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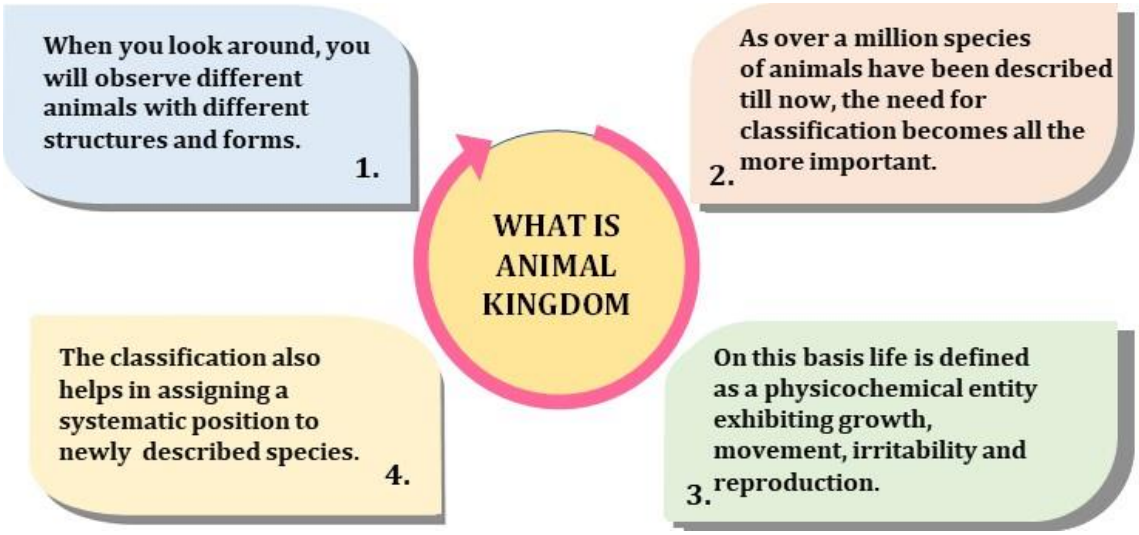
04 Animal Kingdom

1. Introduction :



Important Phyla :

1.	Protozoa (Not included in Animal kingdom)	*Amoeba, Paramecium* etc.
2.	Porifera	Sponges (*Leucosolenia, Sycon*)
3.	Coelenterata/ Cnidaria	*Hydra*, Jellyfish
4.	Ctenophora	*Pleurobrachia, Ctenoplana*
5.	Platyhelminthes	Flat worms (e.g. Tape worm)
6.	Nemathelminthes /Aschelminthes	Round worm (e.g. *Ascaris*)
7.	Annelida	Earthworm, Leech etc.
8.	Arthropoda	Insect, Scorpion, fly etc.
9.	Mollusca	Snail, *Pila*, *Octopus* etc.
10.	Echinodermata	Star fishes
11.	Hemichordata	*Balanoglossus*
12.	Chordata	Fish, Snake, Birds, Monkey etc.

2. Basis of Classification :

- In spite 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.

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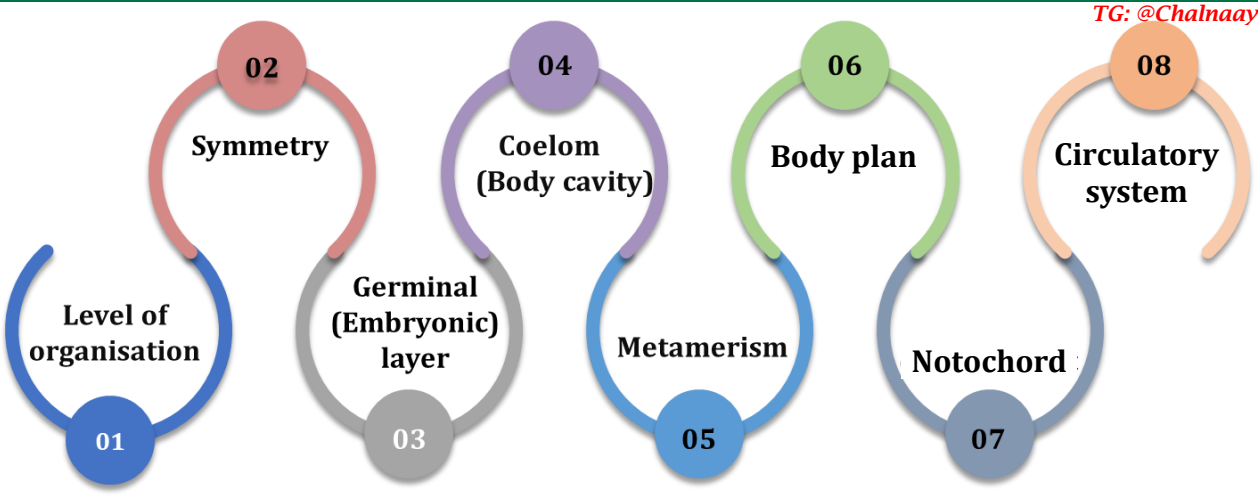


