04 Animal Kingdom

01. INTRODUCTION

- When you look around, you will observe different animals with different structures and forms.
- As over a million species of animals have been described till now, the need for classification becomes all the more important.
- On this basis, life is defined as a physiochemical entity exhibiting growth, movement, irritability and reproduction.
- The classification also helps in assigning a systematic position to newly described species.

Important Phyla :

1.	Porifera	Sponges (*Leucosolenia, Sycon*)
2.	Coelenterata/ Cnidaria	*Hydra*, Jellyfish
3.	Ctenophora	*Pleurobrachia, Ctenoplana*
4.	Platyhelminthes	Flatworms (e.g. Tape worm)
5.	Nemathelminthes / Aschelminthes	Roundworm (e.g. *Ascaris*)
6.	Annelida	Earthworm, Leech etc.
7.	Arthropoda	Insect, Scorpion, fly etc.
8.	Mollusca	Snail, *Pila*, *Octopus* etc.
9.	Echinodermata	Star fish
10.	Hemichordata	*Balanoglossus*
11.	Chordata	Fish, Snake, Birds, Monkey etc.

02. BASIS OF CLASSIFICATION

- Inspite of differences in structure and form of different animals, there are fundamental features common to various individuals in relation to the arrangement of cells, body symmetry, nature of coelom, patterns of digestive, circulatory or reproductive systems. These features are used as the basis of animal classification and some of them are discussed here.

(i) Level of organisation (ii) Symmetry
(iii) Germinal (Embryonic) layer (iv) Coelom (Body cavity)
(v) Metamerism (vi) Body plan
(vii) Notochord (viii) Circulatory system

Levels of Organisation :

Though all members of Animalia are multicellular, all of them do not exhibit the same pattern of organisation of cells.

Cellular level → In Sponges, cells are arranged as loose cell aggregates and division of labour occurs among cells (Tissues absent).

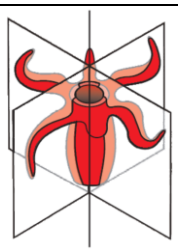
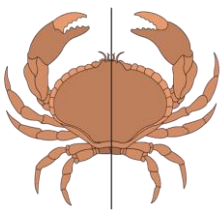
Tissue level → In coelenterates and ctenophores, cells performing the same function are arranged into tissues.

Organ level → In platyhelminthes, tissues are grouped together to form organs.

Organ system level → In higher animals, organs further organise to form organ systems.
e.g., Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata, Hemichordata, Chordata

Symmetry : It is the arrangement of similar body parts on 2 sides of main axis of the body.

Animals on the basis of symmetry are of three types

ASYMMETRICAL	RADIALLY SYMMETRICAL	BILATERALLY SYMMETRICAL
Body cannot be divided into 2 similar parts. **e.g.,** Most Poriferans, Snails.	When any plane passing through the central axis of the body divides the organism into two identical halves. **e.g.,** Some Poriferans (*Sycon* and *Leucosolenia*), Cnidarians, Ctenophores and adult Echinoderms.	Here, body can be divided into identical right & left halves in only one plane. **e.g.,** Platyhelminthes to Chordata (except adult Echinodermata).
		 

Germinal Layers :

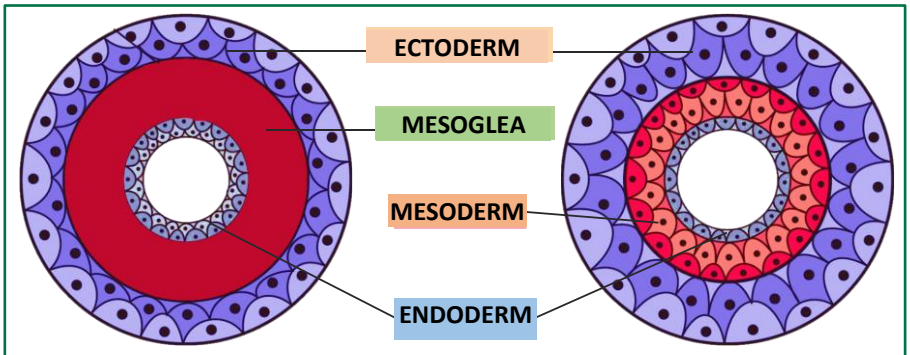
GERMINAL LAYERS

Diploblastic Animals

- 2 germ layers- outer ectoderm and inner endoderm.
- In between these layers, an undifferentiated jelly like layer called **mesoglea** is present.
  e.g, Cnidaria and Ctenophora

Triploblastic Animals

- 3 germ layers- outer ectoderm, middle mesoderm and inner endoderm.
  e.g, Platyhelminthes to Chordates



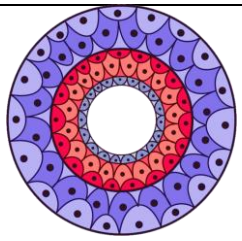
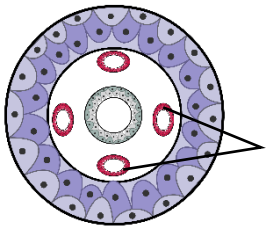
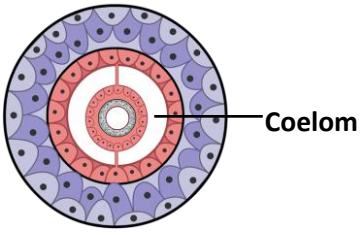
Germinal Layers : (a) Diploblastic (b) Triploblastic

NCERT Question :

How useful is the study of the nature of body cavity and coelom in the classification of animals?

Body Cavity or Coelom :

- Presence or absence of a cavity between the body wall and gut wall is very important in classification.

Acoelomate	Pseudo-coelomate (False coelomate)	Coelomate (True coelom)
Body cavity is absent. **e.g,** Porifera to Platyhelminthes	Body cavity is not lined by mesoderm, instead mesoderm is present as scattered pouches in between ectoderm and endoderm. **e.g.** Aschelminthes	Coelom is lined by mesoderm, and filled with coelomic fluid. **e.g.** Annelida to Chordata
		

- The coelom is a protective cushion for the internal organs of the animals. In worms, the coelom acts as hydro skeleton. Coelom allows the movement of internal organs.

Segmentation :

- **Metameric :** In Annelids, Arthropods and Chordates.
- In these animals, the body is externally and internally divided into segments with a serial repetition of atleast some organs, for example in earthworm, body shows this pattern called metameric segmentation and this phenomenon is known as metamerism.

Body Plan :

BODY PLAN

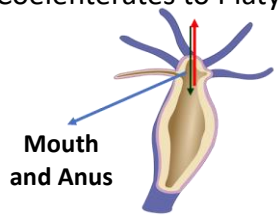
Cell-aggregate type

e.g. Porifera

Blind sac body type

Found in animals having incomplete digestive tract i.e., single opening to the outside of the body that serves as both mouth and anus.

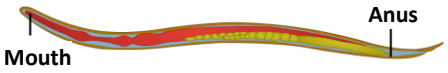
e.g. Coelenterates to Platyhelminthes



Tube with in tube

Found in those animals having complete digestive tract i.e. with separate openings mouth and anus.

e.g. Aschelminthes to Chordates.



NCERT Question :

Distinguish between intracellular and extracellular digestion?

Ans.

Intracellular digestion	Extracellular digestion
Occurs inside food vacuole within the cell.	Occurs outside the cell in the lumen of alimentary canal.
Digestive enzymes in the lysosomes are secreted into the food vacuole.	Glands of alimentary canal secrete digestive enzymes into the lumen.
Only chemical digestion of food occurs.	Both mechanical & chemical digestion occurs.
Occurs in protozoans and poriferans.	Occurs in Aschelminthes to Mammals.

In Coelenterata and Ctenophora both intracellular as well as extracellular digestion takes place.

Notochord :

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

NOTOCHORD

Non-chordates
Animals without notochord
e.g :- Porifera to Hemichordata

Chordates
Animals with notochord
e.g :- Chordata

Circulatory System :

CIRCULATORY SYSTEM

Open type

In which the blood is pumped out of the heart and the cells & tissues are directly bathed in it.

e.g. Arthropods, Molluscs, Echinodermates, Hemichordata.

Closed type

In which the blood is circulated through a series of vessels of varying diameter i.e. Arteries, Veins and Blood Capillaries.

e.g. Annelids and most of the Chordates.

NCERT Question :

What is the difference between direct and indirect development?

Development :

DEVELOPMENT

Indirect

It is a type of development that involves sexually immature larval stage (having different food requirements than adult).

e.g. Most invertebrates and amphibians.

Direct

It is a type of development in which an embryo develops into a mature individual without involving a larval stage.

e.g. Fishes, Reptiles, Birds and Mammals.

Oviparous/Viviparous :

Oviparous :- Egg laying animals are called oviparous.

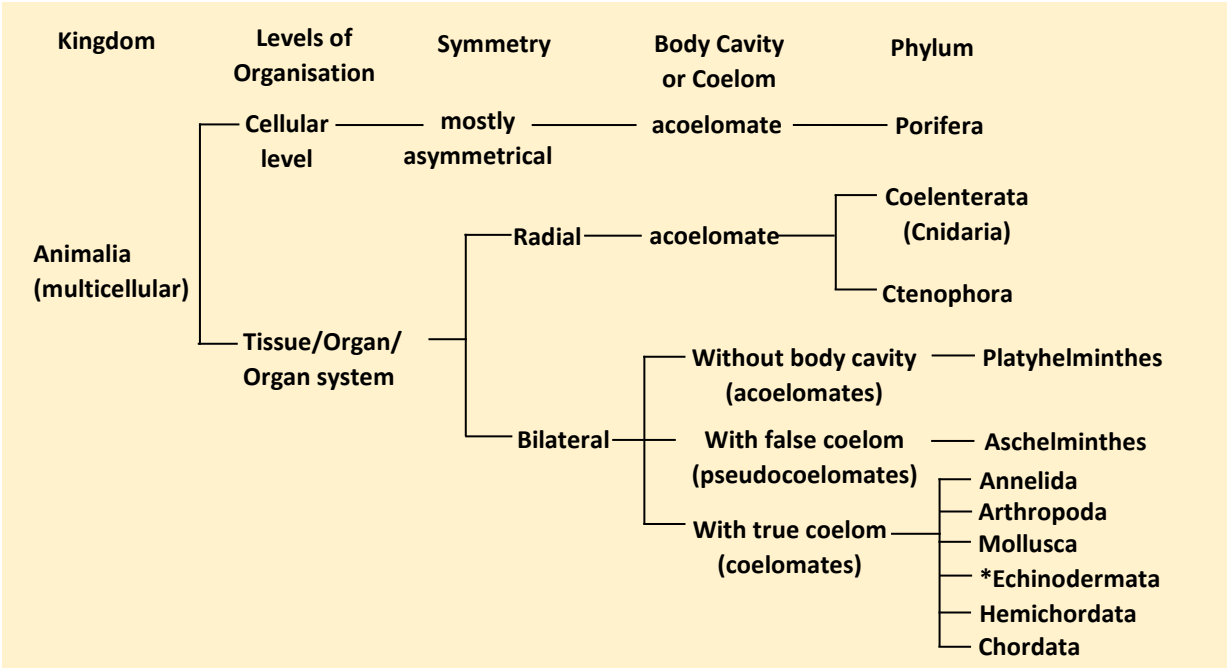
Viviparous :- Animals giving birth to young ones rather than laying eggs are called viviparous.

NCERT Question :

Could the number of eggs or young ones produced by an oviparous and viviparous mother be equal? Why?

Ans. In case of oviparous organisms most of the initial development of young one is occurring in the outside environment and is prone to environmental factors like high wind, being eaten up by other animals.

In viviparous animals most of the initial development completes within the safe environment of mother's body hence survival chances are high so they produce less number of eggs as compared to oviparous organisms.



***Echinodermata exhibits radial or bilateral symmetry depending on the stage.**

Broad classification of Kingdom Animalia based on common fundamental features

NCERT Question :

What are the difficulties that you would face in classification of animals, if common fundamental features are not taken into account?

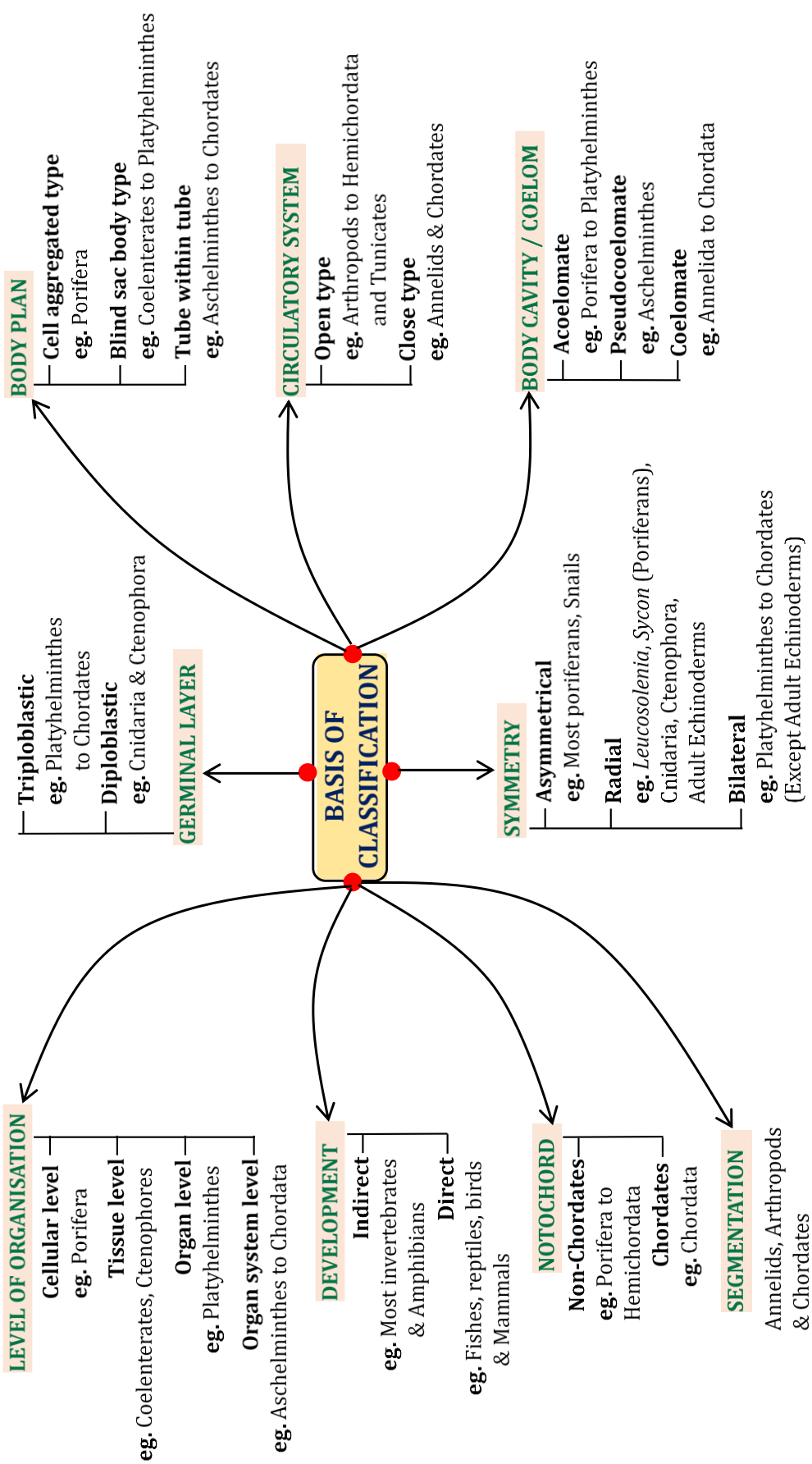
Ans. Without common features, it will be very difficult to classify each organism individually. It is impossible to add new species detected every day without certain common features. To study diversity in animals, classification must be based on common basic features.

NCERT Question :

If you are given a specimen, what are the steps that you would follow to classify it?

Ans. The basic fundamental features such as :

(a) Level of organisation
(b) Body symmetry
(c) Nature of coelom
(d) Pattern of digestive system
(e) Circulatory system
(f) Germinal layer
(g) Segmentation
(h) Notochord (Presence or absence)
(i) Development


BASIS OF CLASSIFICATION
BODY PLAN
Cell aggregated type
eg. Porifera
Blind sac body type
eg. Coelenterates to Platyhelminthes
Tube within tube
eg. Aschelminthes to Chordates
CIRCULATORY SYSTEM
Open type
eg. Arthropods to Hemichordata and Tunicates
Close type
eg. Annelids & Chordates
BODY CAVITY / COELOM
Acoelomate
eg. Porifera to Platyhelminthes
Pseudocoelomate
eg. Aschelminthes
Coelomate
eg. Annelida to Chordata
GERMINAL LAYER
Triploblastic
eg. Platyhelminthes to Chordates
Diploblastic
eg. Cnidaria & Ctenophora
SYMMETRY
Asymmetrical
eg. Most poriferans, Snails
Radial
eg. Leucosolenia, Sycon (Poriferans), Cnidaria, Ctenophora, Adult Echinoderms
Bilateral
eg. Platyhelminthes to Chordates (Except Adult Echinoderms)
LEVEL OF ORGANISATION
Cellular level
eg. Porifera
Tissue level
eg. Coelenterates, Ctenophores
Organ level
eg. Platyhelminthes
Organ system level
eg. Aschelminthes to Chordata
DEVELOPMENT
Indirect
eg. Most invertebrates & Amphibians
Direct
eg. Fishes, reptiles, birds & Mammals
NOTOCHORD
Non-Chordates
eg. Porifera to Hemichordata
Chordates
eg. Chordata
SEGMENTATION
Annelids, Arthropods & Chordates

BEGINNER'S BOX-1 BASIS OF CLASSIFICATION

1. Which of the following phylum have radially symmetrical organisms ?

(1) Coelenterata (2) Platyhelminthes

(3) Aschelminthes (4) Annelida

BAD283

2. Which of the following phylum possess true coelom ?

(1) Aschelminthes (2) Annelida (3) Ctenophora (4) Platyhelminthes

BAD284

3. Loose cell aggregate type body plan is found in _____.

(1) Protozoa (2) Porifera (3) Coelenterata (4) Platyhelminthes

BAD285

4. Which of the following phylum is pseudocoelomate ?

(1) Aschelminthes (2) Arthropoda (3) Annelida (4) Platyhelminthes

BAD286

5. When any plane passing through the central axis of body and divides the animal into two identical halves. It is called as _____.

