

Chapter-4

ANIMAL KINGDOM

POINTS TO REMEMBER

Circulatory System : Open type : Blood pumped out through heart. Cells and tissues are directly bathed in it.

Closed type : Blood is circulated through vessels.

Symmetry : • Asymmetrical : Cannot be divided into equal halves through median plane. *e.g.*, Sponges.

• **Radial symmetry :** Any plane passing through central axis can divide organism into equal halves. *e.g.*, *Hydra*.

• **Bilateral symmetry :** Only one plane can divide the organism into equal halves. *e.g.*, Annelids and Arthropods.

CLASSIFICATION ON BASIS OF GERMINAL LAYERS :

Diploblastic : Cells arranged in two embryonic layers *i.e.* external ectoderm and internal endoderm. (Mesoglea may be present in between ectoderm and endoderm) *e.g.*, Coelentrates. (Cnidarians)

Triploblastic : Three layers present in developing embryo *i.e.*, ectoderm, mesoderm and endoderm *e.g.*, Chordates.

Coelom (Body cavity which is lined by mesoderm)

Coelomates : Have coelom *e.g.*, Annelids, Chordates etc.

Pseudocoelomates : No true coelom as mesoderm is present in scattered pouches between ectoderm and endoderm. *e.g.*, Aschelminthes.

Acoelomates : Body cavity is absent. *e.g.* Platyhelminthes.

Metamerism : If body is externally and internally divided into segments with serial repetition of atleast some organs then phenomenon is called metamerism. *e.g.*, Earthworm.

Notochord : Rod-like structure formed during embryonic development on the dorsal side. It is mesodermally derived. *e.g.*, Chordates.

PHYLUM PORIFERA : • Also called sponges.

• Are usually marine and asymmetrical.

- Have cellular level of organisation.
- Food gathering, respiratory exchange and removal of wastes occurs through water canal system. Digestion intracellular.
- Ostia (minute pores on body), spongocoel (body cavity) and osculum help in water transport. They are lined by choanocytes (collar cells).
- Body wall has spicules and spongin fibres.
- Animals are hermaphrodite. Fertilisation internal. Development is indirect (*i.e.*, has a larval stage distinct from adult stage) *e.g.*, ***Sycon*, *Euspongia***.

PHYLUM COELENTERATA : • Also called Cnidarians.

- Are usually marine and radially symmetrical.
- Have tissue level of organisation
- Are diploblastic
- Food gathering, anchorage and defense occurs through cnidoblasts present on tentacles.
- Digestion extracellular and intracellular.
- Have gastro-vascular cavity and an opening, hypostome.
- Body wall composed of calcium carbonate.
- Exhibit two body forms : polyp and medusa *e.g.*, ***Hydra*, *Aurelia***.
- Alternation of generation between body forms called Metagenesis occurs in ***Obelia*** where Medusa $\xrightarrow{\text{sexually}}$ Polyp.
 $\xleftarrow{\text{Asexually}}$
- *e.g.*, ***Physalia*, *Adamsia***.

PHYLUM CTENOPHORA : • Also called as sea walnuts or comb jellies.

- Are exclusively marine, radially symmetrical.
- Have tissue level organisation, are diploblastic.
- Digestion both extra and intracellular.
- Body has eight external rows of ciliated comb plates for locomotion.
- Show Bioluminescence (living organism emit light).
- Only sexual reproduction occurs. External fertilisation. Indirect development. *e.g.*, ***Ctenoplana***.

PHYLUM PLATYHELMINTHES : • Also called as 'flat worms'.

- Have dorsoventrally flattened body. Are endoparasites in animals.
- Are bilaterally symmetrical, triploblastic, acoelomate.
- Absorb nutrients through body surface.
- Parasite forms have hooks and suckers.
- 'Flame cells' help in osmoregulation and excretion.
- Fertilisation internal. Many larval stages. *Planaria* has high regeneration capacity.

e.g., Taenia, Fasciola.

PHYLUM ASCHELMINTHES : • Also called 'round worms'.

- May be free living, parasitic, aquatic or terrestrial.
- Are bilaterally symmetrical, triploblastic, pseudocoelomate.
- Alimentary canal complete (has muscular pharynx), wastes removed through excretory pore.
- Sexes separate. Shows dimorphism.
- Females longer than males.
- Fertilisation internal. Development direct or indirect.

e.g., Ascaris, Wuchereria.

