Limulus (King crab),

Buthus (Scorpion), Scolopendra (Centipede), Cancer (Common crab), Balanus (Barnacle), Lepisma (Silverfish), Periplaneta (Cockroach), Apis (Bee) Anopheles (Mosquito), Musca (Housefly), Charaxes (Butterfly), Attelabus (Beetle), Locusta (Locust) and An ax (Dragonfly).

2. Answer: Members of this phylum are commonly known as sponges. They are generally marine, diploblastic bilaterally symmetrical with a significant water transport mechanism. They are considered as very primitive multi-cellular animals and have a cellular level of organization.

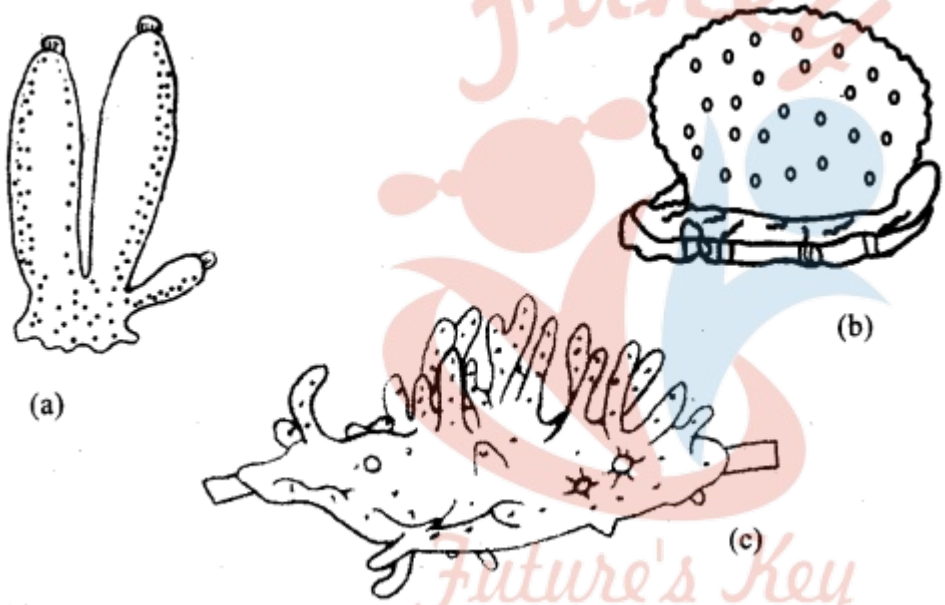
Water can enter through minute pores (Ostia) in the body wall directly or through the

canal into a central cavity, spongocoel, from where it goes out through the osculum.

This pathway of water transport is called the canal system and is helpful in food gathering, respiratory exchange, and removal of water. Choanocytes or collar cells line the spongocoel and the canals. Digestion is intracellular. The body is supported by a skeleton made up of spicules or spongin fibers.

Sexes are not separate (monoecious/hermaphrodite/bisexual), i.e., eggs and sperms are produced by the same individual. Sponges reproduce asexually by fragmentation and sexually by the formation of gametes. Fertilization is internal and development is indirect having a larval stage that is morphologically distinct from the adult.

Examples of Porifera are Sycon (Scypha), Spongilla, Chalina, (Dead man's finger), and Euspongia (Bath sponge)




Examples for Porifera: (a) Sycon (b) Euspongia (c) Spongilla

## Assertion Reason Answer-

1. (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

   **Explanation:** Radial symmetry is advantageous for an animal in responding to stimuli from any direction thereby allowing it to detect food and danger easily.

2. (d) If both Assertion and Reason are false.

   **Explanation:** Many animals have an endoskeleton and exoskeleton such as Chelon-turtle or Testudo-tortoise. Exoskeleton of other animals include chitinous plate, calcareous shell, horny scales, feathers, hair, claws, nails, hoofs, horns and antlers.

## Case Study Based Answer-

1. **Answer:**

   (i) (c)

(ii) (a)

(iii) (d)

(iv) (b)

(v) (c)

**2. Answer:**

(i) (a)

(ii) (c)

(iii) (b)

(iv) (d)

(v) (d)