(1) Asymmetry (2) Radial symmetry

(3) Bilateral symmetry (4) Biradial symmetry

BAD287

6. Which of the following phylum have 'Tube within tube' body plan ?

(1) Platyhelminthes (2) Coelenterata

(3) Porifera (4) Nemathelminthes

BAD288

7. Which of the following phylum has closed circulatory system ?

(1) Arthropoda (2) Annelida (3) Mollusca (4) Echinodermata

BAD289

8. Segmentation is found in :-

(1) Annelida, Arthropoda, Mollusca (2) Arthropoda, Mollusca, Echinoderms

(3) Annelida, Arthropoda, Chordata (4) Arthropoda, Echinoderms, Chordata

BAD290

9. Incomplete digestive tract found in -

(1) Platyhelminthes and Aschelminthes (2) Platyhelminthes and Ctenophora

(3) Aschelminthes and Annelida (4) Coelenterates and Aschelminthes

BAD291

10. Which of the following is not a character of Sponges?

(1) Multicellular (2) Cells are functionally independent

(3) Cellular level of organisation (4) Tissue level of organisation

BAD292

11. Which phylum shows tissue level of organisation?
(1) Protozoa (2) Porifera (3) Coelenterata (4) All of these
BAD293

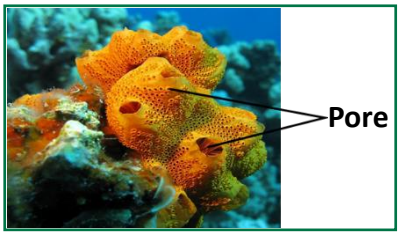
12. Organ system level of organisation is not found in:
(1) Annelida (2) Arthropoda (3) Mollusca (4) Platyhelminthes
BAD294

13. The basic fundamental feature which enables us to broadly classify the animal kingdom are:
(1) Level of organisation (2) Symmetry
(3) Germinal layers (4) All of the above
BAD295

14. In which of the following organism open circulatory system is present?
(1) Arthropods (2) Annelids (3) Chordates (4) Cephalopod molluscs
BAD296

15. Closed type of circulatory system is present in :
(1) Annelids and arthropods (2) Arthropods and molluscs
(3) Annelids and chordates (4) Molluscs and echinoderms
BAD297

03. PHYLUM – PORIFERA



- Members of this phylum are commonly known as "Sponges".
- All are aquatic and sessile, mostly marine but few are found in fresh water also **e.g.** ***Spongilla***. They are solitary or colonial. Entire body made up of pores i.e. numerous small (**Ostia**) for entry and one large opening **(Osculum)** for the exit of water.
- Sponges have various body form and shapes, most of which are irregular, asymmetrical. (Radial symmetry in *Sycon* and *Leucosolenia*)
- Sponges are primitive multicellular acoelomate animals having cellular level of organisation.

Body wall consists of :-

(i) **Outer Pinacoderm** – Consists of pinacocytes and porocytes.

(ii) **Inner Choanoderm** - Consists of flagellated collar cells or **choanocytes** (Unique characteristic of Porifera).

(iii) Between these two layers a gelatinous material **Mesenchyme** is present which contains certain Amoebocytes cells like – **Scleroblasts** – For formation of skeleton elements.

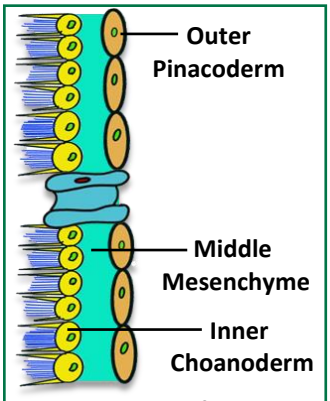
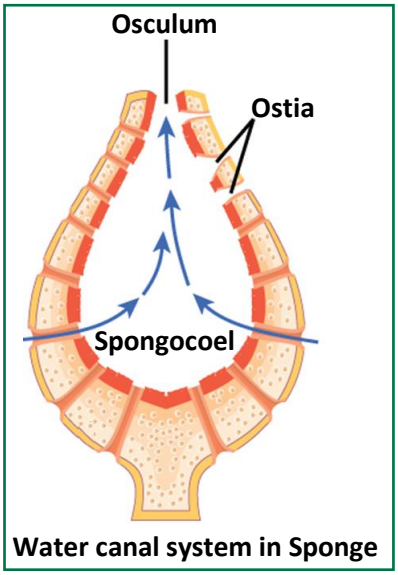


Fig. Body wall of Sponge

Archaeocytes – Totipotent cells (formation of ova & spermatazoa).

- Body wall encloses a large central cavity the **spongocoel** or **paragastric cavity** with small hollow canals.



Water canal system in Sponge

- Canal system or water transport system:
  - ➢ It is unique feature of sponges.
  - ➢ Water enters through ostia in the body wall into spongocoel and goes out through osculum.
  - ➢ This pathway of water transport is helpful in food gathering (Nutrition), respiratory exchange and removal of wastes (excretion).
- Respiration and excretion takes place by diffusion of gases through body surface.
- Excretory matter is **Ammonia**.
- Choanocytes forms lining of spongocoel and canals. Ceaseless beating of flagella helps in maintaining flow of water current.
- Nutrition is **holozoic**. Digestion is **intracellular** and occurs in food vacuoles of choanocytes.

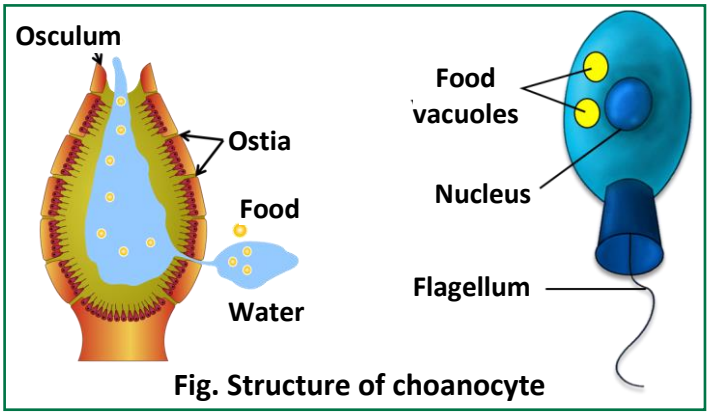
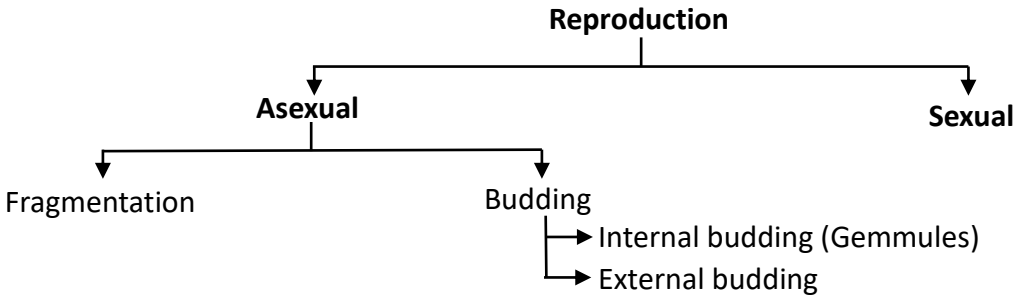


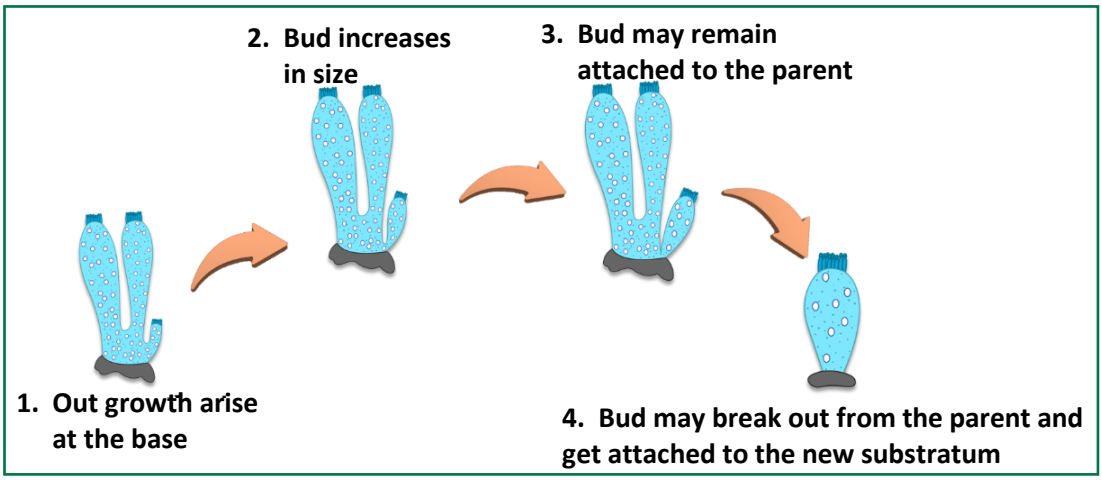
Fig. Structure of choanocyte

- Skeleton is internal, consist of tiny calcareous spicules or siliceous spicules or fine spongin fibre located in mesenchyme. Scleroblast secretes spicules and spongioblast secretes spongin fibres.
- Reproduction takes place by asexual and sexual mode :-



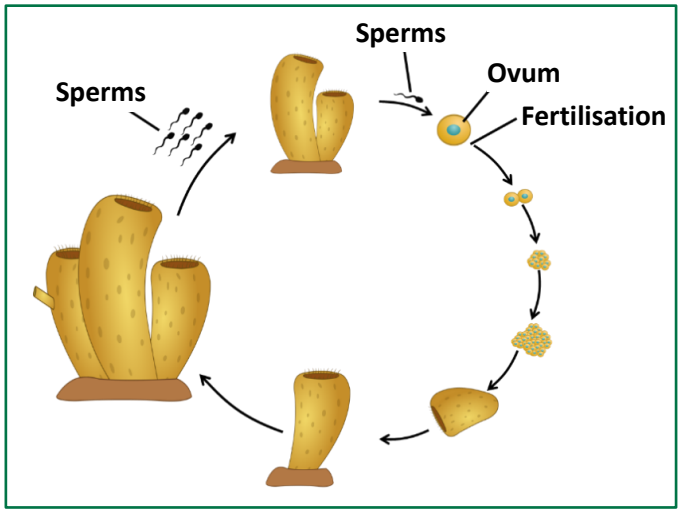
(a) Asexual

- By Budding or Fragmentation or by special cell mass gemmules containing Archaeocytes.
- Endogenous buds of asexual reproduction in sponge are known as Gemmules (In unfavourable condition).



(B) Sexual

- Sponges are **hermaphrodite**, fertilization is **internal** and cross due to **protogynous condition** and development is **indirect** having a larval stage which is morphologically distinct from adult.



Formation of ova & spermatozoa (From Archaeocytes) → Fertilization - Internal (takes place in another sponge through water current) → ZYGOTE → LARVA → Free living larva escapes from osculum → Adult Sponge

Examples

Euspongia **(Bath sponge)**

Euplectella **(Venus Flower Basket)**

Sycon **(Scypha)**

Cliona **(Boring Sponge)**
Harmful to oyster industry

BEGINNER'S BOX-2 PORIFERA

1. Which of the following cells of Porifera act as totipotent cells and responsible for high power of regeneration?
(1) Pinacocytes (2) Choanocytes (3) Collenocytes (4) Archaeocytes
BAD298

2. Fertilisation in *Leucosolenia* is :
(1) Internal & Cross (2) External & Self (3) Internal & Self (4) External & Cross
BAD299

3. Boring sponge is :
(1) *Cliona* (2) *Spongilla* (3) *Euspongia* (4) *Hyalonema*
BAD300

4. 'Venus flower basket' is :
(1) *Cliona* (2) *Euplectella* (3) *Sycon* (4) *Euspongia*
BAD301

5. Level of organisation in porifera is :
(1) Cellular (2) Tissue (3) Organ (4) Organ system
BAD302

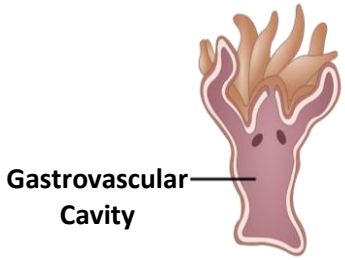
6. Digestion in Porifera is :
(1) Intercellular (2) Extracellular
(3) Intracellular (4) Intracellular as well as extracellular
BAD303

7. Exclusive feature of porifera is :
(1) Water vascular system (2) Water canal system
(3) Ostia (4) Radial symmetry
BAD304

8. Body wall of sponges encloses a large central cavity called _____ with small hollow canals.
(1) Spongocoel (2) Coelenteron (3) Archenteron (4) All of the above
BAD305

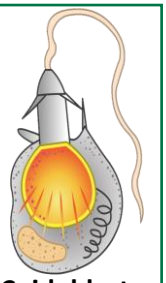
9. In sponge, the sperm and ova are produced by the same individual. Such types of organisms are called :
(1) Asexual (2) Unisexual (3) Hermaphrodites (4) Dioecious
BAD306

04. PHYLUM – CNIDARIA/COELENTERATA



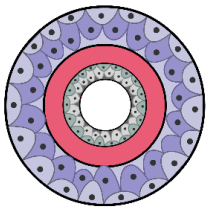
WHY NAMED SO?
Cnidarians due to the presence of stinging cells called Cnidoblasts or Cnidocytes.

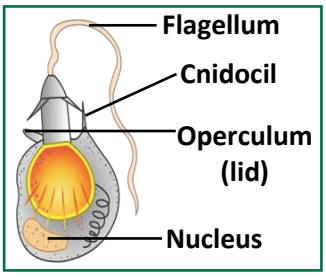
WHY NAMED SO?
Coelenterates due to the presence of gastrovascular cavity or coelenteron.

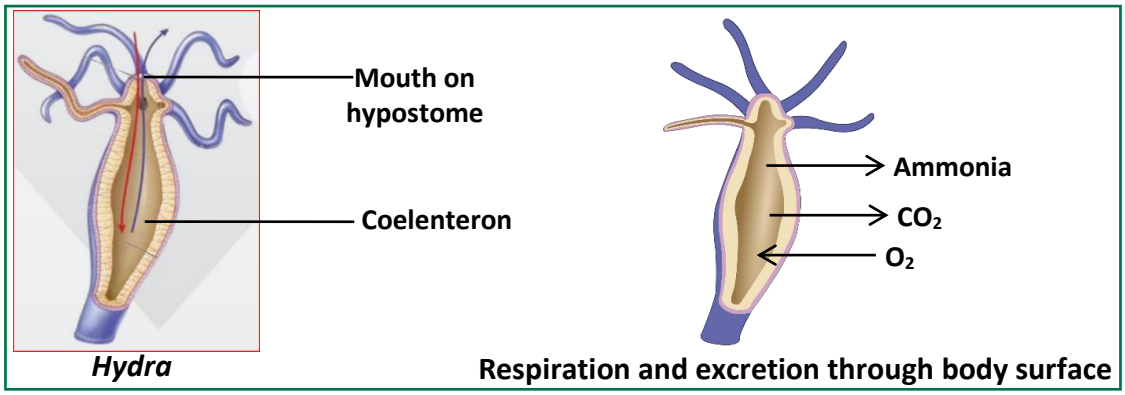


- Mostly marine, few fresh-water (*Hydra*) carnivorous, sessile or free swimming.

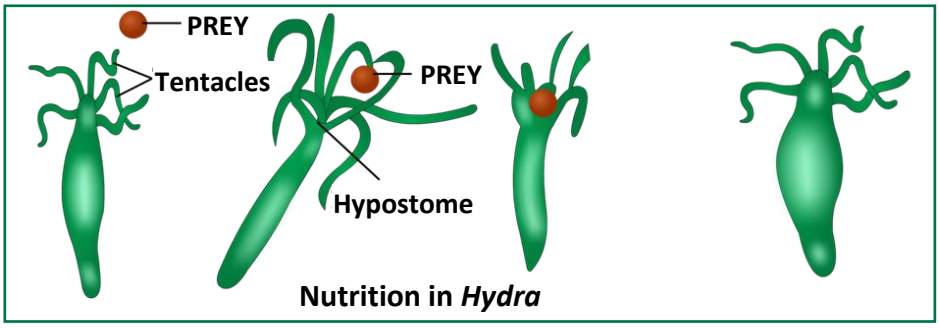
- **Radially symmetrical** animals.
- **Tissue level** of organisation, acoelomate animals.
- They develop from two germinal layers - Outer ectoderm and inner endoderm i.e., animals are **Diploblastic** (mesoglea is present between two layers).
- Body of some coelenterates may be covered by exoskeleton of calcium carbonate. e.g. **Corals**
- **Cnidoblast** or **Cnidocyte** (contains stinging capsule or Nematocyst) present on the tentacles and body, which are used for **anchorage** (**Attachment**), defence and for the capture of Prey (**Offence**).
- A large central cavity called **Coelenteron** is having single aperture mouth on hypostome i.e. Incomplete digestive tract (**Blind sac**).
- Respiration and excretion takes place by **diffusion** of gases through body surface.
- Excretory matter is **Ammonia**.



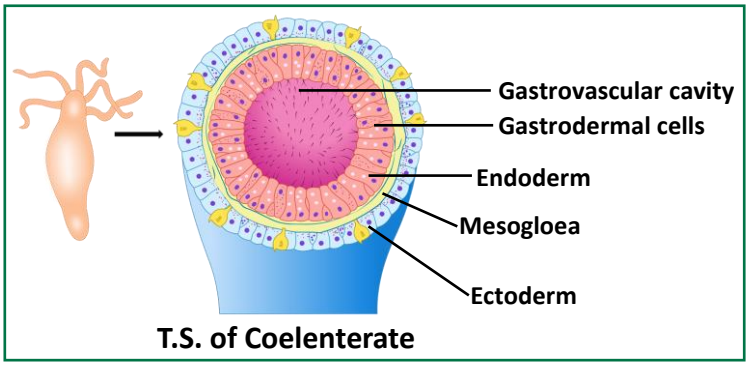




- Coelenterates are carnivorous

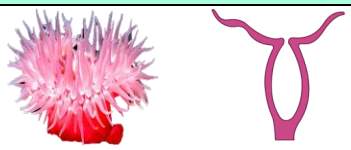


- Digestion is **extracellular** as well as **intracellular** i.e. takes place in coelenteron as well as in food vacuole respectively.