Levels of Organisation :

Protoplasmic level → In protozoans, unicellular body performs all biological activities

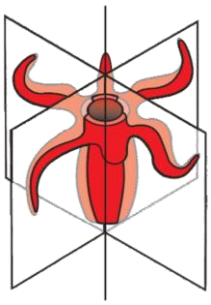
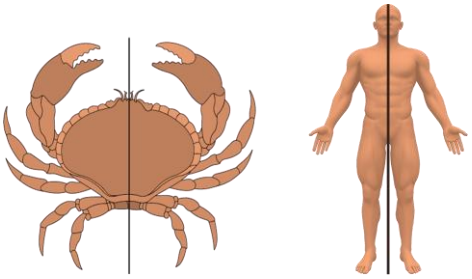
Cellular level → In sponges, cells are arranged as loose cell aggregates and division of labour occurs among cells (Tissues absent)

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

ASYMMETRIC ANIMALS	RADIAL SYMMETRY	BILATERAL SYMMETRY
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, 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).
		

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Germinal Layers :

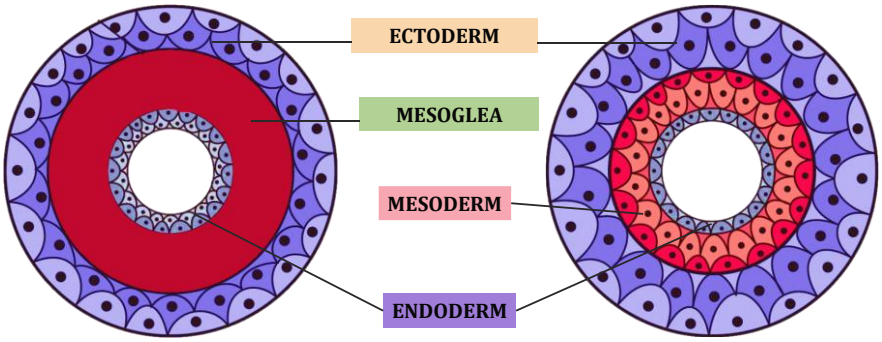
GERMINAL LAYERS

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

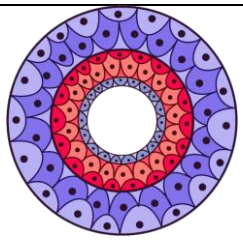
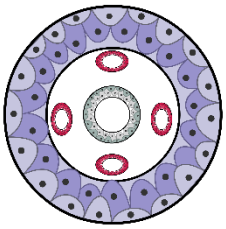
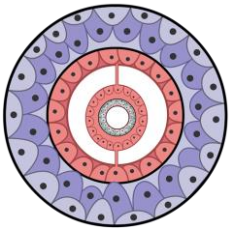
Triploblastic Animals

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



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 coelon)
Body cavity is absent. **e.g,** Porifera to Platyhelminthes	Body cavity is not lined by mesoderm. **e.g.** Aschelminthes	Coelom is lined by mesoderm, and filled with coelomic fluid. **e.g.** Annelida to Chordata
		

Segmentation :

(A) **Pseudometameric : e.g.** Tapeworms

(B) **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 segmentaion and this phenomenon is known as metamerism.

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Body Plan :

BODY PLAN

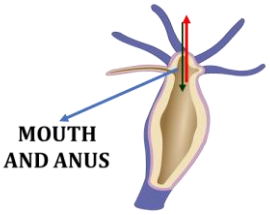
Cell-aggregated type

e.g. Porifera

Blind sac body type

Only single opening to the outside of the body that serves as both mouth and anus.

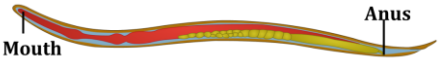
e.g. Coelenterates to Platyhelminthes



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.



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

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

e.g. Arthropods, Molluscs, Echinodermates, Hemichordata & lower chordates like tunicates.

Closed

In which the blood is circulated through a series of vessels of varying diameter i.e. Arteries, veins and blood capillaries.

e.g. Annelids, most of the Chordates, Cephalopod Molluscs

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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

2. Which of the following phylum possess true coelom ?

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

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

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

4. Which of the following phylum is pseudocoelomate ?

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

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

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

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

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

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

8. Segmentation is found in :-

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

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

9. Incomplete digestive tract found in -

(1) Platyhelminthes and Aschelminthes

(2) Platyhelminthes and Ctenophora

(3) Aschelminthes and Annelida

(4) Coelenterates ad Aschelminthes

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

11. Which phylum shows tissue level of organisation?

(1) Protozoa (2) Porifera (3) Coelenterata (4) All of these

12. Organ system level of organisation is not found in

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

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

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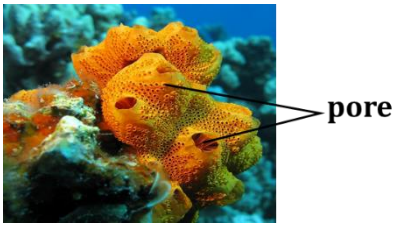
14. In which of the following organism open circulatory system is present?
(1) Arthropods (2) Annelids (3) Chordates (4) Cephalopod molluscs

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

3. 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 with pores i.e. numerous small. Ostia for entry and one large opening Osculum for exit of water.