PHYLUM ANNELIDA : • Are aquatic or terrestrial, free-living or parasitic.

- Are bilaterally symmetrical, triploblastic, organ-system level of organisation and metamerically segmented body.
- Have longitudinal and circular muscles for locomotion.
- *Nereis* (dioecious and aquatic annelid) has lateral appendages called parapodia for swimming.
- Have nephridia for osmoregulation and excretion.
- *e.g.,* Earthworm (*Pheretima*) and Leech (*Hirudinaria*) which are hermaphrodites (*i.e., monoecious*).

PHYLUM ARTHROPODA : • Largest phylum of Animalia.

- Are bilaterally symmetrical, triploblastic and organ system level of organisation, coelomate.

- Body divisible into head, thorax, abdomen and has a chitinous exoskeleton. Jointed appendages are present.
- Respiration by gills, book gills, lungs or tracheal system. Excretion through malpighian tubules.
- Sensory organs : Antennae, eyes; Organs of balance : Statocysts.
- Fertilisation internal. Development is indirect or direct. Are mostly oviparous.

e.g., Apis, Bombyx, Anopheles, Locusta, Limulus.

14. PHYLUM MOLLUSCA : • Second largest phylum of Animalia.

- Are bilaterally symmetrical, triploblastic and organ system level of organisation, coelomate.
- Body divisible into head, muscular foot and visceral hump and is covered by calcareous shell and is unsegmented.
- Mantle : Soft and spongy layer of skin; Mantle cavity : Space between visceral hump and mantle.
- Respiration and excretion by feather like gills in mantle cavity.
- Head has sensory tentacles. Radula-file like rasping organ for feeding.
- Are oviparous, dioecious, have indirect development.

e.g., Pila, Pinctada, Octopus.

PHYLUM ECHINODERMATA : • Are spiny bodied organisms.

- Are exclusively marine, radially symmetrical in adult but bilaterally symmetrical in larval stage. Organ system level of organisation.
- Digestive system complete. Mouth ventral, Anus on dorsal side.
- Food gathering, respiration, locomotion carried out by water vascular system.
- Excretory system is absent.
- Fertilisation external. Development indirect (free swimming larva)
- *e.g., Asterias, Cucumaria.*

PHYLUM HEMICHORDATA : • Has small worm-like organisms.

- Was earlier placed as sub-phylum of Phylum Chordata.
- Bilaterally symmetrical, triploblastic and coelomate.

- Body cylindrical, has proboscis, collar and trunk.
- Respiration by gills, excretion by proboscis gland.
- Sexes separate, external fertilisation, indirect development.

e.g., Balanoglossus

PHYLUM CHORDATA • Presence of Notochord

- Have dorsal hollow nerve chord.
- Have paired pharyngeal gill slits.
- Heart is ventral.
- Post anal tail present.

(i) SUB-PHYLA UROCHORDATA

- Notochord present only in larval tail.

e.g., Ascidia, Sepia.

(ii) SUB-PHYLA CEPHALOCHORDATA

- Notochord extends from head to tail.

e.g., Amphioxus.

(iii) SUB-PHYLA VERTEBRATA

- Have notochord only during embryonic period.
- Notochord gets replaced by bony or cartilaginous vertebral column.
- Have ventral muscular heart, paired appendages and kidneys for excretion and osmoregulation.

SUB-PHYLUM VERTEBRATA

(a) AGNATHA (Lack Jaw) : Class : Cyclostomata

- Have sucking and circular mouth without jaws.
- Live as ectoparasites on some fishes.
- No scales, no paired fins.
- Cranium and vertebral column is cartilaginous.
- Migrate to fresh water for spawning and die after spawning.
- Larva returns to ocean after metamorphosis.

e.g., Petromyzon.

(b) **GNATHOSTOMATA (Bear Jaws)**

SUPER-CLASS : PISCES

1. Class : Chondrichthyes

- Have cartilagenous endoskeleton.
- Mouth ventral.
- Gill slits without operculum
- Skin has placoid scales.
- Usually oviparous, fertilisation internal.
- No air bladder, so swim constantly to avoid sinking.
- Teeth are backwardly directed, modified placoid scales.
- Notochord is persistent throughout life. Males have claspers on pelvic fins.
- *e.g., Torpedo, Trygon, Scoliodon.*

2. Class : Osteichthyes

- Have bony endoskeleton.
- Mouth is usually terminal.
- Four pairs of gill slits covered by operculum.
- Skin has cycloid/ctenoid scales.
- Usually viviparous, fertilisation external.
- Have air bladder which regulates buoyancy.
- *e.g., Hippocampus, Labeo, Catla, Betta.*

SUB-PHYLUM VERTEBRATA : GNATHOSTOMATA

SUPER CLASS : TETRAPODA

1. Class : Amphibia

- Can live in aquatic as well as terrestrial habitats.
- Body divisible into head and trunk.
- Skin moist. No scales.
- Tympanum represents ear.
- Cloaca is the common chamber where alimentary, urinary and reproductive tracts open.