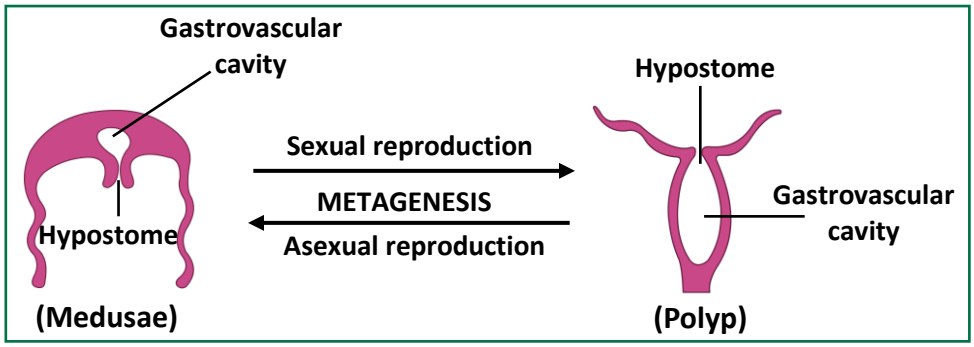
➢ Coelenteron is also responsible for distribution of food beside partly digesting it.

- Nervous system is of **diffuse type** and consists of non-polar neurons (**Nerve net**).
- Coelenterates have two basic body forms (Dimorphic)

Polyp	Medusa
	
• Cylindrical and sessile form • May be solitary or colonial • Mouth and tentacles directed upwards • Asexual form **e.g.** *Hydra*, *Adamsia*	• Umbrella shaped and free swimming • Always solitary • Mouth and tentacles directed downwards • Sexual form **e.g.** *Aurelia*

- Alternation of generation **(Metagenesis)** is the phenomenon shown by some cnidarians in which polyps produce medusae asexually and medusae form the polyps sexually.

  e.g, *Obelia, Physalia*



Note :- Metagenesis is absent in *Hydra*, *Adamsia* and *Aurelia*

- **Reproduction :**

  – Asexual by budding

  – Sexual by production of gametes

  – Development is indirect with larval stages

Examples :

(i) *Hydra* (Fresh water polyp), (ii) *Obelia* (Sea fur)

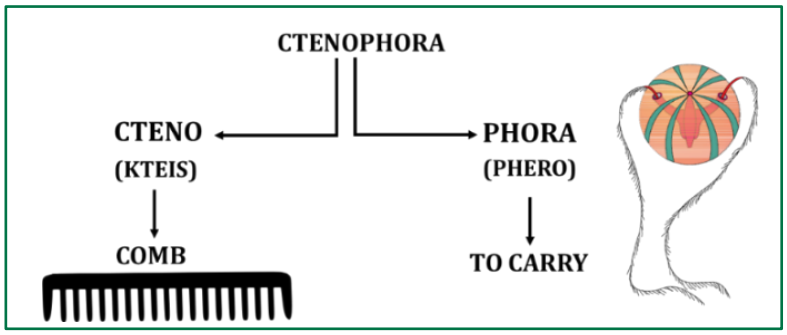
(iii) *Pennatula* (Sea pen), (iv) *Physalia* (Portuguese man of war)

(v) *Gorgonia* (Sea fan), (vi) *Adamsia* (Sea anemone)

(vii) *Aurelia* (Jelly fish), (viii) *Meandrina* (Brain coral)

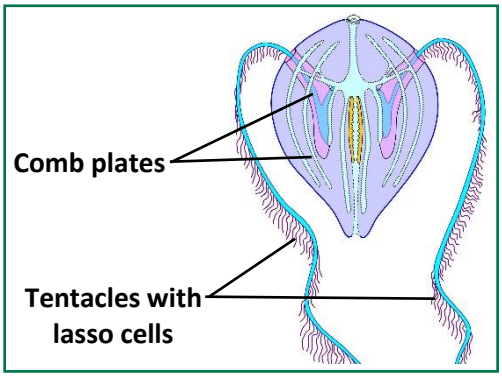
05. PHYLUM – CTENOPHORA

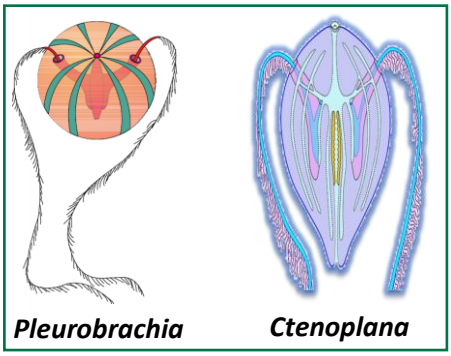
- **Why named so?**
- Ctenophores are known for their beauty and delicate nature. In sunlight their comb plates give the effect of a rainbow. They are commonly known as **'Sea-gooseberries'** or **'Comb-jellies'** or **'Sea-walnuts'**.



- Habitat - Animals are **exclusively marine**.
- **Bioluminescence** (The property of a living organism to emit light) is well marked.
- Body is soft, transparent, jelly like.
- Symmetry - They are **radially symmetrical**.
- Germ layers - **Diploblastic** organism with tissue grade of body organisation.
- Locomotion takes place by the presence of 8 external rows of **ciliary comb** plates on the body surface.
- Digestion is both **extracellular** and **intracellular**.
- Skeletal, Excretory and Respiratory systems are absent.
- They are carnivorous. A pair of long solid tentacles are present.
- Sexes are not separate.
- Reproduction takes place **only by sexual means**. Fertilisation is **external**. Development is of **indirect** type.

  e.g., *Pleurobrachia, Ctenoplana*





BEGINNER'S BOX-3 COELENTERATA AND CTENOPHORA

1. Which one of the following animals is diploblastic ?
(1) *Pennatula* (2) *Sycon* (3) *Taenia solium* (4) *Ascaris*
BAD307

2. The function of nematoblast in coelenterate is :
(1) Locomotion (2) Offence & defence
(3) Reproduction (4) Nutrition
BAD308

3. 'Corals' belong to the phylum :
(1) Porifera (2) Coelenterata (3) Mollusca (4) Echinodermata
BAD309

4. A radially symmetrical diploblastic animal is :
(1) *Ascaris* (2) Earth worm (3) Liver Fluke (4) *Hydra*
BAD310

5. Medusa stage is not found in :
(1) *Hydra* (2) *Aurelia* (3) *Obelia* (4) *Physalia*
BAD311

6. 'Portuguese man of war' is :
(1) *Obelia* (2) *Physalia* (3) *Euplectella* (4) *Meandrina*
BAD312

7. The characteristic feature of Ctenophora is :
(1) External comb plates (2) Internal comb plates
(3) Cnidoblast (4) Choanocytes
BAD313

8. 'Comb jellies' or 'Sea Walnuts' belong to the phylum :
(1) Coelenterata (2) Ctenophora (3) Mollusca (4) Echinodermata
BAD314

9. Lasso cells are present in :
(1) Coelenterata (2) Ctenophora (3) Porifera (4) Protozoa
BAD315

10. Which one of the following is coelentrate :
(1) Sea walnut (2) Sea cucumber (3) Sea fan (4) Sea horse
BAD316

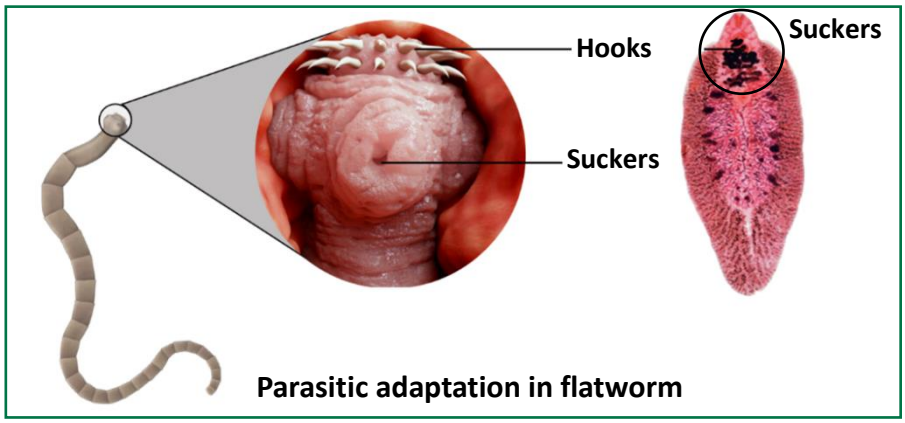
11. Gastro-vascular cavity with single opening is found in :
(1) Porifera (2) Coelenterata (3) Aschelminthes (4) Annelida
BAD317

12. Ctenophores are commonly known as :
(1) Sea walnut (2) Comb jellies (3) Both (1) and (2) (4) Sponges
BAD318

13. Body bears eight external rows of ciliated comb plates present in phylum _____.
(1) Coelenterate (2) Porifera (3) Ctenophora (4) Platyhelminthes
BAD319

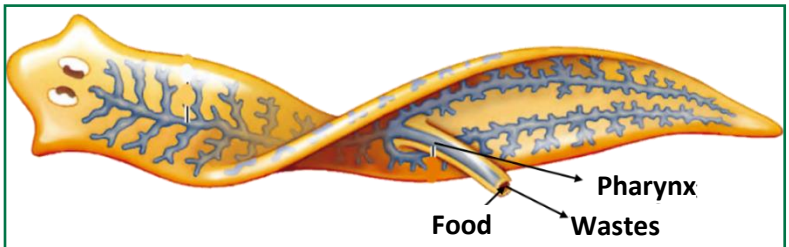
06. PHYLUM – PLATYHELMINTHES

- They have dorsoventrally flattened body hence are called **flatworms**.
- These are **mostly endoparasites** found in animals including human beings but **some are free living** (aquatic).
- Body is **bilaterally symmetrical** and body organisation is of **organ /organ system** grade.
- Body is **triploblastic** i.e. body is formed from three germinal layers i.e. Ectoderm, Endoderm & Mesoderm.
- Locomotory organs are absent in these animals but adhesive organs like **suckers** and **hooks** are present in parasitic form.



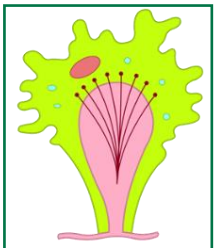
Parasitic adaptation in flatworm

- On the body wall of parasitic animals, a **thick cuticle** is present i.e. Tegument.
- Thick cuticle protects the parasite from the digestive enzymes of the host. (Muscles in the body-wall are mesodermal). Below the epidermis, longitudinal, circular and oblique muscles are present.
- These are **acoelomate**.
- Digestive system is **incomplete** (Blind sac body plan) but in **Tapeworm digestive system is completely absent**. They absorb nutrients from the host directly through their body surface.

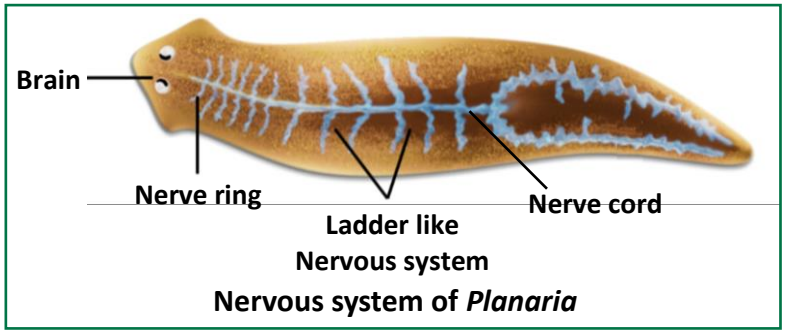


Digestive system of *Planaria*

- **Skeleton, respiratory and circulatory systems are absent**.
- They respire through body surface. Anaerobic respiration is found in internal parasites like *Taenia*.
- Excretion and osmoregulation occurs through specialised cells **called flame cells or Solenocytes (Protonephridia)**.


Flame cells

- Excretory matter is ammonia.
- Nervous system is **ladder** like, consist of a nerve ring and longitudinal nerve cords.

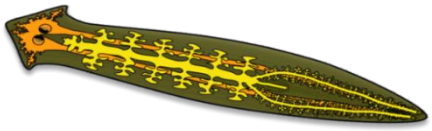


Nervous system of *Planaria*

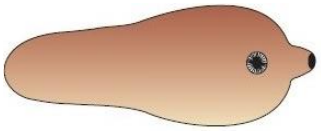
- They are bisexual. Reproductive system is complex and well developed. Fertilization is internal (Self/cross). Development is **indirect** through many larval stages.
- Some members like ***Planaria*** possess **high regeneration capacity**. ***e.g.*** – *Planaria*

Examples :

(i) *Planaria* (Dugesia)



(ii) *Fasciola hepatica* (Liver fluke)



(iii) *Taenia solium* (Pork tapeworm):

NCERT Question :

What are the peculiar features that you find in parasitic platyhelminthes?

Ans. Peculiar features in parasitic platyhelminthes are :

- Body is dorso-ventrally flattened.
- Hooks and suckers are present for attachment inside the body of the host.
- Their body is covered with thick tegument, which protects them from the action of digestive juice of the host.
- Tegument also helps in absorbing nutrients from the host's body.

BEGINNER'S BOX-4 PLATYHELMINTHES

1. Platyhelminthes are :

(1) Diploblastic, radially symmetrical and coelomate

(2) Diploblastic, radially symmetrical and acoelomate

(3) Triploblastic, bilaterally symmetrical and acoelomate

(4) Triploblastic, bilaterally symmetrical and pseudocoelomate

BAD320

2. Protonephridia or flame cells of fresh water platyhelminthes help in :

(1) Excretion and osmoregulation (2) Nutrition and excretion

(3) Reproduction and respiration (4) Secretion and nutrition

BAD321

3. Which one of the following has mesoderm but no coelom ?

(1) Flatworm (2) Earthworm (3) Roundworm (4) Leech

BAD322

4 Function of sucker cells in liver fluke :

(1) Defense (2) Reproduction

(3) Locomotion (4) Absorb nutrients

BAD323

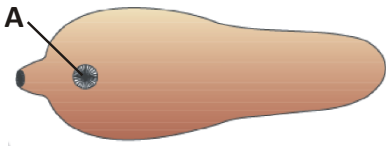
5. In the given diagram what does 'A' represent ?

(1) Hooks

(2) suckers

(3) Flame cell

(4) Ostia



BAD324

6. Which of the following is not the feature of the members of phylum Platyhelminthes?

(1) Bilateral symmetry (2) Tube within tube body plan

(3) Excretory organs are flame cells (4) Hooks and suckers are present

BAD325

7. Which of the following statement is incorrect about Platyhelminthes?

(1) These are mostly endoparasites.

(2) Organ level of organisation.

(3) Dorsoventrally flattened body, so called flatworms.

(4) Fertilization is external.

BAD326

8. Which of the following statement is incorrect about *Planaria*?

(1) Organ system level of organisation. (2) Excretion through flame cells

(3) Circulatory system is absent (4) All of the above

BAD327

9. Which of the following is not an example of Phylum Platyhelminthes?

(1) *Planaria* (2) *Fasciola hepatica*

(3) Tapeworm (4) *Wuchereria*

BAD328

10. Which of the following statement is not related with *Taenia solium*?

(1) *T. solium* is human gut parasite

(2) Triploblastic acoelomate animal

(3) Excretory organs are flame cells

(4) Development is direct

BAD329

11. Which of the following is not a triploblastic acoelomate animal?

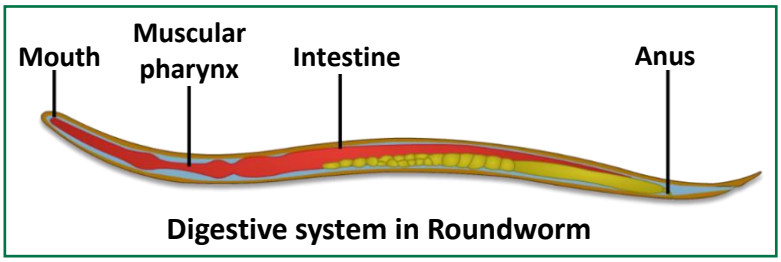
(1) *Taenia solium* (2) *Fasciola hepatica*

(3) *Ctenoplana* (4) *Schistosoma*

BAD330

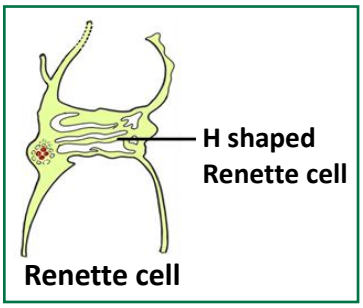
07. PHYLUM – ASCHELMINTHES/NEMATHELMINTHS

- The body of members is circular in cross section and tapering at both ends, without segmentation. So also called **Roundworms**.
- **Habit and habitat** - Nematodes are found everywhere, they may be **free living** (aquatic and terrestrial) or **parasite** in plants and animals.
- **Shape** - They have worm shaped long, cylindrical body with tapering ends.
- **Symmetry** - Bilateral.
- **Germ layers** – All three primary germ layers are present so animals are **triploblastic**.
- **Level of organisation** - Organ-system level.
- Anterior end does not show distinct head (**Cephalisation absent**).
- They are **pseudocoelomate** animals, body cavity is there between body wall and digestive tract which is not lined by mesodermal epithelium i.e. Pseudocoel.
- **Skeleton is absent** but fluid pressure in the pseudocoelom maintains body shape. It is called **Hydro skeleton**.
- Digestive tract is **complete** and differentiated into mouth, pharynx, intestine and anus. Pharynx is muscular and well developed. It is used to **suck the liquid food**. Intestine is non-muscular.



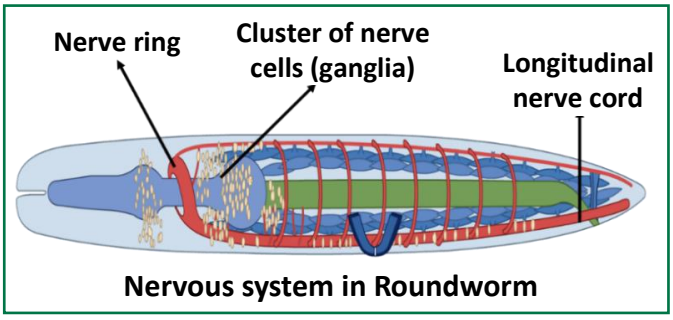
Digestive system in Roundworm

- Respiration is through body surface by diffusion.
- Circulatory system is **absent**.
- Excretory system is H-shaped (**Renette cell**) and consists of excretory canals (Protonephridia) which removes body wastes from body cavity through excretory pore. They develop from an embryonic 'Renette cell' . Excretory matter is **ammonia**.