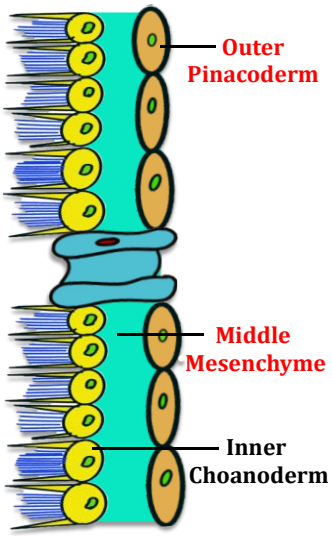
- Sponges have various body form and shapes with irregular shape mostly asymmetrical.
(Radial symmetry in Sycon and *Leucosolenia*)

- Sponges are primitive multicellular acoelomate animals and have cellular level of organisation.

Body wall consists of :-

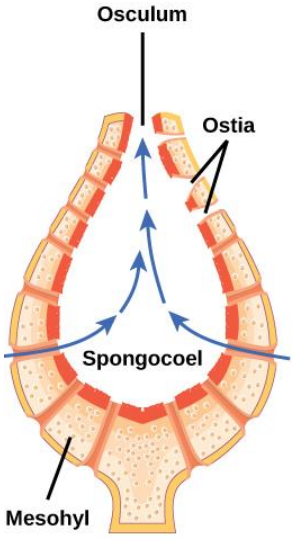
(i) Outer Pinacoderm – Consists of pinacocytes and porocytes.
(ii) Inner choanoderm - Consists of flagellated collar cells or choanocytes. (Unique characteristic of Porifera).
(iii) Between these two layers a gelatinous material Mesenchyme is present which contains Certain Amoebocytes cells like – Scleroblasts – For formation of skeleton elements.

Archaeocytes – Totipotent cells (Formation of ova & spermatazoa)



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

- 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).



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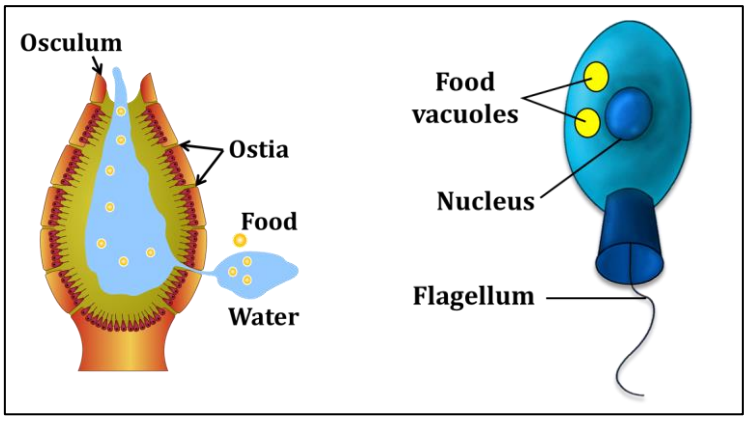
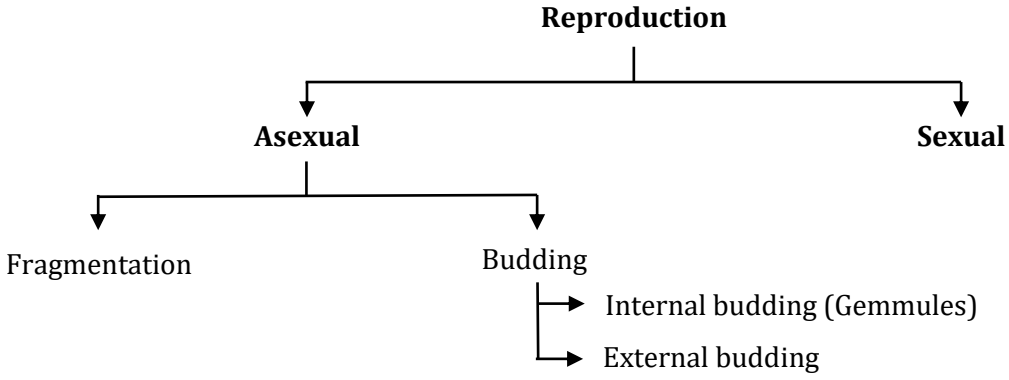


- Choanocytes forms lining of spongocoel and canals. Ceaseless beating of flagella helps in maintaining flow of water current.
- Water Canal System/Water Transport System.
  - The unique feature of sponges.
  - Water enters through ostia in the body wall into spongocoel and goes out through osculum.
  - This pathway helpful in food gathering (nutrition).
  - Respiration and excretion takes place by diffusion of gases through body surface. Excretory matter is ammonia
- Nutrition is holozoic. Digestion is intracellular and occurs in food vacuoles of choanocytes.
- 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.