- Respiration by gills, lungs or skin.
- Heart is 3-chambered.
- Oviparous. Indirect development.
- e.g., *Bufo*, *Rana*, *Hyla*.

2. Class : Reptilia

- Creep or crawl to locomote.
- Body has dry and cornified skin and epidermal scales or scutes.
- Tympanum represents ear.
- Limbs when present are two pairs.
- Snakes and lizards shed scales as skin cast.
- Heart 3-chambered but 4-chambered in crocodiles.
- Oviparous. Direct development.
- e.g., *Testudo*, *Naja*, *Vipera*, *Calotes*.

3. Class : Aves

- Presence of feathers and beak.
- Forelimbs are modified into wings.
- Hind limbs have scales.
- No glands on skin except oil gland at base of tail.
- Endoskeleton bony with air cavities (pneumatic) and hollow bones to assist in flight.
- Air sacs are connected to lungs to supplement respiration.
- Oviparous. Direct development.
- e.g., *Columba*, *Struthio*.

4. Class : Mammalia

- Have mammary glands to nourish young ones.
- Have two pairs of limbs.
- Skin has hairs.
- External ears or pinna present.
- Different types of teeth in jaw.
- Viviparous. Direct development.
- e.g., *Rattus*, *Canis*, *Elephas*, *Equus*. Oviparous mammal is *Ornithorhynchus*.

QUESTIONS

Very Short Answer Questions (1 mark each)

1. What is mesogloea ? Where is it found ?
2. When is the development of an organism called as Indirect ?
3. Why are corals important ?
4. What is the difference between class Amphibia and class Reptilia in respect of their skin ?
5. Which phylum consists of organisms with cellular level of organisation ?
6. Name the arthropod which is a (i) Living fossil, (ii) Gregarious pest.
7. Which organ helps in excretion in (i) Arthropods, (ii) Hemichordates ?

Short Answer Questions-II (2 marks each)

8. Distinguish between poikilothermous and homoiothermous organisms.
9. Define metagenesis with a suitable example.
10. List the characteristic features of class Mammalia.

Short Answer Questions-I (3 marks each)

11. What is the difference between organisms on the basis of the coelom ? Give examples for each.
12. Compare the water transport (vascular) system of poriferans and the echinoderms.
13. What are the features of class Aves which help them in flying ?

Long Answer Questions (5 marks each)

14. Distinguish between the chordates and non-chordates.
15. Differentiate between class Chondrichthyes and class Osteichthyes.

ANSWERS

Very Short Answers (1 mark each)

1. Undifferentiated layer present between ectoderm and endoderm. It is found in Coelenterates.
2. Have a larval stage morphologically distinct from adult.
3. Have skeleton composed of calcium carbonate which gets deposited and can lead to formation of land forms. *e.g.*, Lakshadweep (a coral island).

4. **Class Amphibia** : Have moist skin without scales.

Class Reptilia : Have dry cornified skin with scales.

5. Phylum Porifera.

6. (i) *Limulus* (King crab), (ii) *Locusta* (Locust)

7. (i) Malpighian tubules, (ii) Proboscis gland.

Short Answers-II (2 marks each)

8. **Poikilothermous** (cold blooded) : Lack ability to regulate their body temperature.

Homoiothermous (warm blooded) : Can regulate body temperature.

9. Refer 'Points to Remember',

10. Refer 'Points to Remember',

Short Answers-I (3 marks each)

11. Refer 'Points to Remember',

12. Refer 'Points to Remember', NCERT, Text Book of Biology for Class XI.

13. Wings, bones long and hollow with air cavities, air sacs connected to lungs to supplement respiration.

Long Answers (5 marks each)

14. Refer Table 4.1, page 55, NCERT, Text Book of Biology for Class XI.

15. Refer 'Points to Remember'.