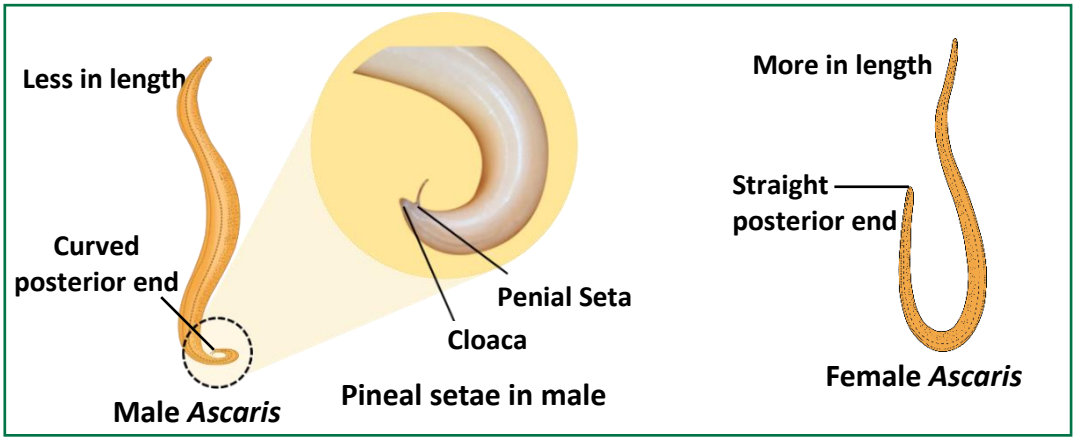
Renette cell

- Nervous system comprises of a **nerve ring** (Brain) and **longitudinal nerve cords**.



Nervous system in Roundworm

- Reproductive system is developed, and sexes are separate (**Dioecious**) **i.e.**, male and female are distinct. Fertilization is **internal** and development may be **direct or indirect**.



Male *Ascaris*
Pineal setae in male
Female *Ascaris*

Examples:

(i) ***Ascaris*** (Roundworm) – Parasite of small intestine.

(ii) ***Ancylostoma*** (Hookworm) – Parasite of small intestine.

(iii) ***Wuchereria*** (Filarial worm) – Viviparous.

- Digenetic parasite that causes **Filariasis/Elephantiasis disease**.
- Adult mainly infects lymph vessels and lymph nodes in humans.
- Carrier host is female mosquito.

(iv) ***Enterobius*** (Pinworm or seat worm) – Parasite of large intestine

Diagram showing inflammation in lower limbs due to Elephantiases

BEGINNER'S BOX-5 ASCHELMINTHES

1. Which of the following endoparasite of man is viviparous ?

(1) *Ascaris* (2) *Wuchereria* (3) *Taenia* (4) *Enterobius*

BAD331

2. Which of the following is pseudocoelomate animal ?

(1) *Ascaris* (2) Fluke (3) Flat worm (4) Tape worm

BAD332

3. *Ascaris* is found in -

(1) Body cavity (2) Tissue (3) Alimentary canal (4) Lymph nodes

BAD333

4. Identify the given animal in the diagram ?

(1) Male *Taenia* (2) Female *Taenia* (3) Male *Ascaris* (4) Female *Ascaris*

BAD334

5. The pseudocoelomate among these is :-

(1) Porifera (2) Annelida (3) Mollusca (4) Aschelminthes

BAD335

6. Match the following columns and select the option shows correctly matched pairs :

Column-I	**Column-II**
(p) *Ascaris*	(i) Hookworm
(q) *Wuchereria*	(ii) Roundworm
(r) *Ancylostoma*	(iii) Flatworm
(s) Tapeworm	(iv) Filaria worm

(1) p–(ii), q–(iv), r–(iii), s–(i) (2) p–(ii), q–(i), r–(iii), s–(iv)

(3) p–(ii), q–(iv), r–(i), s–(iii) (4) p–(i), q–(ii), r–(iv), s–(iii)

BAD336

7. Which of the following statement is incorrect about Aschelminthes?

(1) Organ system level of organisation

(2) Triploblastic animals

(3) Male and female are united means these are hermaphrodite animals

(4) Mouth and anus both are present

BAD337

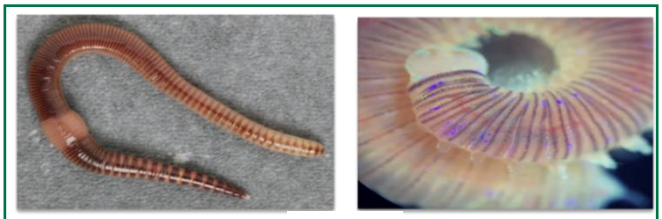
8. Scientific name of pinworm is: -

(1) *Enterobius* (2) *Ascaris* (3) *Wuchereria* (4) *Ancylostoma*

BAD338

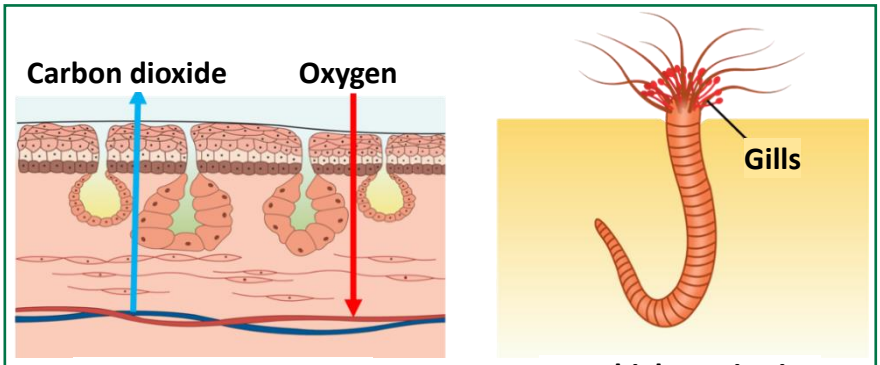
08. PHYLUM – ANNELIDA

- Their body surface is distinctly marked out into segments or metameres (Latin, **annulus**: **little ring**) and hence, the phylum name Annelida. They are commonly called **segmented** worm.



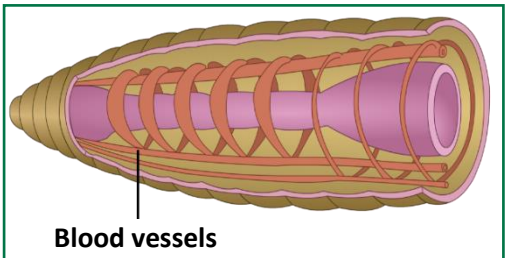
Annelids

- **Habit and habitat** - **free living** found in moist soil (terrestrial), fresh water or marine but few are **parasite**.
- **Body shape** – Body is soft elongated, cylindrical, and divided into segments or metameres by ring like grooves called Annuli.
- They are **bilaterally symmetrical**, **triploblastic** and have **organ system** level of organisation with tube within tube body plan. They are metamerically segmented and coelomate animals.
- Anterior end has a distinct head with sense organs in few annelids. (***e.g.*** *Nereis*)
- It is filled with coelomic fluid that serves as a **hydrostatic skeleton**.
- **Locomotion** - Annelids have **chitinous setae** and lateral muscular appendages called **Parapodia** for locomotion. Parapodia are found in *Nereis*. In some organisms, locomotory organs are absent **e.g.** Leech.
- Digestive tract is **complete**, straight and extends through entire body. Digestive glands were developed for the first time in Annelida.
- Respiration is through **moist skin** (Cutaneous respiration), some have **gills** (Branchial respiration).



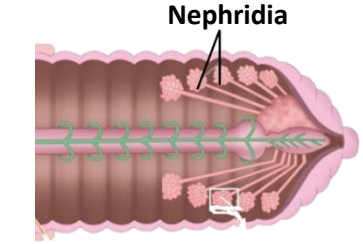
Respiration in Annelid

- **Circulatory system-**
  - In annelids circulatory system is **closed type**.
  - Heart is **neurogenic**.
  - Some blood vessels enlarge to act as pumping heart.
  - Heart appear **first time** in annelids.
  - Blood is red in colour but haemoglobin is dissolved in plasma (RBC absent).



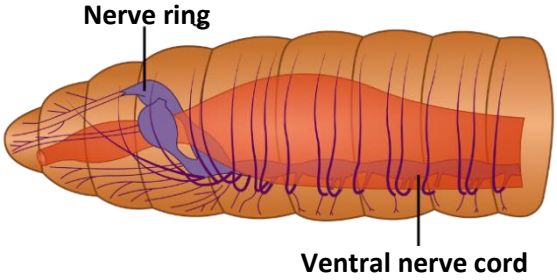
Circulatory system in Annelids

- Excretory organs are **Nephridia** (sing. nephridium). Nephridia are coiled tubules. They also help in osmoregulation (some annelids have protonephridia or flame cells as excretory organs).
  Excretory matter
  (a) Ammonia in aquatic form (b) Urea in land form



Excretory system in Annelids

- Skeletal system - Absent but hydrostatic skeleton is present.
- Nervous system consists of a nerve ring (Brain) and a solid, double, and **ventral nerve cord** with **paired ganglia**.



Nervous system in Annelids

- **Reproduction** is sexual - *Nereis* is **dioecious**, but earthworms and leeches are **monoecious**.
- Development is **direct** (Earthworm and Leech) or **indirect** (*Nereis*) with free swimming ciliated trochophore larva.

- During course of evolution metameric segmentation, true coelom, closed circulatory system and pumping heart appeared first in annelids.

Examples :

(i) ***Nereis*** **–** Sandworm/Ringworm	**(ii)** ***Pheretima*** **-** Earthworm	**(iii)** ***Hirudinaria*** **–** (Blood sucking leech) Fresh water leech	**(iv)** ***Aphrodite*** **-** Sea mouse
			

NCERT Question :
Segmentation in body is first observed in which of the following:
(a) Platyhelminthes (b) Aschelminthes (c) Annelida (d) Arthropoda
Ans. (c) Annelida

BEGINNER'S BOX-6 — ANNELIDA

1. Parapodia are locomotary structures in :-
(1) *Fasciola* (2) *Nereis* (3) Centipede (4) Earthworm
BAD339

2. Animals showing metameric segmentation are :
(1) Poriferans (2) Annelids (3) Tape-worms (4) Aschelminthes
BAD340

3. *Aphrodite*, commonly known as 'sea mouse' is an :-
(1) Annelid (2) Mollusc (3) Insect (4) Mammal
BAD341

4. Which is correct for earthworm?
(1) Segments (2) Monoecious (3) Nephridia (4) All of the above
BAD342

5. Neural system consists of paired ganglia connected by lateral nerves to double _____ in annelida.
(1) ventral nerve cord (2) dorsal nerve cord
(3) Anterior nerve cord (4) posterior nerve cord
BAD343

6. Blood sucking animal is:-
(1) *Nereis* (2) Earthworm (3) Both (1) & (2) (4) Leech
BAD344

09. PHYLUM – ARTHROPODA

ARTHROPODA

ARTHRO — **Joints**

PODA — **Appendages**

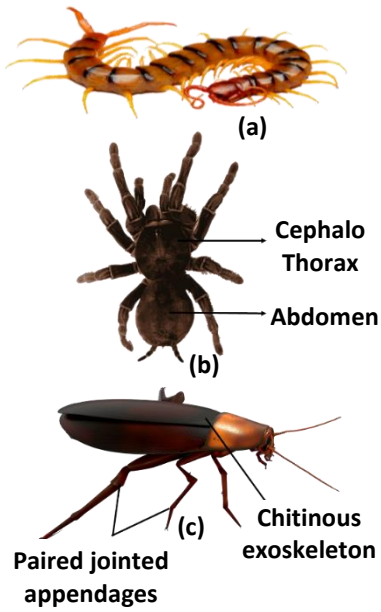


Fig. Example of Arthropods (a) Centipede; (b) Spider; (c) Cockroach

- Arthropoda is the **largest phylum** of animalia which includes insects.
- Over two-thirds of named species on earth are arthropods.
- **Habit and Habitat** -They may be aquatic (marine and fresh water) or terrestrial, free living and sometimes parasitic (mosquito), solitary (centipede, millipede), colonial (bee), gregarious (Locust).
- Body is Bilaterally symmetrical, Triploblastic with organ system level of organisation, tube within tube body plan.
- They are metamerically segmented and coelomate animals.
- Body is divided into three region **Head, thorax & abdomen.**
- In some animals (for example Scorpion, Crab) there are two body parts Cephalothorax and abdomen. (Head and thorax fused to form cephalothorax)
- Unique features
  - (i) They have **jointed appendages** for different functions.
    (arthro - jointed, poda - foot/appendages).
  - (ii) The body of Arthropods is covered by **chitinous exoskeleton**.
- Respiration by gills (e.g. Prawn), **Book-gills** (e.g. King crab), **Tracheal system** (e.g. Insects), **Book-lungs** (e.g. Scorpion). **Trachea** carry oxygen directly to the body cells.

GILLS in Crustacea (Prawn)

BOOK GILLS in King Crab

BOOK LUNGS in Arachnida (Scorpion)

TRACHEAL SYSTEM in Insecta (Cockroach)

What is the site of gaseous exchange in an insect?

In insects, gaseous exchange occurs through a network of tubes collectively known as the **tracheal system**. The small openings on the sides of an insect's body are known as **spiracles**. Oxygen-rich air enters through the spiracles. The spiracles are connected to the network of tubes. From the spiracles, oxygen enters the **tracheae**. From here, oxygen diffuses into the cells of the body. The movement of carbon dioxide follows the reverse path. The CO_2 from the cells of the body first enters the tracheae and then leaves the body through the spiracles.

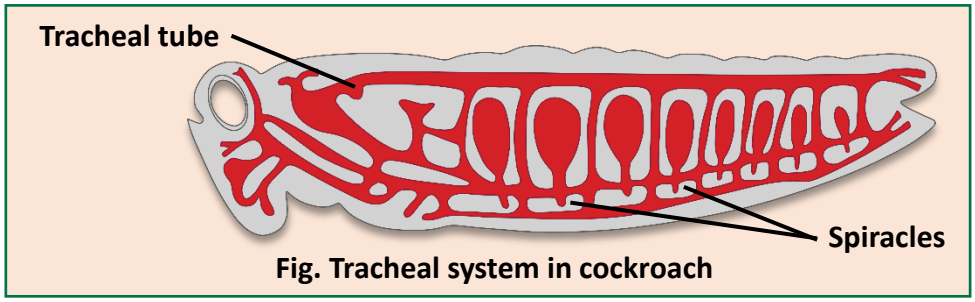
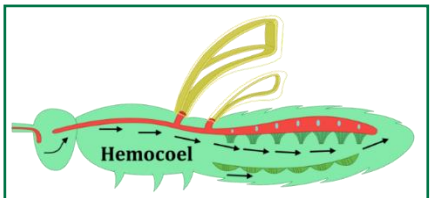


Fig. Tracheal system in cockroach

- Circulatory system is **Open type** i.e. blood flows in open tissue spaces and haemocoel instead of blood vessels. Blood is colourless called **Haemolymph** (e.g. Insect). Respiratory pigment absent. Body cavity around viscera contains blood and the coelom filled with blood is called the **haemocoel**.



Haemocoel in arthropods

- Digestive tract is **complete**, and they can feed upon all kind of food substances.
- **Excretory organs** are –
  - **(i)** **Antennary** or green glands (e.g. Prawn),
  - **(ii)** **Coxal gland** (e.g. Scorpion),
  - **(iii)** **Malpighian tubules** (e.g. Insects) opening into the gut.
- Excretory matter is **ammonia** in aquatic animals and **uric acid** in land animals.
- Nervous system comprises of a nerve ring and a double, solid, and ventral nerve cord bearing ganglia.
- Head is distinct [High degree of cephalization]
- Sensory organs like simple eyes, or compound eyes or both, antennae, statocyst and anal cerci are found.

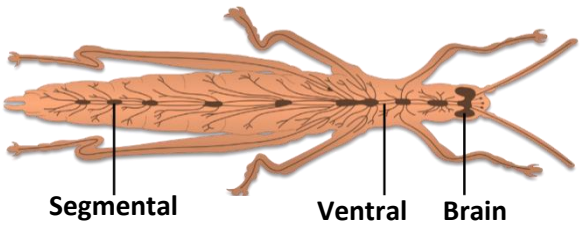
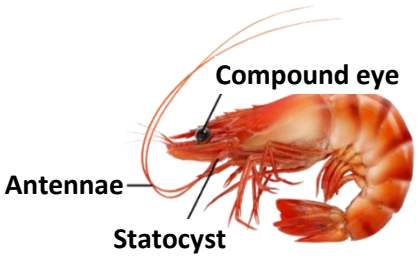


Fig. Nervous system in Arthropods



Sense organs of arthropods

- They are mostly **dioecious**. Sexes are separate. Fertilization is usually **internal**, but few aquatic forms have **external fertilization**. Gonads have ducts. Sexual dimorphism may be present. They are mostly **oviparous** (Few are viviparous e.g. scorpion).
- Development may be **direct** or **indirect**.
- Animals of Arthropoda are most successful invaders of terrestrial environment among invertebrates due to presence of -

  (i) Cuticle (Chitinous exoskeleton) (ii) Appendages (iii) Wings

  Examples :
  - Gregarious pest - *Locusta* (Locust)
  - Living Fossil - *Limulus* (King crab)
  - Others - Butterfly, Scorpion, Prawn, Spider, Centipede, Millipede
  - *Peripatus* (Connecting link between annelida and arthropoda).
  - *Lepisma*-Silver fish (book louse / Book worm), wingless insect

I	CLASS	Insecta	Arachnida	Crustacea
II	**BODY DIVISION**	Head, Thorax and Abdomen	Cephalothorax and Abdomen	Cephalothorax and Abdomen
III	**RESPIRATION BY**	Tracheae	Book Lungs	Gills
IV	**EXCRETION BY**	Malpighian Tubules	Coxal Glands	Green Glands
V	**LEGS**	6 Legs	8 Legs	10 Legs
VI	**EXCRETORY WASTE**	Uric Acid	Guanine	Ammonia
VII	**ANTENNAE**	1 Pair	Absent	2 Pair
VIII	**EYES**	Compound	Simple	Compound
IX	**EXAMPLE**	 **Butterfly**	 **Scorpion**	 **Crab**

Vectors :

(a) Mosquitoes	**(b) Other vectors**
(i) *Anopheles* :- Malaria	(i) *Glossina* :- Sleeping sickness
(ii) *Aedes* :- Dengue	(ii) Sand-fly :- Leishmaniases
(iii) *Culex* :- Elephantiasis	

Economically important insects :-

(i) *Apis* (Honey bee)

(ii) *Bombyx* (Silk worm)

(iii) *Laccifer* (Lac insect)

NCERT Question.