- Respiration and Excretion takes place by diffusion of gases through body surface. Excretory matter is Ammonia.
- Reproduction flow chart Reproduction takes place by means of :-



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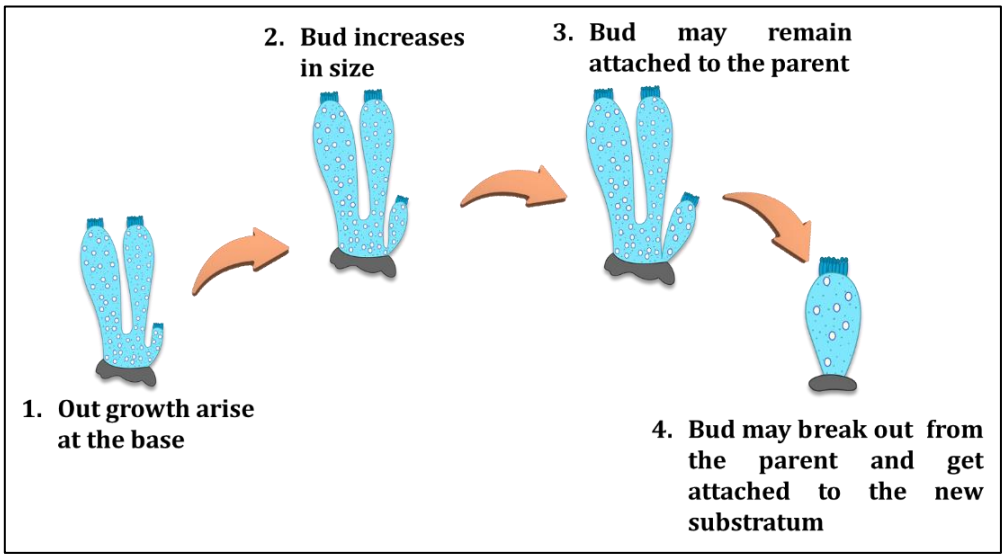
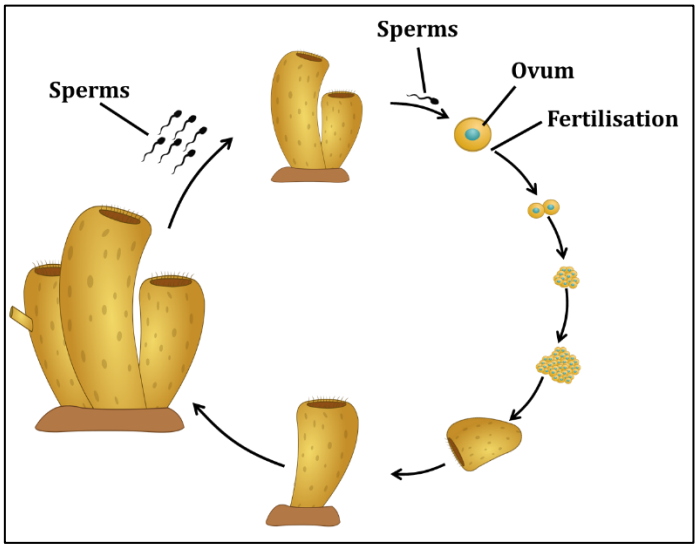
(a) Asexual :-

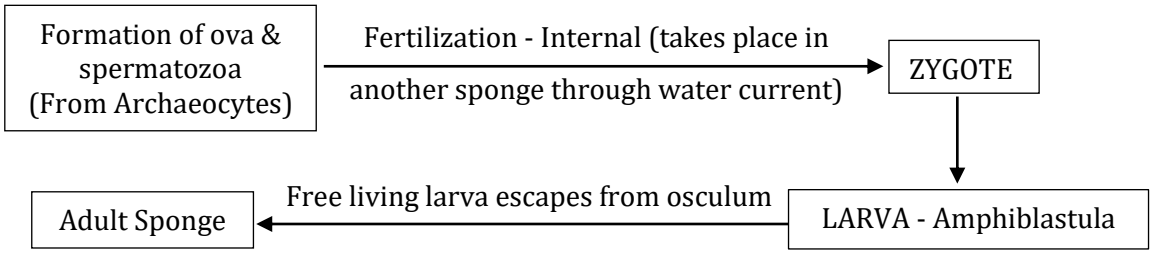
- By Budding or Fragmentation or by special cell mass Gemmules containing Archaeocytes.
- Endogenous buds of asexual reproduction in sponge are known as Gemmules (In unfavourable condition).