What are the reasons that you can think of for the arthropods to constitute the largest group of the animal kingdom?

Ans. (a) Presence of chitinous exoskeleton (provide protection, reduces water loss from the body of arthropods making them more adapted to the land environment).

(b) Presence of jointed appendages (provide motility).

BEGINNER'S BOX-7 ARTHROPODA

1. Green glands are found in :

(1) Insects (2) Crustaceans (3) Annelida (4) Arachnida

BAD345

2. The phylum Arthropoda is characterised by :

(1) Chitinous exoskeleton, external segmentation and paired appendages

(2) Chitinous exoskeleton and antennae

(3) Chitinous exoskeleton, antennae and compound eye

(4) Chitinous exoskeleton, metameric segmentation and paired jointed appendages

BAD346

3. Excretion in Arthropod animals takes place by :

(1) Malpighian tubules (2) Green glands

(3) Coxal glands (4) All of the above

BAD347

4. Book - lungs are found in :

(1) Scorpion (2) Prawn (3) *Limulus* (4) Cockroach

BAD348

5. Which one of the following is most important feature of insects :
(1) Compound eyes (2) Long abdomen
(3) Three pairs of legs (4) Two pairs of wings
BAD349

6. Number of walking legs in a spider are :
(1) Three pairs (2) Four pairs (3) Six pairs (4) Two pairs
BAD350

7. Which of the following is a wingless insect?
(1) *Lepisma* (2) Cockroach (3) Moth (4) *Apis*
BAD351

8. Book gills for respiration are found in :
(1) House - fly (2) Termites (3) Ant (4) King-Crab
BAD352

9. Members of phylum Arthropoda lack one of the following features :
(1) External skeleton made of chitin
(2) Compound eyes
(3) Excretion by malphigian tubules
(4) Usually a close type of blood vascular system
BAD353

10. Which of the following animal is not an insect ?
(1) Crab (2) Honey bee (3) *Locusta* (4) Silkworm
BAD354

11. Which of the following is not an economically important insect?
(1) Honey bee (2) Locust (3) Silk worm (4) Lac insect
BAD355

12. Number of walking legs in a butterfly are :
(1) Three pairs (2) Four pairs (3) Six pairs (4) Two pairs
BAD356

13. Largest phylum of animal kingdom :
(1) Mollusca (2) Annelida (3) Chordata (4) Arthropoda
BAD357

14. Which of the following is not the feature of arthropods?
(1) Metamerism (2) Chitinous exoskeleton
(3) Perforated body (4) Paired jointed appendages
BAD358

15. Level of organisation in arthropoda is :
(1) Cellular level (2) Tissue level
(3) Organ level (4) Organ system level
BAD359

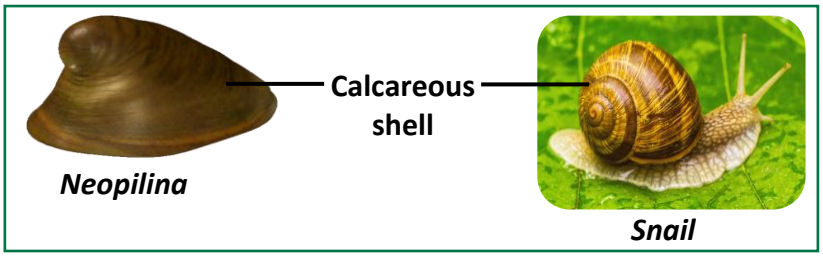
10. PHYLUM – MOLLUSCA

- It is **second largest phylum** which includes 'soft bodied and shelled' animals.
- **Habit and habitat** - They are **aquatic** (marine or fresh water) or **terrestrial**.
- Molluscs are **bilaterally symmetrical**. Few are secondarily **asymmetrical** (**snail**) due to twisting / torsion during growth.

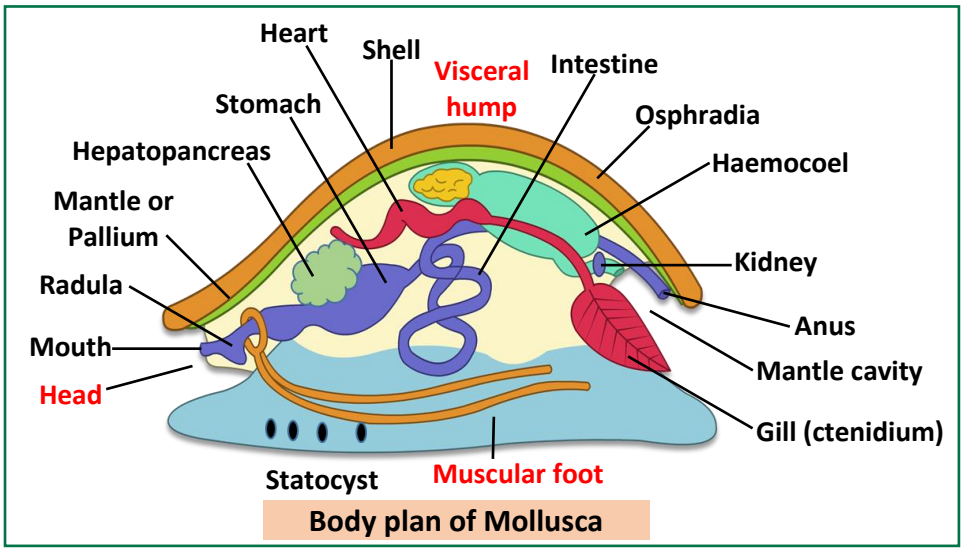
Snail

- They are **triploblastic** and **coelomate** animals with organ system level of organisation.
- Body is **unsegmented** with variety of shapes and covered with calcareous shell.

  ***Neopilina* is exceptionally segmented**.

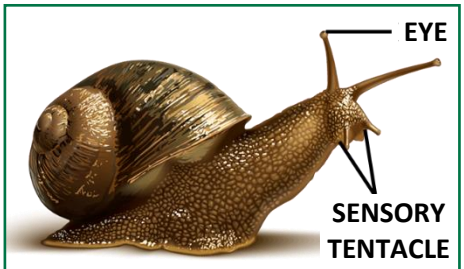


- Body is divisible into three parts :
  - **(i)** **Head** with sense organs like eyes and sensory tentacles.
  - **(ii)** **Dorsal visceral mass/ hump** containing all visceral organs of body.
  - **(iii)** **Ventral muscular** foot for locomotion.
- Soft and spongy layer of skin form a **mantle or pallium** over the visceral hump.
- The space between hump and mantle is called **mantle cavity**. The mantle usually secretes an external calcareous shell. Shell is made up of calcium carbonate and chitin.
- Digestive tract is **complete**. Buccal cavity contain a file-like rasping organ for feeding called **Radula**, with transverse rows of teeth. Anus opens into the mantle cavity. Digestive gland is called hepato pancreas.
- Respiration is usually by **feather like gills** (**Ctenidia**) located in the mantle cavity which also helps in excretion. Pila respire by pulmonary sac on land and by gills in water.



Body plan of Mollusca

- Circulatory system is **open type**. It includes dorsal pulsatile heart and a few arteries that open into sinuses. Coelom is greatly reduced. Spaces among the viscera contain blood and form haemocoel.
- Excretory system includes 1 or 2 pairs **Keber's organs or Organ of Bojanus**, which open into the mantle cavity. Excretory matter is **ammonia** in aquatic molluscs and **uric acid** in terrestrial molluscs.
- Nervous system comprises 3 or 4 pairs of ganglia.
- Senses organs :
  - **(i)** **Eye** - present over a stalk called ommatophore in some molluscs.
  - **(ii)** **Statocyst/Lithocyst** - for body equilibrium in foot
  - **(iii)** **Osphradium** - chemoreceptor/olfactory receptor for testing chemical nature of water (pH).



Sense organ in Mollusca

- They are usually **dioecious**, they are mostly **oviparous**. Fertilisation may be **external** or **internal**.
- Development - Mostly **indirect**.

Examples :-

Pila (Apple Snail), *Pinctada* (Pearl oyster), *Sepia* (Cuttle fish),
Loligo (Squid), *Dentalium* (Tusk shell), *Octopus* (Devil fish),
Aplysia (Sea hare), *Chaetopleura* (Chiton),
Neopilina (**Connecting link between mollusca and annelida**)

BEGINNER'S BOX-8 MOLLUSCA

1. The connecting link between Annelida and Mollusca is :

(1) *Peripatus* (2) *Hirudinaria* (3) *Neopilina* (4) *Teredo*

BAD360

2. Organ of Bojanus are found in :

(1) Chordata (2) Echinodermata (3) Annelida (4) Mollusca

BAD361

3. Which animal becomes asymetrical due to torsion in body and shell?

(1) Land snail (2) Apple snail (3) *Aplysia* (4) All of the above

BAD362

4. Which of the following is a mollusc?

(1) Sea-horse (2) Sea-mouse (3) Sea-hare (4) *Limulus*

BAD363

5. Which of the following is not the feature of Mollusca?

(1) Three parts of body-head, visceral hump and muscular foot.

(2) Soft and spongy layer of skin form a mantle over the visceral hump.

(3) Radially symmetrical animals.

(4) Radula in buccal cavity.

BAD364

6. Which mollusc is commonly called "tusk shell"?

(1) *Doris* (2) *Dentalium* (3) *Unio* (4) *Teredo*

BAD365

7. The mouth of mollusc contains a file like rasping organ for feeding is called :

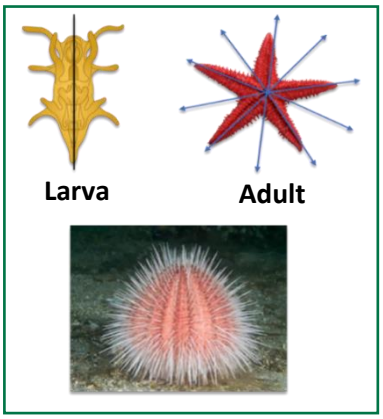
(1) Parapodia (2) Gill (3) Radula (4) Hypostome

BAD366

11. PHYLUM – ECHINODERMATA

- Why named so?

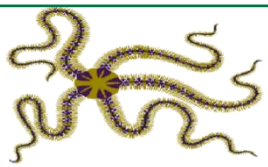
  Echino = spiny, **derma** = skin, ata = to have Spiny skinned animals
- **Habit and habitat** – All animals are **exclusively marine**. Generally live at bottom of sea and are slow moving.
- **Shape** - Body shape is Star like (Star fish), Cylindrical (*Holothuria*), Melon like (Sea urchin), Flower like (Sea lily)
- **The adult Echinoderms are radially symmetrical but larvae** are **bilaterally symmetrical**.



- Animals are **triploblastic** with three primary germ layers.
- Coelomate animals with **organ-system** level of organisation. Echinoderms have **true coelom**. They do not have distinct head. Tube within tube body plan.
- Skin of echinoderms contains calcareous spines, pedicellariae and endoskeleton consists of (calcareous plate/dermal ossicle). Minute pincer like structure pedicellariae comes out through skin. They keep body surface clear of debris.
- The most distinctive feature of echinoderms is presence of water filled **ambulacral** or **water vascular system** with tube feet to help in locomotion, capture and transport of food, excretion and respiration.
- A perforated plate madreporite permits entry of water into ambulacral system, structures like tube feet, radial canals and stone canal are also found in water vascular system.
- **Digestive tract is complete** with mouth on lower side (ventral) and anus on the upper side (dorsal).
- Respiration takes place by **body surface or gills**.
- Circulatory system is reduced and **open type**. No heart or pumping vessel.
- There is **no excretory** system. Nitrogenous waste ammonia diffuses out through body surface.
- Nervous system is simple and less developed.
- Reproduction is **sexual**, sexes are **separate** (unisexual).
- Fertilization is usually **external** and development is indirect with free swimming larva. (e.g. Bipinnaria larva).

Examples:

Cucumaria /Holothuria
(Sea cucumber)



Antedon
(Sea lily)

Asterias
(Star fish)

Echinus
(Sea urchin)

Ophiura
(Brittle star)

NCERT Question :

Water vascular system is the characteristic of which group of the following :

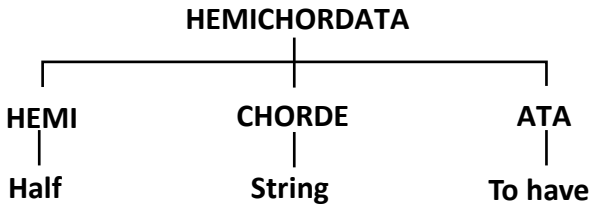
(a) Porifera (b) Ctenophora (c) Echinodermata (d) Chordata

Ans. (c) Echinodermata

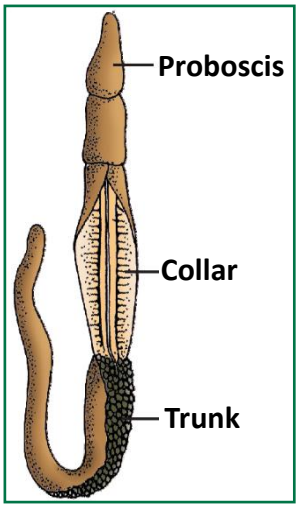
12. PHYLUM – HEMICHORDATA

- Hemichordata is a **connecting link** between Non - chordata & Chordata.
- Why named so?

  Hemichordata was earlier considered as a subphylum under phylum chordata, but now it is placed as a separate phylum under non chordata.



- This phylum consists of a small group of worm like marine animals with organ system level of organisation.



- They are **bilaterally symmetrical, triploblastic** and **coelomate animals**.
- The body is cylindrical, unsegmented and divided into three parts : **anterior proboscis, middle collar** and a **posterior long trunk**.
- Digestive tract is **complete**.
- Hemichordata have a rudimentary structure in the collar region called stomochord, a structure similar to notochord (Post anal tail is absent).
- Respiration takes place through gills.
- Circulatory system is **open type**. Blood is colourless with amoeboid corpuscles. Respiratory pigment vanadium is present in some cases. Heart is situated dorsally.
- Excretion occurs through a single glomerulus or **proboscis gland**.
- Central nervous system is just like non-chordates.
- Reproduction is **sexual** and mostly animals are unisexual

  (i) Fertilisation is **external**.

  (ii) Development is **indirect** with **tornaria larva**.

  e.g. 1. *Balanoglossus* (Tongue worm or Acorn worm) 2. *Saccoglossus*

BEGINNER'S BOX-9 ECHINODERMATA, HEMICHORDATA

1. Water vascular system is found in :

(1) *Sycon* (2) Leech (3) Fish (4) Star-fish

BAD367

2. The animal with tube-feet is :

(1) Star-fish (2) Jelly-fish (3) Silver-fish (4) Cray-fish

BAD368

3. Which is the characteristic feature of Echinodermata ?

(1) Smooth skin and radial symmetry

(2) Spiny skin and radial symmetry

(3) Spiny skin and bilateral symmetry

(4) Smooth skin and bilateral symmetry

BAD369

4. Excretory organ of *Balanoglossus* is :

(1) Protonephridia (2) Supra neural gland

(3) Solenocytes (4) Proboscis gland

BAD370

5. The larval form of Hemichordata is called :

(1) Trochophore (2) Tornaria (3) Tadpole (4) Ammocoete

BAD371

6. In echinodermata, tube feet are related with:

(1) Excretory system (2) Water vascular system

(3) Reproductive system (4) Respiratory system

BAD372

7. Respiration by dermal gills (branchiae) and respiratory tree is performed by the animals of :

(1) Mollusca (2) Echinodermata

(3) Protochordata (4) Arthropoda

BAD373

8. The most distinctive feature of echinoderms is:

(1) Water vascular system

(2) Water canal system

(3) Paired jointed appendages

(4) Radula in mouth

BAD374

9. Which of the following is an example of Echinodermata?

(1) Prawn (2) Locust (3) Star fish (4) Apple Snail

BAD375

10. Members of Hemichordata are :

(1) Burrowing marine animals

(2) Exclusively fresh water animals

(3) Fresh water worms

(4) Terrestrial

BAD376

11. *Balanoglossus* belongs to :

(1) Hemichordata (2) Cephalochordata

(3) Urochordatra (4) Cyclostomata

BAD377

13. PHYLUM – CHORDATA

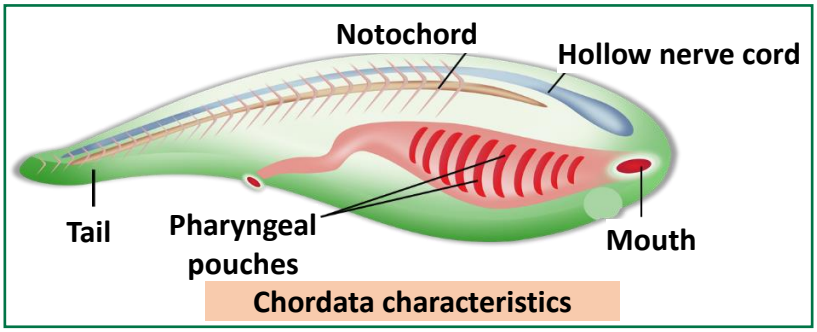
- Animals belonging to phylum Chordata are fundamentally characterised by the presence of a **notochord, a dorsal hollow nerve cord** and **paired pharyngeal gill slits**.
- **Phylum chordata has following fundamental features :**

1. **Notochord** :- Elastic, solid rod like structure which is present throughout the life or only during embryonic development, locked between nerve and digestive tube.
2. **Dorsal hollow nerve cord** :- It differentiates into brain and spinal cord, it is present above the notochord.
3. **Paired pharyngeal gill slits** : -

   Take part in circulation of water for respiration.

   In higher chordates, they occur only in embryonic stage.

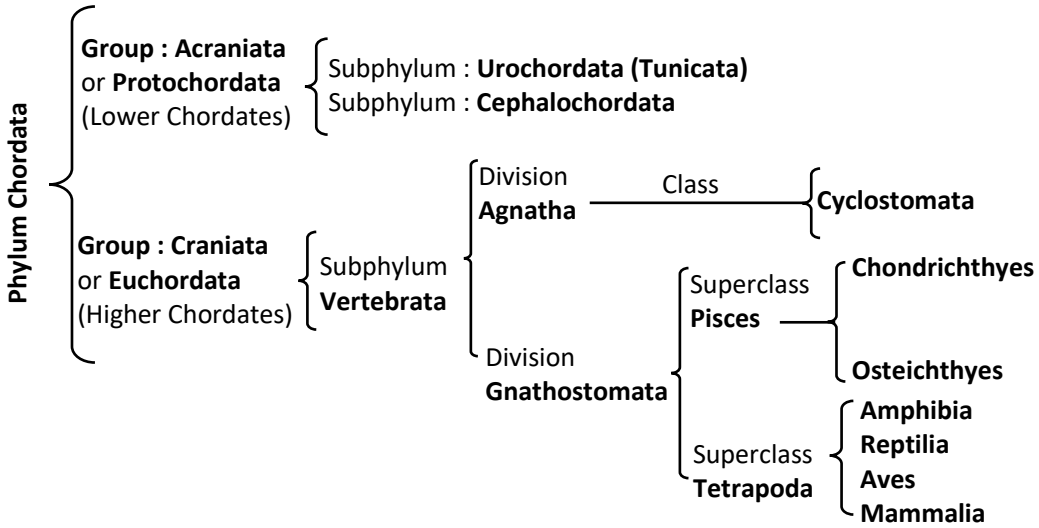
- These are bilaterally symmetrical, triploblastic, coelomate with organ-system level of organisation. They possess a post anal tail, closed circulatory system and are segmented animals.



Chordata characteristics

Comparison of Chordates and Non-chordates

S.No.	Chordates	Non-chordates
1.	Notochord present.	Notochord absent.
2.	Central nervous system is dorsal, hollow and single.	Central nervous system is ventral, solid and double.
3.	Pharynx perforated by gill slits.	Gill slits are absent.
4.	Heart is ventral.	Heart is dorsal (if present)
5.	A post-anal part (tail) is present.	Post-anal tail is absent.



Characters	Group Acraniata (Protochordata)	Group Craniata (Euchordata)
Habitat	Exclusively marine	Aquatic and Terrestrial
Respiration	Gills	Gills and lungs
Notochord	Present only in larval tail in Urochordata. Persistent throughout life in cephalochordata.	The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult.
Paired appendages	Absent	Mostly present
Sexes	Unisexual/Bisexual	Unisexual
Fertilisation	External	External or Internal
Development	Indirect	Direct or indirect

- Phylum Chordata is divided into three subphyla: Urochordata or Tunicata, Cephalochordata and Vertebrata.
- Subphyla Urochordata and Cephalochordata are often referred to as protochordates and are exclusively marine.

BEGINNER'S BOX-10 FUNDAMENTAL CHARACTERS OF CHORDATA

1. Chordates are distinguished from non-chordates by the presence of :
(1) Brain (2) Dorsal hollow tubular nerve cord
(3) Ventral nerve cord (4) Dorsal nerve cord

BAD378

2. In which one of the following group, brain box is absent :
(1) Cyclostomata (2) Pisces (3) Amphibia (4) Urochordata

BAD379

3. Which of the following is not found in the phylum chordata?
(1) A dorsal hollow nerve cord
(2) Lateral paired gill slits during development
(3) A notochord at some stage of development
(4) Double solid nerve cord

BAD380

4. Which of the following is not a characteristic unique to all members of phylum chordata?
(1) A notochord, a dorsal hollow CNS (2) A ventral heart
(3) An endoskeleton (4) Vertebrae

BAD381

5. Chordata have :
(1) Dorsal, hollow and single CNS (2) Ventral heart
(3) Post-anal tail (4) All

BAD382

6. Which of the following is incorrect difference between chordata and non chordata?
(1) Chordates have dorsal heart but non chordates have ventral heart
(2) Chordates have pharyngeal gill slits which is not found in non chordates
(3) Chordates have post anal tail which is not found in non chordates
(4) Notochord is found in chordates but not in non chordates

BAD383

7. Notochord is extended from head to tail region and is persistent throughout their life in
(1) Hemichordata (2) Cephalochordata
(3) Urochordata (4) All of these

BAD384

8. Which of the following is the incorrect statement from the following?
(1) In vertebrates, the notochord is replaced by cartilaginous or bony vertebral column
(2) In cephalochordates, the notochord is extended from head to tail region and is persistent throughout life
(3) Protochordates are exclusively marine
(4) Notochord is present in tail of adult in urochordata

BAD385

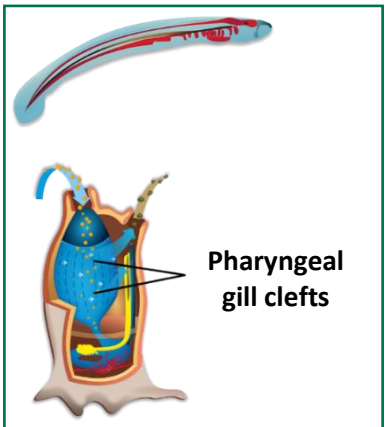
9. Vertebrates have :
(1) Ventral muscular heart with 2, 3 or 4 chambers.
(2) Kidneys for excretion and osmoregulation.
(3) Paired appendages which may be fins or limbs.
(4) All of these

BAD386

14. GROUP : ACRANIATA OR PROTOCHORDATA

Subphylum Urochordata :

- In Urochordata, notochord is present only in larval tail.
- **Adults are sessile while larva is free swimming**
- Only one chordate character is found in adults which is pharyngeal gill clefts.
- Adult members have test over their body, made up of tunicin hence animals are also called Tunicates.
- Circulatory system is open.

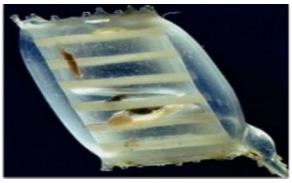


Respiration in Urochordates

Examples of Urochordata :


Ascidia


***Herdmania* (Sea-squirts)**


Doliolum

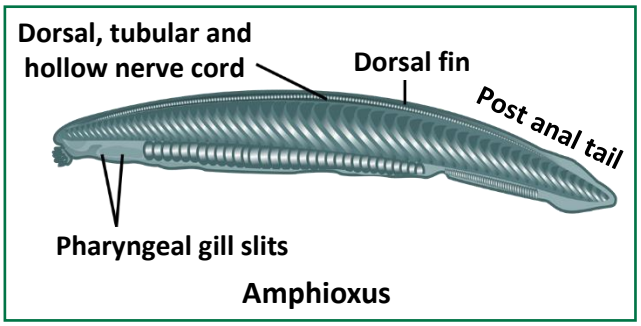

Salpa

Subphylum Cephalochordata :

- In Cephalochordata
  (a) Notochord extends from head to tail region and is persistent throughout their life.
  (b) Excretion through protonephredia or flame cell or solenocytes.
  (c) Excretory matter is ammonia.
  (d) Circulatory system is closed.

Examples :

Branchiostoma (Amphioxus or Lancelet).



BEGINNER'S BOX-11 PROTOCHORDATA

1. Which one of the following is a chordate but not a vertebrate :

(1) *Scoliodon* (2) Hag fish (3) Amphioxus (4) Star fish

BAD387

2. Cephalochordate is :

(1) Amphioxus (2) *Ascidia* (3) *Salpa* (4) *Herdmania*

BAD388

3. First complete/typical chordate is :

(1) *Herdmania* (2) Amphioxus (3) *Balanoglossus* (4) All the above

BAD389

4. "Sea - squirt" is common name of :

(1) *Balanoglossus* (2) *Herdmania* (3) Amphioxus (4) *Ascidia*

BAD390

5. Notochord is found only in the tail of Larva in :

(1) All chordata (2) Hemichordata (3) Urochordata (4) Cephalochordata

BAD391

6. The other name of *Branchiostoma* is :

(1) Amphioxus (2) Lancelet (3) Both (1) and (2) (4) *Petromyzon*

BAD392

Subphylum Vertebrata :

- The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult.
- Thus all **vertebrates are chordates but all chordates are not vertebrates**. Besides the basic chordate characters, vertebrates have a ventral muscular heart with two, three or four chambers, **kidneys** for excretion and osmoregulation and **paired appendages** which may be fins or limbs.

Vertebrata (Notochord is replaced by vertebral column**)**

Divison

Agnatha
(lacks jaw)

Class
1. Cyclostomata

Gnathostomata
(bears jaw)
Super Class

Pisces
(bears fins)

Class
1. Chondrichthyes
2. Osteichthyes

Tetrapoda
(bears limbs)

Class
1. Amphibia
2. Reptilia
3. Aves
4. Mammals

NCERT Question :

"All vertebrates are chordates but all chordates are not vertebrates". Justify the statement.

Ans. Presence of notochord is characteristic of the phylum chordata, the member of subphylum vertebrata possess notochord during the embryonic period which is replaced by cartilaginous or bony vertebral column in adults. Chordates that are not vertebrates do not passes vertebral column. Thus all vertebrate are chordates but all chordates are not vertebrates.

DIVISION AGNATHA

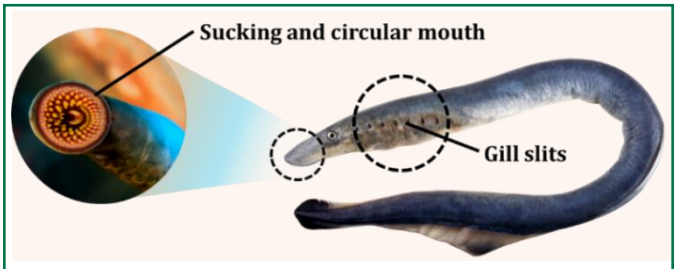
15. CLASS – CYCLOSTOMATA

CYCLOSTOMATA

CYCLO → **Circular**

STOMA → **Mouth**

ATA → **To Have**



Jawless vertebrate

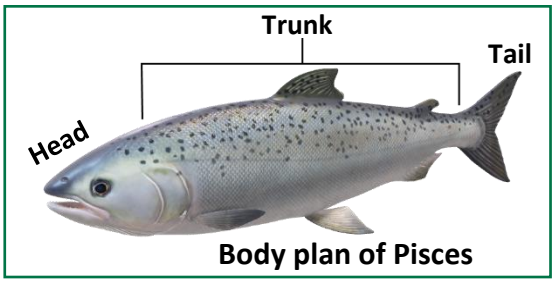
- All living members of the class Cyclostomata are **ectoparasites** on some fishes.
- They have an elongated body bearing **6-15 pairs of gill slits** for respiration.
- Cyclostomes have a **sucking and circular** mouth without jaws.
- Their body is **devoid of scales and paired fins**.

- Cranium and vertebral column are cartilaginous.
- Circulation is of **closed** type. Heart is two chambered.
- Animals are **unisexual**.
- Fertilisation is **external**.
- Larval stage is usually absent except : **Ammocoete larva** in *Petromyzon*.
- Cyclostomes are marine but migrate for spawning to fresh water. After spawning, within a few days, they die. Their larvae, after metamorphosis, return to the ocean (Anadromous migration). **Examples :-** *Petromyzon* (Lamprey) and *Myxine* (Hagfish).

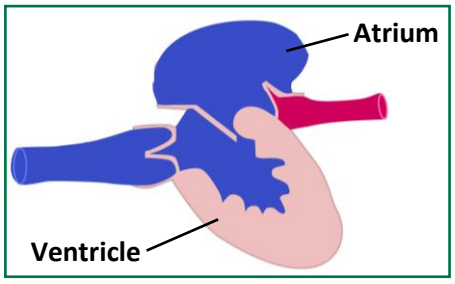
DIVISION GNATHOSTOMATA

16. SUPER CLASS PISCES

- This super class includes **true fishes**.
- They are cold blooded (**Poikilothermous**) animals i.e. they lack the capacity to regulate their body temperature.



- They are aquatic, may be **fresh water** or **marine**.
- Body is long, boat shaped and stream lined, which is divided into head, trunk and tail.
- Neck is absent.
- External and middle ears are absent, only internal ear is present which works as statoreceptor (for balancing).
- Respiration by gills, which are **naked** or **covered by operculum**.
- Heart is two chambered, known as "**Venous heart**", because it contains only impure blood, which goes to gills for oxygenation from heart, oxygenated blood is then distributed to all parts of body directly from gills i.e. single circulation of blood.



- RBC's are nucleated.

- In the skull of fishes only one occipital condyle is present, so their skull is called **monocondylar** type.
- Cranial nerves are **10 - pairs**.
- Kidneys in fishes are excretory organs, Urinary bladder is absent.
- Cartilaginous fishes excrete Urea, Marine bony fishes excrete Trimethyl amine oxide (TMAO) and fresh water bony fishes excrete Ammonia.
- Fishes are **unisexual**.
- Fertilization is internal or external.
- Development is **direct** i.e. larval stage is lacking during development.
- Baby fishes are called **Fry or Hatchling**.

(A) Chondrichthyes

- They are marine animals with streamlined body and have cartilaginous endoskeleton.
- Mouth is located ventrally.
- **Notochord** is **persistent** throughout life.
- Gill slits are separate and without **operculum** (gill cover).
- The skin is tough, containing minute **placoid scales**. Teeth are modified placoid scales which are backwardly directed. Their jaws are very powerful. These animals are predaceous.
- Due to the absence of air bladder, they have to swim constantly to avoid sinking.
- Heart is two-chambered (one auricle and one ventricle).
- Some of them have **electric organs** (e.g. *Torpedo*) and some possess **poison sting** (e.g. *Trygon*). They are cold-blooded (**poikilothermous**) animals, i.e., they lack the capacity to regulate their body temperature.
- Sexes are separate. In males pelvic fins bear claspers.
- They have internal fertilisation and many of them are viviparous.

Examples:

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

(B) Osteichthyes :

- It includes both marine and fresh water fishes with bony endoskeleton. Their body is streamlined.
- Mouth is mostly terminal.
- They have four pairs of gills which are covered by an **operculum** on each side.

- Skin is covered with cycloid/ctenoid scales.
- **Air bladder** is present which regulates buoyancy.
- Heart is two chambered (one auricle and one ventricle). They are cold-blooded animals.
- Sexes are separate.
- Fertilisation is usually external.
- They are mostly oviparous and development is direct.

Examples:

Marine – *Exocoetus* (Flying fish), *Hippocampus* (Sea horse : Swims vertically)

Freshwater – *Labeo* (Rohu), *Catla* (Katla), *Clarias* (Magur);

Aquarium – *Betta* (Fighting fish), *Pterophyllum* (Angel fish).

Comparison Between Chondrichthyes and Osteichthyes :

Characteristics	Osteichthyes	Chondrichthyes
Habit and habitat	Both marine and fresh water fishes with bony endoskeleton. Their body is streamlined.	Marine, stream lined body, predaceous. Cartilaginous endoskeleton, Notochord persistent throughout life.
Respiration by	4 pair of gills with operculum	5 to 7 pair of gills without operculum
Mouth	Terminal	Ventral
Scales	Cycloid or ctenoid	Placoid
Air bladder	Present	Absent
Tail	Homocercal tail	Heterocercal tail
Copulatory organ	Absent	Clasper present in male
Cloaca/Anus	Anus is present	Cloaca is present
Fertilization	Usually external	Internal
Oviparous/Viviparous	Mostly Oviparous	Many of them are viviparous
Scroll valve	Absent	Present

NCERT Question :

How important is the presence of air bladder in Pisces?

Ans. Air bladder in pisces helps maintain buoyancy, which prevents fishes from sinking.

BEGINNER'S BOX-12 CYCLOSTOMATA AND PISCES

1. Which of the following is the larva of *Petromyzon* ?

(1) Ammocoete (2) Trochophore (3) Tadpole (4) Tornaria

BAD393

2. Circular and suctorial mouth is present in :

(1) *Labeo* (2) *Petromyzon* (3) *Scoliodon* (4) All the above

BAD394

3. Jaw less fishes are included in :

(1) Chondrichthyes (2) Osteichthyes (3) Cyclostomata (4) Lung fishes

BAD395

4. Air bladder is present in :

(1) Dog fish (2) Flying fish (3) Hag fish (4) Electric fish

BAD396

5. The fish that swims vertically :

(1) *Scoliodon* (2) *Hippocampus* (3) *Exocoetus* (4) *Trygon*

BAD397

6. All living members of which class are ectoparasite on fishes?

(1) Turbellaria (2) Chondrichthyes

(3) Cephalopoda (4) Cyclostomata

BAD398

7. Which of the following are characters of cyclostomata?

(1) 6–15 pairs of gill slits is present for respiration

(2) Sucking and circular mouth without jaws

(3) Body is devoid of scales and paired fins

(4) All of these

BAD399

8. Which of the following organism possess cartilaginous cranium, vertebral column, closed type of circulatory system and migrate to fresh water for spawning?

(1) *Ascidia* (2) *Scoliodon* (3) *Petromyzon* (4) *Branchiostoma*

BAD400

9. After spawning, within a few days, they die. Their larvae, after metamorphosis, return to ocean. Which of the following are marine but migrate for spawning to fresh water?

(1) *Petromyzon* (Lamprey) (2) *Scoliodon*

(3) *Trygon* (4) *Torpedo*

BAD401

10. Which of the following is correct about cyclostomes?

(1) Ectoparasite on fishes during their adult stage.

(2) Skin with scales and contain unicellular mucous gland.

(3) Three chambered heart.

(4) Heart is two chambered and possess 4 pair of gill slits for respiration.