(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.





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Examples:

Euspongia (Bath sponge)

Cliona (Boring Sponge)

Leucosolenia (Smallest sponge)

Scypha (Sycon)

Euplectella (Venus Flower Basket)

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) Archeocytes

2. Larval form found in sponges is :
(1) Planula (2) Parenchymula (3) Cysticercus (4) Glochidium

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

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

5. "Venus' flower basket" is :
(1) *Hyalonema* (2) *Euplectella* (3) *Sycon* (4) *Euspongia*

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

7. Digestion in porifera is :-
(1) Intercellular (2) Extracellular
(3) Intracellular (4) Intracellular as well as extracellular

8. _____ is smallest sponge.
(1) Sycon (2) *Leucosolenia* (3) *Euplectella* (4) *Spongilla*

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

10. 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

11. 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

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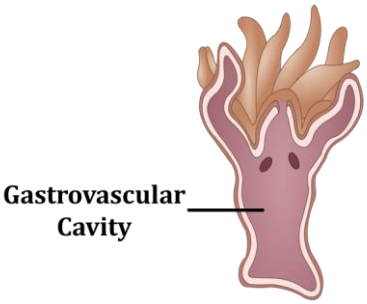
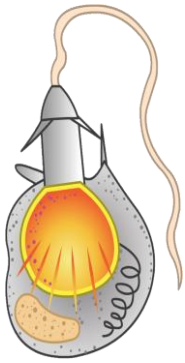
4. Phylum – Cnidaria/Coelenterata :-

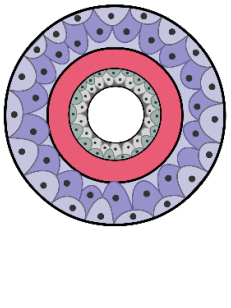


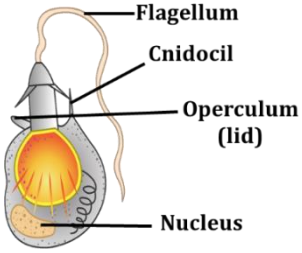
WHY NAMED SO?
Cniodarians due to the presence of stinging cells called Cnidoblasts or Cnidocytes.

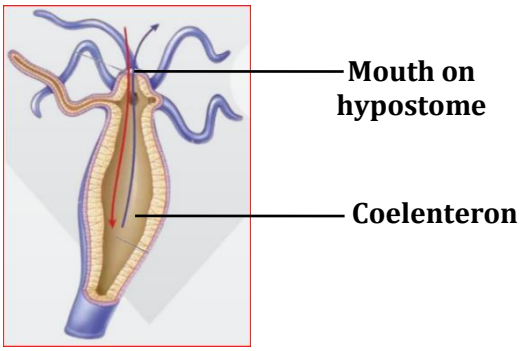
WHY NAMED SO?
Coelenterates due to the presence of gastrovascular cavity or coelenteron.

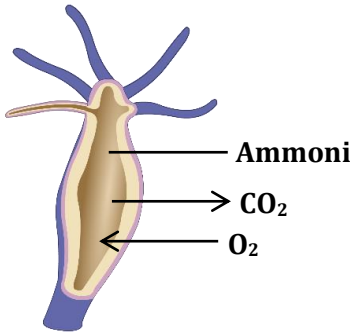


- Mostly marine, few fresh-water (*Hydra*) carnivorous, sessile or free swimming.
- Radially symmetrical animals.
- Tissue level of organisation, acoelomate animals.
- They develop from two germinal layers - Outer ectoderm and inner endoderm
- Animals are Diploblastic (mesoglea between two layers)
- Body of some coelenterates may be covered by exoskeleton of calcium carbonate. e.g. Corals
- Cnidoblast or Cnidocyte (contains stinging capsule as 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 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.