BAD402

11. Select the correct matching :

(1) *Betta* – Fighting fish (2) *Hippocampus* – Flying fish

(3) *Pterophyllum* – Fighting fish (4) *Clarias* – *Labeo*

BAD403

12. Which of the following is a marine bony fish?

(1) *Exocoetus* (Flying fish) (2) *Hippocampus* (Sea-horse)

(3) Both (1) and (2) (4) *Pristis* (Saw fish)

BAD404

13. Which of the following is a fresh water bony fish?

(1) *Labeo* (Rohu) (2) *Catla* (Katla)

(3) *Clarias* (Magur) (4) All of these

BAD405

14. The scales found in chondrichthyes is/are :

(1) Placoid (2) Cycloid (3) Ctenoid (4) All of these

BAD406

15. Select the difference which is wrongly written between Cartilaginous fish and Bony fishes respectively.

(1) Operculum is absent – Operculum is present

(2) Fertilization is internal – Fertilization is external

(3) Posses 5–7 pair of gills – Posses 4 pair of gills

(4) Mostly oviparous – Mostly viviparous

BAD407

16. Which of the following fish possess poison sting?

(1) Dog fish (2) Electric ray (3) Sting ray (4) Fighting fish

BAD408

17. Males possess claspers in pelvic fins in class _____.

(1) Cyclostomata (2) Chondrichthyes

(3) Osteicthyes (4) Amphibia

BAD409

18. Number of chambers in the heart of fishes :

(1) One (2) Two (3) Three (4) Four

BAD410

19. Common name of *Exocoetus* is :-

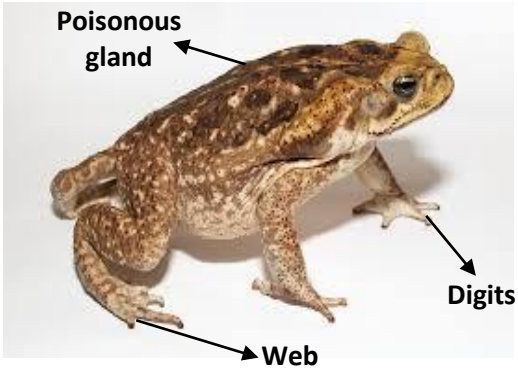
(1) Fighting fish (2) Saw fish (3) Flying fish (4) Electric ray

BAD411

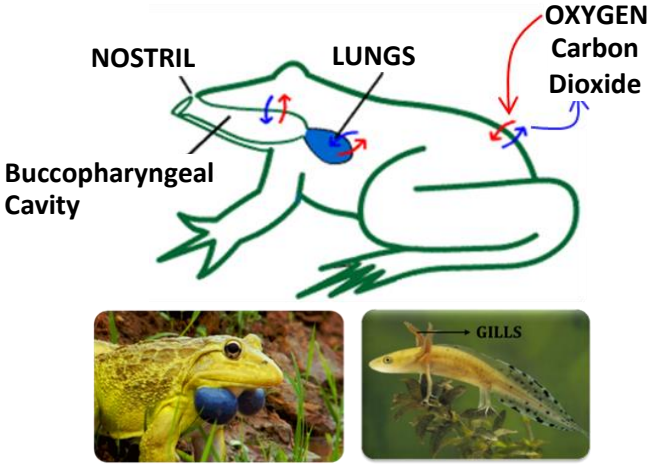
TETRAPODA :

17. CLASS – AMPHIBIA (AMPHI = DUAL, BIOS = LIFE)

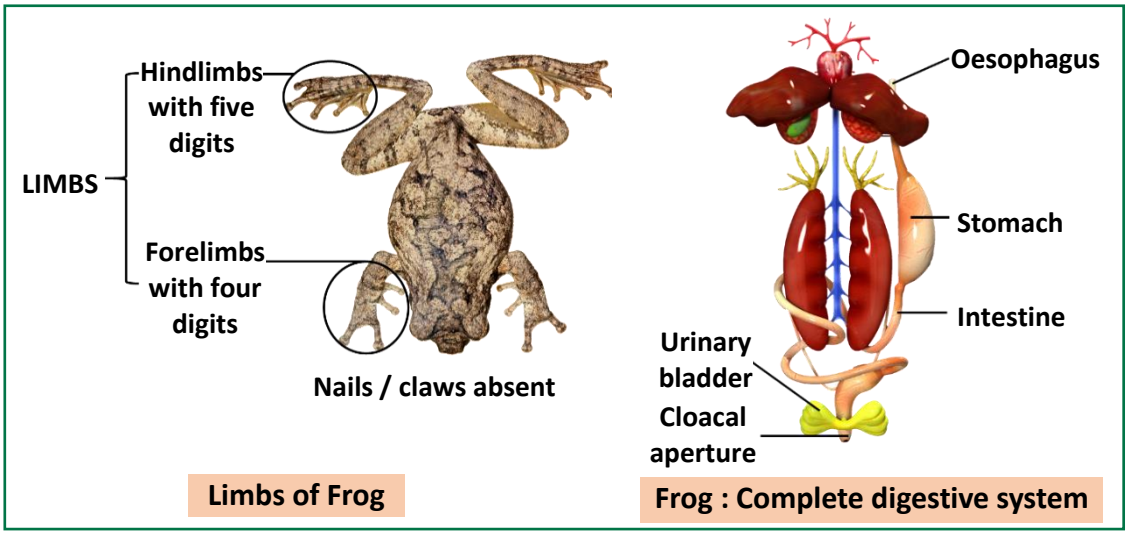
- Class amphibia includes animals which can live on both the places with ease i.e. under water and on the land. **(Never found in marine water)**.
- These are the first chordate animals which came out of water but these are not able to live on land permanently as they depend on water for reproduction. Their eggs do not have protective covering to check evaporation.
- These animals **undergo hibernation** or **aestivation** to prevent themselves from extreme cold and heat and to overcome unfavourable conditions.
- Body is divided into **head** & **trunk**. Tail may be present in some amphibians **e.g.** Salamander. Neck is totally absent.
- Skin is **moist**, **smooth** and **scale less**.
- Skin - Numerous glands are found for moistening the skin and poisonous glands are also present in skin.
- Pigment cells are also found as chromatophore for colouration posses changing ability known as metachrosis.
- Respiration by **gills**, **skin**, **lungs** or **buccopharyngeal** cavity.



Frog

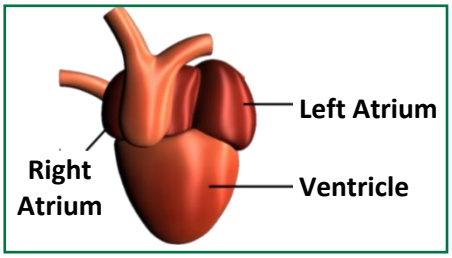


- Most of them have **two pairs** of limbs. Forelimbs have four digits and hindlimbs have five digits.

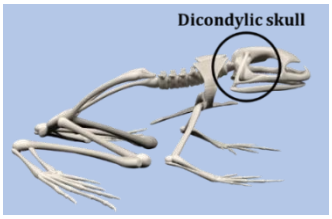


Limbs of Frog | Frog : Complete digestive system

- A well developed and **complete alimentary canal** along with digestive glands are present in digestive system (Salivary glands are absent in frog).
- Alimentary canal, urinary bladder and genital ducts open into a common chamber called **cloaca**, which opens to the exterior.
- These are cold blooded or **poikilothermal animals**.
- Heart is **three chambered**, 2 atria and 1 ventricle. Incomplete double circulation.



- RBCs are **biconvex**, oval and **nucleated**.
- **Renal portal** system and **hepatic portal** system are present.
- **Pacemaker is sinus venosus.**
- **Excretory organs :** One pair of kidneys
- **Excretory matter :** Ammonia in aquatic forms, Urea in terrestrial forms.
- Ten pairs of cranial nerves present.
- **Skeletal system :** Dicondylic skull (Skull has two occipital condyles) Ribs are absent.



- **Eye :** The eyes have eyelids.
- **Ear :** Only one ear ossicle (Columella) present in middle ear. A tympanum represents the ear.
- **Reproduction :** Sexes are separate. Animals return to water from land for reproduction.

- Fertilisation is **external**, takes place in water.
- In some amphibians fertilisation is internal.
- Amphbians are **oviparous**, lay eggs in water.
- Development is **indirect**. Larva is present.
- Larva of frog is tadpole larva.
- Larva of salamander is axolotl larva.

***Bufo* (Toad)**

***Hyla* (Tree frog)**

***Salamandra* (Salamander)**

***Ichthyophis* (Limbless amphibian)**

***Rana tigrina* (Indian bull frog)**

BEGINNER'S BOX-13 — AMPHIBIA

1. Amphibians have :

(1) Three chambered heart (2) Four chambered heart

(3) Open circulation (4) Two chambered heart

BAD412

2. The amphibians are characterized by :

(1) Only aquatic habit

(2) Monocondylar skull

(3) Scaleless, smooth moist and glandular skin

(4) Scaly and non-glandular skin

BAD413

3. Tree frog is :

(1) *Salamandra* (2) *Hyla* (3) *Rana* (4) *Icthyophis*

BAD414

4. *Rana tigrina* is scientific name of :

(1) Tree frog (2) Common toad (3) Indian bull frog (4) Sting ray

BAD415

5. Terrestrial amphibians are :

(1) Ammonotelic (2) Ureotelic (3) Uricotelic (4) Excrete TMAO

BAD416

6. Which of the following tract open into a common chamber cloaca in amphibians?

(1) Alimentary canal (2) Urinary tract

(3) Reproductive tract (4) All of these

BAD417

18. CLASS – REPTILIA

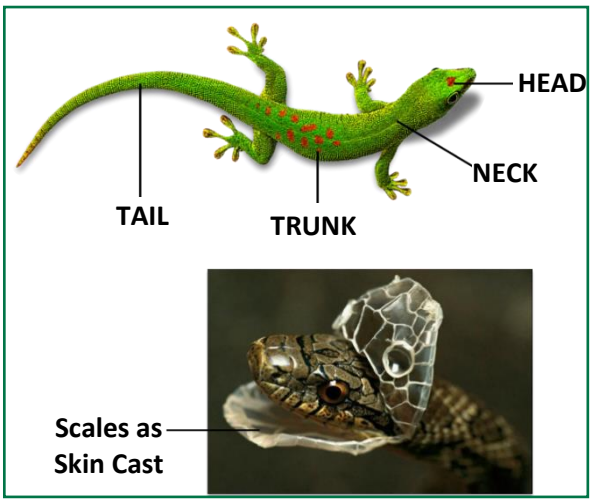
- Reptiles are first successful terrestrial vertebrates.
- Why called reptiles?

  Class name refers to creeping or crawling mode of locomotion.

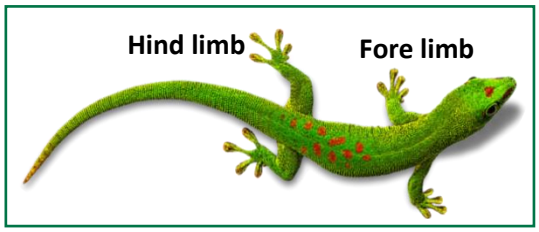
  (Latin reptum repere - To creep or Crawl)

Body parts :

- Body is divided into head, neck, trunk and tail.
- These are cold blooded/ **Poikilothermal animals**.
- Reptiles were the first successful terrestrial vertebrates but some are also found in aquatic habitat.
- Skin is **dry, cornified, rough and non-glandular**.
- Exoskeleton is made up of horny epidermal **scales** or **scutes**.
- Snakes and Lizards shed their scales as skin cast.

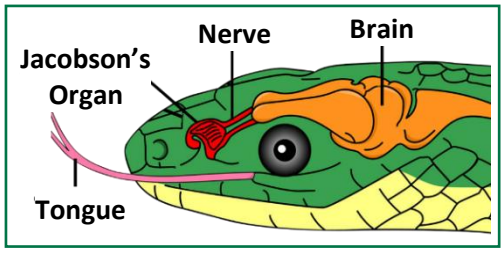


- Limbs, when present are two pairs and each limb has five digits. Each digit has incurved nails.



- Snakes are **limbless**.
- A **complete alimentary** canal is found in these animals, which opens into cloaca.
- Respiration occurs through **lungs** throughout the life.

- Heart is usually **3 chambered** but **4 chambered** in **crocodiles**.
- RBCs are **oval** and **nucleated**.
- Only one occipital condyle is present in skull (monocondylar skull).
- Ribs are present in neck and thorax region.
- **One pair of kidneys** are present for excretion and osmoregulation. These animals are uricotelic for water conservation.



- Brain is well developed and **12 - pairs of cranial nerves** are present. They do not have external ear opening. Tympanum represents ear (tympanum is not present in snakes).
- At the roof/ceiling of buccal cavity **Jacobson's organ** (olfactory) is **present**.
- Ureters, genital ducts and alimentary canal open into a **single cloacal aperture**.

Reproduction :

Sexes are separate. These are unisexual animals. Genital aperture is not separate from anus. Ureters, genital ducts and alimentary canal open into a cloaca. Fertilisation is **internal**. Animals are **oviparous.**

- Eggs are Megalecithal (with large amount of yolk) and cleidoic. Eggs are leathery in snakes. Poikilothermal (cold blooded animals). Body temperature changes according to the environment.
- Development is **direct** i.e. larval stage is absent. Parental care present in this class.

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

Poisonous snakes : **Non-poisonous snakes :**


***Naja* (Cobra)**


***Vipera* (viper)**


***Bangarus* (Krait)**


***Python* (Ajgar)**

BEGINNER'S BOX-14 REPTILIA

1. Non-poisonous snake is :
(1) *Python* (2) *Vipera* (3) *Naja* (4) *Bangarus*

BAD418

2. Which of the following pair is unmatched for the animals of Reptilia class?
(1) Temperature constant and external fertilisation
(2) Sexes seperate and lack of Metamorphosis
(3) 12 pairs cranial nerves and rough skin
(4) Skull monocondylic and skin with scales

BAD419

3. In which of the following tympanum is absent?
(1) Birds (2) Frogs (3) Lizards (4) Snakes

BAD420

4. Number of cranial nerves in a reptile :
(1) 8- pairs (2) 10- pairs (3) 12- pairs (4) 14- pairs

BAD421

5. *Chelone* belongs to :
(1) Amphibia (2) Reptilia (3) Protochordates (4) Fishes

BAD422

6. Tree lizard :
(1) *Calotes* (2) *Chameleon* (3) *Hemidactylus* (4) *Chelone*

BAD423

7. Reptilia means :
(1) Flying mode of locomotion
(2) Swim mode of locomotion
(3) Saltation mode of locomotion
(4) Creeping or crawling mode of locomotion

BAD424

8. Which of the following is not the property of reptiles?
(1) Poikilothermals
(2) Presence of hair on body
(3) Exoskeleton is made up of horny epidermal scales
(4) Skull is monocondylic

BAD425

9. Match the following columns and choose the correct answer from the options given below.

Common Name		Scientific Name	
(A)	Cobra	(i)	*Vipera*
(B)	Krait	(ii)	*Naja*
(C)	Viper	(iii)	*Bangarus*

(1) A – i , B – ii , C – iii (2) A – ii , B – iii , C – i
(3) A – iii , B – i , C – ii (4) A – i , B – iii , C – ii

BAD426

10. Number of chambers in heart of crocodile is :
(1) One (2) Two (3) Three (4) Four
BAD427

11. First successful terrestrial vertebrates are :
(1) Pisces (2) Amphibians (3) Reptiles (4) Aves
BAD428

12. *Calotes* is the scientific name of :
(1) Garden lizard (2) Wall lizard (3) King cobra (4) Krait
BAD429

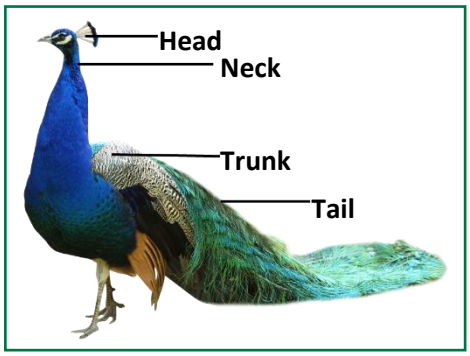
19. CLASS – AVES

- All types of birds are included in this class.
- **Dr. Salim Ali** was the great ornithologist of India and regarded as **"Birdman of India".**
- Birds are also known as **"Feathered bipeds or glorified reptiles".**
- The characteristic features of birds are presence of feathers all over the body and most of them can fly except flightless birds. Feathers keep them warm and also make body weight light. Feathers are **modification of epidermal scales**.

Functions of Feathers :

(i) Protection
(ii) Heat Retention
(iii) Protective Coloration
(iv) Sexual Dimorphism

- Birds are warm blooded or **homeothermic** or endothermic animals i.e. Body temperature remains almost constant.
- Body is **boat shaped**. It is divided into **head**, **neck**, **trunk** and **tail**. Neck is long and flexible.



Skeletal System :

(i) Endoskeleton is fully ossified (bony).
(ii) Long bones are hollow with air cavities called **pneumatic bones**.
(iii) Pneumatic bones make the body light in weight and help in flying.

Most of the birds can fly - Except flightless birds (e.g., Ostrich, Kiwi, Penguin).

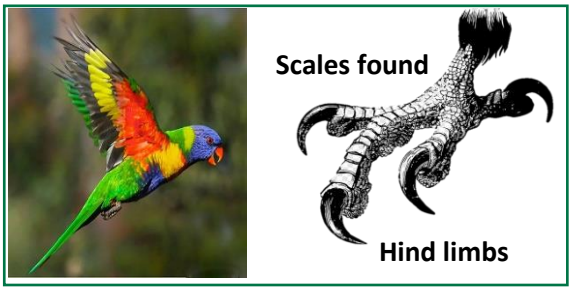
Limbs :

(i) Forelimbs (with three digits) are **modified** into **wings**, which help in flying and in conserving heat.

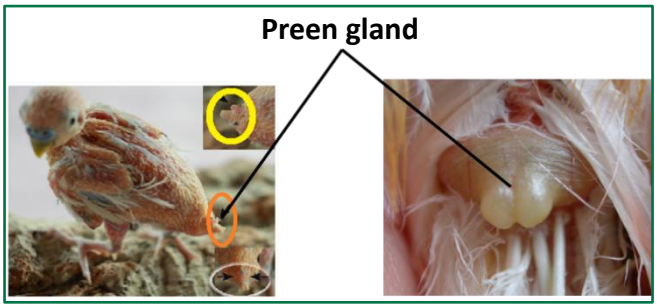
(ii) Hind limbs with four **clawed digits**.

(iii) Scales are found only on hind limbs.

(iv) Hind limbs are best adapted for sitting, walking, perching and swimming.



- Skin is dry and without glands. But oil glands or **Preen glands** are found at the base of the tail. These glands secrete oil, which lubricates feathers.



Digestive System :

(i) Additional chambers are present – **crop and gizzard.**

(ii) Oesophagus is modified into crop for quick food ingestion and storage.

(iii) Gizzard – for crushing the food which is swallowed unmasticated.

(iv) Pigeon or crop milk is secreted in both the sexes.

(v) Three chambered cloaca is present.

(vi) **Teeth are absent**. Beak is present.

Respiratory system :

(i) **Spongy lungs** are present for respiration.

(ii) Air sacs are also found. Air sac connected to lungs supplement respiration.

(iii) **Syrinx** : Sound producing organ at the junction of trachea and bronchi.

Circulatory system :

(i) Heart is completely **four chambered**.

(ii) Only right aortic arch is present.

(iii) **Hepatic portal system** is well developed in birds.

Excretory system :

(i) Excretory organs are **Kidneys.**

(ii) **Urinary bladder is absent.**

(iii) Ureters open into cloaca.

(iv) Excretory waste is semi solid uric acid.

(v) Animals are **uricotelic**.

Eyes : Eyes are large and nictitating membrane is present.

Ear : External ear are present but ear pinnae absent.

Nervous system :

(i) Brain is large, smooth and highly developed.

(ii) Cerebellum is well developed, for aerial mode of life.

(iii) Cranial nerves are **12 pairs** in number.

Reproduction :

(i) Birds are **unisexual**.

(ii) Sexual dimorphism is present.

(iii) Birds are monodelphic i.e. only left ovary and left oviduct are functional in females.

(iv) Fertilisation is **internal**.

(v) They are egg laying i.e., **Oviparous**.

(vi) Embryonic development is **direct**.

(vii) Birds form nests.

(viii) Parental care is well marked.

Examples :

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

***Struthio* (Ostrich)**
Largest bird

Psittacula
(Parrot)

Pavo
(Peacock)

Neophron
(Vulture)

NCERT Que.

What are the modifications that are observed in birds that help them fly?

Ans.

(a) Fore limbs modified into wings to help them in flying.

(b) Pneumatic bones lighten the skeleton.

(c) Absence of urinary bladder reduce weight of retained urine.

(d) Presence of streamlined body provides less resistance and enables longer flight.

BEGINNER'S BOX-15 AVES

1. Characteristic of birds is :
(1) Unisexual and sexual dimorphism absent.
(2) Bisexual and sexual dimorphism absent.
(3) Unisexual and sexual dimorphism present.
(4) Bisexual and sexual dimorphism present.

BAD430

2. Which of the following group of animals have monocondylar skull :
(1) Amphibia & mammals
(2) Reptilia & mammals
(3) Aves & mammals
(4) Reptilia & aves

BAD431

3. *Archaeopteryx* shows the characters of :
(1) Reptiles and birds
(2) Reptiles and mammals
(3) Birds and mammals
(4) Fishes and amphibia

BAD432

4. Birds differ from reptiles in which one of the following character :
(1) Skin has scales
(2) They lay eggs
(3) They are vertebrates
(4) There is regulation of body temperature

BAD433

5. Which of the following are warm blooded animals?
(1) Reptilia (2) Amphibian (3) Birds (4) Fishes

BAD434

6. Pneumatic bones are found in :
(1) Wall lizard (2) Tadpole of frog
(3) Flying lizard (4) Pigeon

BAD435

7. Which of the following is not the feature of birds?
(1) Beak (2) Teeth (3) Feathers (4) Pecten in eyes

BAD436

8. *Psittacula* is the scientific name of :
(1) Pigeon (2) Parrot (3) Peacock (4) Ostrich

BAD437

9. Which of the following is the function of feathers?

(1) Protective coloration (2) Sexual dimorphism

(3) Heat retention (4) All of the above

BAD438

10. Which of the following is incorrect about birds?

(1) Air sacs is connected to lungs which help in respiration.

(2) Hind limb posses scales and are modified for walking, swimming or clasping.

(3) Separate sexes, internal fertilization, oviparous and direct development.

(4) Endoskeleton consists of feathers, scales, beak and claws.

BAD439

11. All are flying birds from the following except :

(1) Crow (2) Pigeon (3) Parrot (4) Penguin

BAD440

20. CLASS – MAMMALIA

Habit and Habitat :

- The members of this class are **cosmopolitan** and found in a variety of habitats - polar ice caps (Polar bear), deserts (Camel), mountains (Mountain goat), forest (Lion), grasslands (Horse) and dark caves (Bat).
- Some of them have adapted to fly [*Pteropus* (Flying fox)] and some live in water (Dolphin and Whale). Mammals are warm blooded or **homeothermic** or endothermic animals.

Body Divisions :-

- Body is divided into head, neck, trunk and tail.

Skin :

- The skin of mammals is unique in **possessing hair**.
- Skin of mammals is thick and glandular. So many types of glands are present in the skin as sweat glands, sebaceous glands and mammary glands (mostly modified sweat glands).

Mammary Glands :

- The most **unique mammalian character** is the presence of milk producing glands (mammary glands) by which the young ones are nourished.

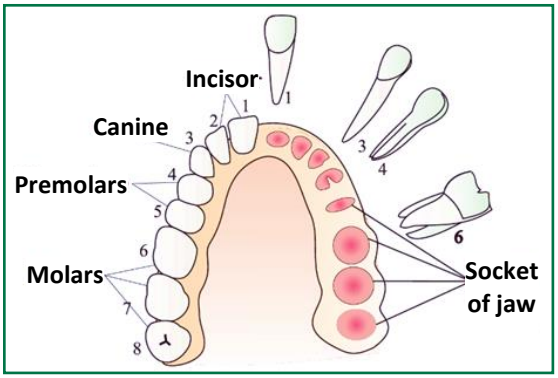
Exoskeleton Provide Protection :

- Horns on Head
- Nails or claws on digits and Hoof

Limbs :

- **Two pairs of limbs** are present.
- Limbs are adapted for burrowing, walking, running, climbing, flying and swimming.
- Hind limbs are absent in some aquatic mammals.

Digestive System :



- Alimentary canal is **complete**.
- Anus and urinogenital apertures are separate.
- Cloaca is usually absent, but present in some mammals **e.g.** Duck-billed platypus.
- Teeth are **thecodont** (embedded in bony sockets), **Heterodont** (different types- Incisors, Canines, Premolars and Molars) and mostly **diphyodont** (appear twice in life time).

Diaphragm :

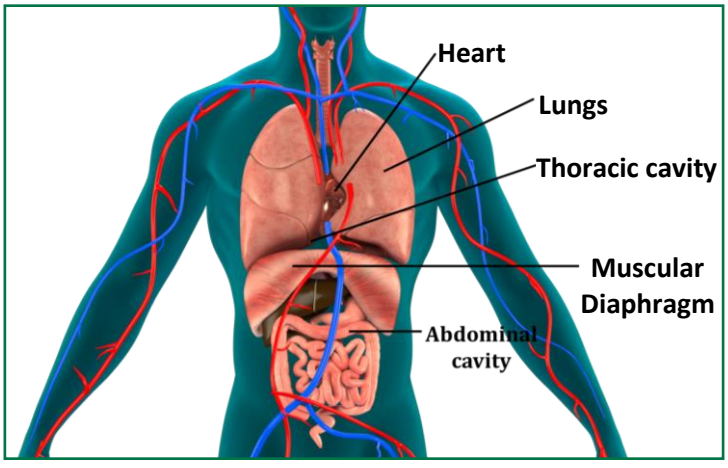
- A horizontal, muscular diaphragm is present in between thorax and abdomen of all the members without any exception. Diaphragm helps in respiration, defecation, micturition and parturition.

Respiratory Organs :

- Respiration is by **one pair of lungs** (enclosed in pleural cavity).
- **Larynx or sound producing organ** is found in the neck region.

Circulatory System :

- Heart is four chambered (Two atria and two ventricles).
- **Double circulatory system** is present.
- Pacemaker is S.A. Node.
- RBCs small, circular and enucleated.



Skeletal System :

- Endoskeleton is bony and skull is **dicondylic**.
- Neck is having 7 cervical vertebrae.
- Ribs are bicephalic.

Excretory System :

- One pair of kidneys are situated in abdominal cavity.
- Mammals are **ureotelic**, i.e. excretory matter is urea.

Nervous System :

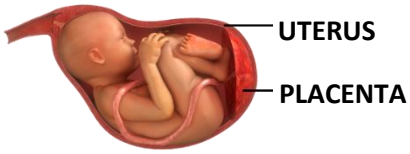
- Brain is comparatively large. Cerebrum and cerebellum are highly developed.
- Cranial nerves are **12 – pairs** skull is dicondylic.

Ear :

- External ear is present in the form of ear pinna.

Reproductive System :

- Mammals are **unisexual** animals.
- Testes of males are situated outside the abdominal cavity in the scrotal sacs.
- A distinct penis is present in males for copulation.
- Ovaries are found in females.
- Fertilization is **internal** and it takes place in fallopian tubes.



- Embryo is attached with the uterus of mother by placenta in higher mammals, so these animals are also called placental animals.
- Mostly mammals are **viviparous**, which give birth to their young ones. Some mammals are oviparous [Prototherians].
- Parental care is well marked in mammals.
- Mother feeds the child from milk secreted from her mammary glands and looks after her child.

Examples :

Ornithorhynchus (Platypus)(Egg laying mammal) ; 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).

ANIMAL	*Ornithorhynchus* (Duck billed platypus)	*Macropus* (Kangaroo)	*Pteropus (Flying fox)*	*Balaenoptera* (Whale)
OVIPAROUS/ VIVIPAROUS	Oviparous (Egg laying mammal)	Viviparous	Viviparous	Viviparous
PINNA	Absent	Present	Present	Absent
CLOACA / ANUS	Cloaca present	Anus present	Anus present	Anus present
				

BEGINNER'S BOX-16 MAMMALIA

1. External ear pinna is found in :

(1) Reptiles (2) Mammals (3) Amphibians (4) Fishes

BAD441

2. Respiratory organs of whale are :

(1) Book lungs (2) Lungs (3) Gills (4) Skin

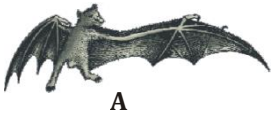
BAD442

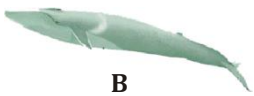
3. Character found only in mammals :

(1) Homeothermy (2) Viviparity

(3) Dicondylic skull (4) Muscular diaphragm

BAD443

4. 
A


B


C

A, B, and C animals are respectively :

(1) *Pteropus*, *Balaenoptera*, *Macropus*

(2) *Macropus*, *Balaenoptera*, *Pteropus*

(3) *Balaenoptera*, *Pteropus*, *Macropus*

(4) *Balaenoptera*, *Macropus*, *Pteropus*

BAD444

5. Trait is found in all mammals :

(1) Muscular diaphragm (2) Mammary glands

(3) 4 chambered heart (4) All of these

BAD445

6. Which is viviparous (give birth to young ones) ?

(1) Kangaroo, Dolphin (*Delphinus*), flying fox (*Pteropus*), Blue whale

(2) Lion, Bat, Whale, Ostrich

(3) Platypus, Penguin, Bat

(4) Shrew, Bat, Cat, *Corvus*

BAD446

7. Select the incorrect matching :

(1) Kangaroo – *Macropus*

(2) Blue whale – *Balaenoptera*

(3) Monkey – *Macaca*

(4) Camel – *Elephas*

BAD447

8. Which of the following is an aquatic mammal?

(1) *Panthera tigris* (2) *Balaenoptera*

(3) *Pteropus* (4) *Macropus*

BAD448

9. Which one of the following is oviparous?

(1) Platypus (2) Flying fox (Bat)

(3) Elephant (4) Whale

BAD449

10. Type of teeth in mammals are :

(1) Heterodont, Thecodont, Diphyodont

(2) Homodont, Thecodont, Diphyodont

(3) Heterodont, Thecodont, Polyphyodont

(4) Homodont, Thecodont, Polyphyodont

BAD450

11. Which of the following is not the feature of mammals?

(1) Ear pinna

(2) Muscular diaphragm

(3) Animals are poikilothermal

(4) Hair on body

BAD451

BEGINNER'S BOX ANSWERS KEY

BEGINNER'S BOX-1											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	2	2	1	2	4	2	3	2	4
	Que.	11	12	13	14	15					
	Ans.	3	4	4	1	3					

BEGINNER'S BOX-2										
	Que.	1	2	3	4	5	6	7	8	9
	Ans.	4	1	1	2	1	3	2	1	3

BEGINNER'S BOX-3											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	2	2	4	1	2	1	2	2	3
	Que.	11	12	13							
	Ans.	2	3	3							

BEGINNER'S BOX-4											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	3	1	1	4	2	2	4	1	4	4
	Que.	11									
	Ans.	3									

BEGINNER'S BOX-5									
	Que.	1	2	3	4	5	6	7	8
	Ans.	2	1	3	3	4	3	3	1

BEGINNER'S BOX-6							
	Que.	1	2	3	4	5	6
	Ans.	2	2	1	4	1	4

BEGINNER'S BOX-7											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	2	4	4	1	3	2	1	4	4	1
	Que.	11	12	13	14	15					
	Ans.	2	1	4	3	4					

BEGINNER'S BOX-8								
	Que.	1	2	3	4	5	6	7
	Ans.	3	4	4	3	3	2	3

BEGINNER'S BOX-9											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	4	1	2	4	2	2	2	1	3	1
	Que.	11									
	Ans.	1									

BEGINNER'S BOX-10										
	Que.	1	2	3	4	5	6	7	8	9
	Ans.	2	4	4	4	4	1	2	4	4

BEGINNER'S BOX-11							
	Que.	1	2	3	4	5	6
	Ans.	3	1	2	2	3	3

BEGINNER'S BOX-12											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	2	3	2	2	4	4	3	1	1
	Que.	11	12	13	14	15	16	17	18	19	
	Ans.	1	3	4	1	4	3	2	2	3	

BEGINNER'S BOX-13							
	Que.	1	2	3	4	5	6
	Ans.	1	3	2	3	2	4

BEGINNER'S BOX-14											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	1	4	3	2	2	4	2	2	4
	Que.	11	12								
	Ans.	3	1								

BEGINNER'S BOX-15											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	3	4	1	4	3	4	2	2	4	4
	Que.	11									
	Ans.	4									

BEGINNER'S BOX-16											
	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	2	2	4	1	4	1	4	2	1	1
	Que.	11									
	Ans.	3									

Salient Features of Different Phyla in the Animal Kingdom

Phylum	Level of Organisation	Symmetry	Coelom	Segmentation	Digestive System	Circulatory System	Respiratory System	Distinctive Features
Porifera	Cellular	Many	Absent	Absent	Absent	Absent	Absent	Body with pores and canals in walls.
Coelenterata (Cnidaria)	Tissue	Radial	Absent	Absent	Incomplete	Absent	Absent	Cnidoblasts present.
Ctenophora	Tissue	Radial	Absent	Absent	Incomplete	Absent	Absent	Comb plates for locomotion.
Platyhelminthes	Organ & Organ system	Bilateral	Absent	Absent	Incomplete	Absent	Absent	Flat body, suckers.
Aschelminthes	Organ system	Bilateral	Pseudo coelomate	Absent	Complete	Absent	Absent	Often worm shaped, elongated.
Annelida	Organ system	Bilateral	Coelomate	Present	Complete	Present	Present	Body segmentation like rings.
Arthropoda	Organ system	Bilateral	Coelomate	Present	Complete	Present	Present	Exoskeleton of cuticle, jointed appendages.
Mollusca	Organ system	Bilateral	Coelomate	Absent	Complete	Present	Present	External skeleton of shell usually present.
Echinodermata	Organ system	Radial	Coelomate	Absent	Complete	Present	Present	Water vascular system, radial symmetry.
Hemichordata	Organ system	Bilateral	Coelomate	Absent	Complete	Present	Present	Worm-like with proboscis, collar and trunk.
Chordata	Organ system	Bilateral	Coelomate	Present	Complete	Present	Present	Notochord, dorsal hollow nerve cord, gill slits with limbs or fins.

NCERT SUMMARY

The basic fundamental features such as level of organisation, symmetry, cell organisation, coelom, segmentation, notochord, etc., have enabled us to broadly classify the animal kingdom. Besides the fundamental features, there are many other distinctive characters which are specific for each phyla or class.

Porifera includes multicellular animals which exhibit cellular level of organisation and have characteristic flagellated choanocytes. The coelenterates have tentacles and bear cnidoblasts. They are mostly aquatic, sessile or free-floating. The ctenophores are marine animals with comb plates. The platyhelminths have flat body and exhibit bilateral symmetry. The parasitic forms show distinct suckers and hooks. Aschelminthes are pseudocoelomates and include parasitic as well as non-parasitic roundworms.

Annelids are metamerically segmented animals with a true coelom. The arthropods are the most abundant group of animals characterised by the presence of jointed appendages. The molluscs have a soft body surrounded by an external calcareous shell. The body is covered with external skeleton made of chitin. The echinoderms possess a spiny skin. Their most distinctive feature is the presence of water vascular system. The hemichordates are a small group of worm-like marine animals. They have a cylindrical body with proboscis, collar and trunk. Phylum Chordata includes animals which possess a notochord either throughout or during early embryonic life. Other common features observed in the chordates are the dorsal, hollow nerve cord and paired pharyngeal gill slits. Some of the vertebrates do not possess jaws (Agnatha) whereas most of them possess jaws (Gnathostomata). Agnatha is represented by the class, Cyclostomata. They are the most primitive chordates and are ectoparasites on fishes. Gnathostomata has two super classes, Pisces and Tetrapoda. Classes Chondrichthyes and Osteichthyes bear fins for locomotion and are grouped under Pisces. The Chondrichthyes are fishes with cartilaginous endoskeleton and are marine. Classes, Amphibia, Reptilia, Aves and Mammalia have two pairs of limbs and are thus grouped under Tetrapoda. The amphibians have adapted to live both on land and water. Reptiles are characterised by the presence of dry and cornified skin. Limbs are absent in snakes. Fishes, amphibians and reptiles are poikilothermous (coldblooded). Aves are warm-blooded animals with feathers on their bodies and forelimbs modified into wings for flying. Hind limbs are adapted for walking, swimming, perching or clasping. The unique features of mammals are the presence of mammary glands and hairs on the skin. They commonly exhibit viviparity.