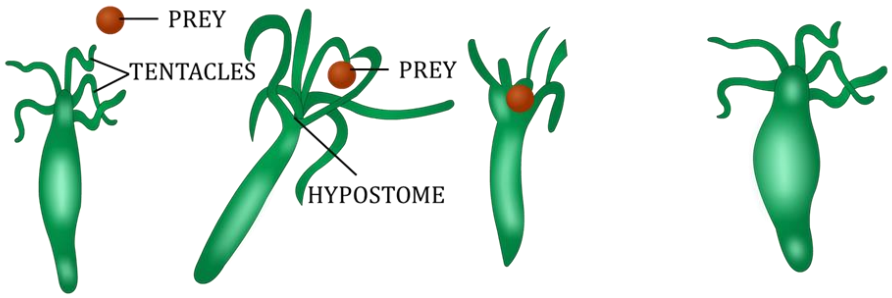








- Coelenterates are carnivorous



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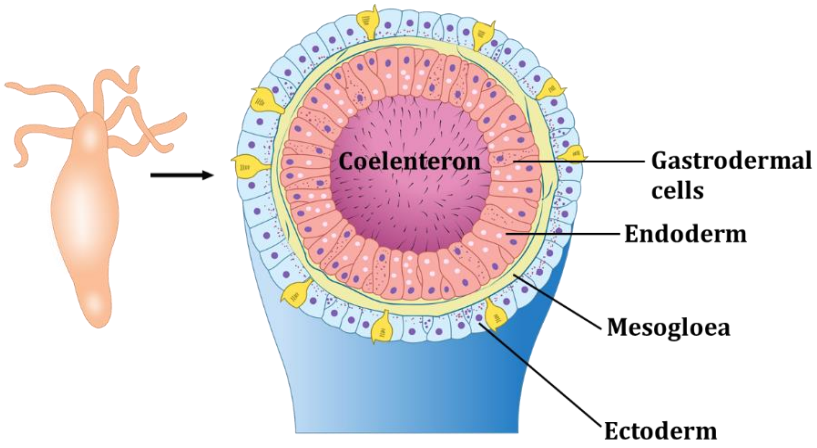
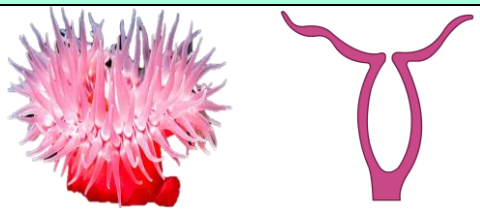
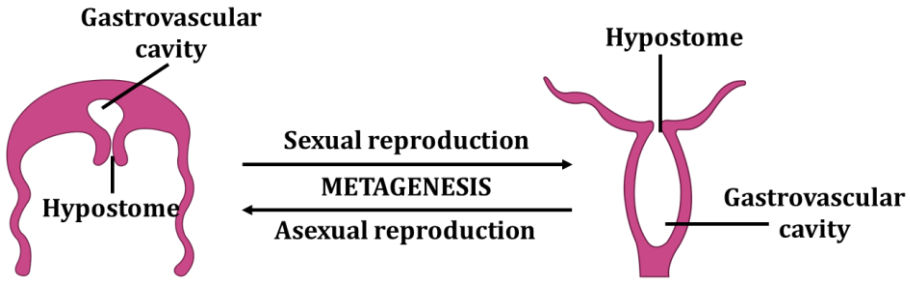
- Digestion is extracellular as well as Intracellular i.e. takes place in coelenteron as well as in food vacuole. Mouth serves both purposes.
  - ➢ Coelenteron is also responsible for distribution of food besides partly digesting it.
  - ➢ Due to this dual role it is named as coelenteron or Gastrovascular cavity.



- Nervous system diffused 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	• Umbrella shaped and free swimming • Always solitary • Mouth and tentacles directed downwards • Sexual form

- 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

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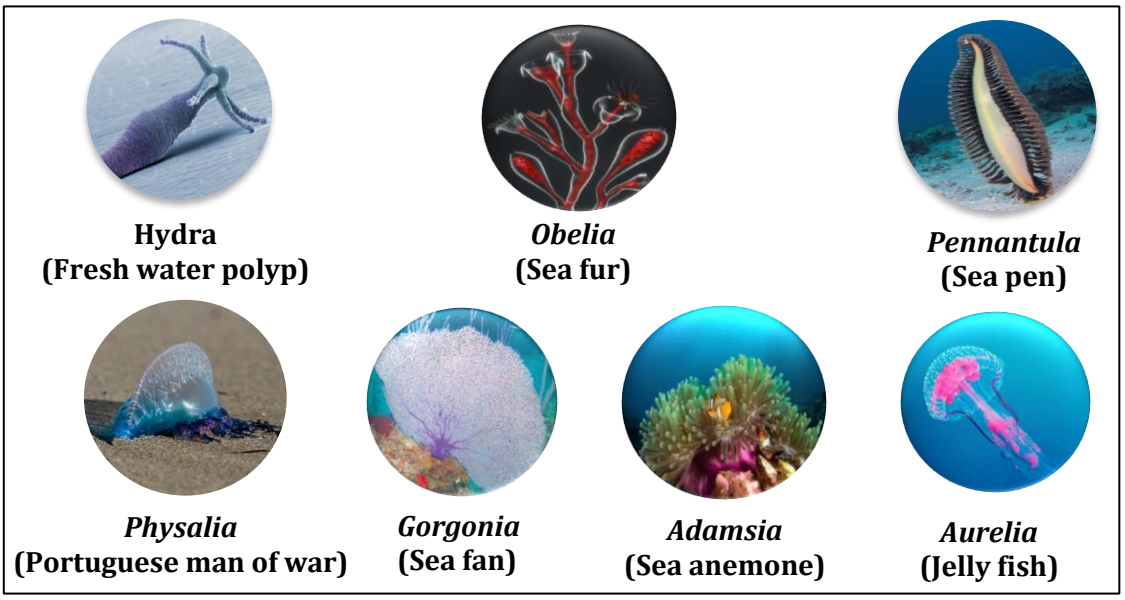
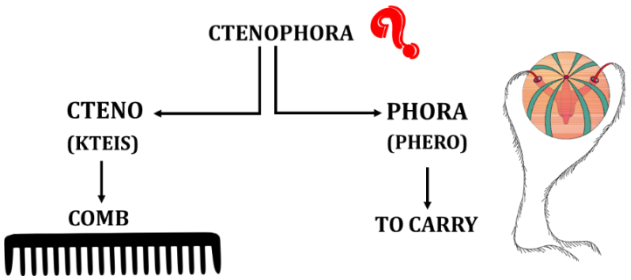
Examples :



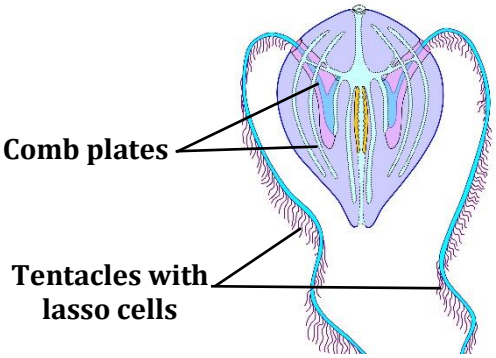
5. Phylum – Ctenophora :

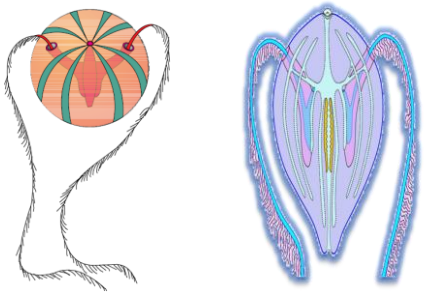
- **Why named so?**
- Ctenophores are known for their beauty and delicate nature. In sunlight their comb plates give the effect of a rainbow. They are commonly known as "Sea-gooseberries" or "Comb-jellies" or "Sea-walnuts".



- 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 body organisation.
- Locomotion takes place by the presence of 8 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. In place of nematoblasts, special type of cells are present on tentacles, called Lasso cells (Collo blasts) which help in catching the prey.
- Sexes are not separate.
- Reproduction takes place only by sexual means. Fertilization is external. Development is of indirect type.
- Life cycle involves a free living Cydippid larval stage.

  e.g. *Pleurobrachia, Ctenoplana*





Pleurobrachia ***Ctenoplana***

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BEGINNER'S BOX-3 COELENTERATA AND CTENOPHORA

1. Which one of the following animals is diploblastic ?

(1) *Pennatula* (2) *Paramoecium* (3) *Taenia solium* (4) *Ascaris*

2. The function of nematoblast in coelenterate is :

(1) Locomotion (2) Offence & defence

(3) Reproduction (4) Nutrition

3. "Corals" belong to the phylum :

(1) Porifera (2) Coelenterata (3) Mollusca (4) Echinodermata

4. A radially symmetrical diploblastic animal is :

(1) *Ascaris* (2) Earth worm (3) Liver Fluke (4) *Hydra*

5. Medusa stage is not found in :

(1) Hydra (2) Aurelia (3) Obelia (4) Physalia

6. "Portuguese man of war" is –

(1) *Obelia* (2) *Physalia* (3) *Euplectella* (4) *Meandrina*

7. The characteristic feature of Ctenophora is :

(1) External comb plates (2) Internal comb plates

(3) Cnidoblast (4) Choanocytes

8. "Comb jellies " or "Sea Walnuts" belong to the phylum :

(1) Coelenterata (2) Ctenophora (3) Mollusca (4) Echinodermata

9. Lasso cells are present in :

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

10. Which one of the following is coelentrate –

(1) Sea walnut (2) Sea cucumber (3) Sea fan (4) Sea horse

11. Gastro-vascular cavity with single opening is found in :-

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

12. The characteristic larva of Ctenophora is :-

(1) Cydippid (2) Velliger (3) Nauplius (4) Trochopore

13. Ctenophores are commonly known as :-

(1) Sea walnut (2) Comb jellies

(3) Both (1) and (2) (4) Sponges

14. Body bears eight external rows of ciliated comb plates present in phylum ____.

(1) Coelenterate (2) Porifera (3) Ctenophora (4) Platyhelminthes

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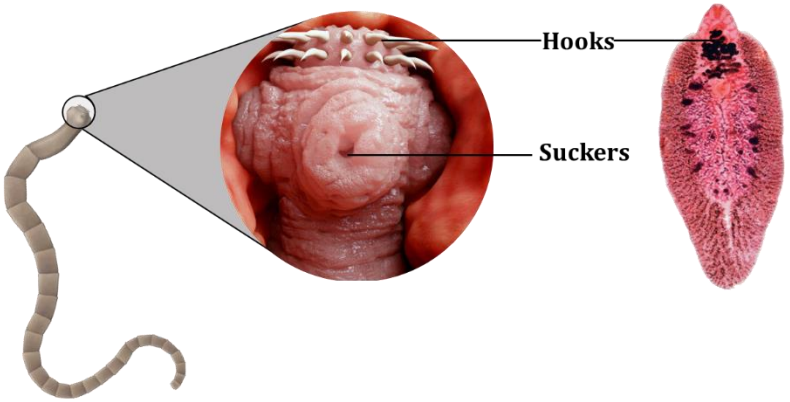
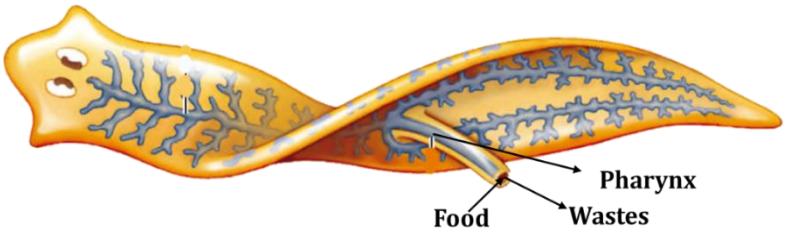
6. Phylum – Platyhelminthes :

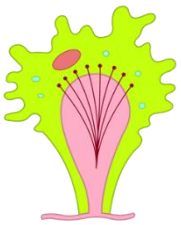
- They have dorsoventrally flattened body hence are called flat worms.
- These are mostly endoparasites found in animals including human being but some are free living (aquatic).
- Body is bilaterally symmetrical and body organisation is of organ /organ system grade.
- Body is triploblastic i.e. body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



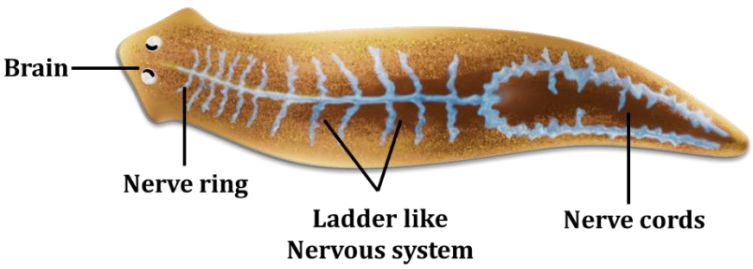
- On the body wall of parasitic animals, a thick cuticle is present i.e. Tegument.
- Thick cuticle protects the parasite from the digestive enzymes of the host. Muscles in the body-wall are mesodermal. Below the epidermis, longitudinal, circular and oblique muscles are present.



- These are acoelomate.
- Digestive system is incomplete (Blind sac body plan) and without anus but in Tapeworm digestive system is completely absent. They absorb nutrients from the host directly through their body surface.
- Skeleton, respiratory and circulatory systems are absent.
- They respire through body surface. Anaerobic respiration is found in internal parasites like *Taenia*.
- Excretion occurs through specialised cells called flame cells or Solenocytes (Protonephridia).


Flame cells

- They also help in osmoregulation. Excretory matter is ammonia.
- Nervous system is ladder like, consist of a nerve ring and longitudinal nerve cords.



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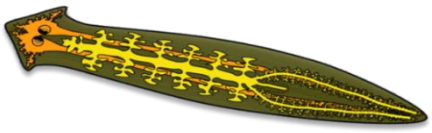
- They are bisexual. Reproductive system is complex and well developed. Fertilization is internal. (Self/cross). Development indirect through many larva stages.
- Some members like Planaria possess high regeneration capacity. ***e.g.*** – *Planaria*

(a) ***Planaria*** **(Dugesia)** - Found in fresh water, nocturnal, cannibalic, slow creeping, omnivorous. Reproduce sexually as well as asexually (Transverse binary fission), good power of regeneration. Pharynx can be everted.

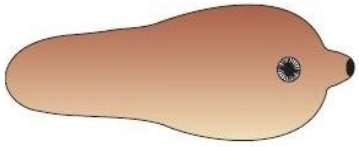


(b) ***Fasciola hepatica*** **(Liver fluke) -** Life history involves two hosts (Digenetic parasite)

(i) Primary host - Sheep & Goat

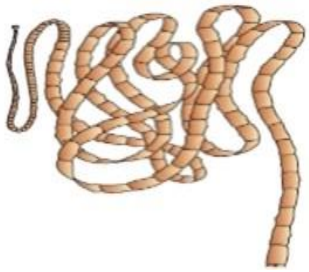
(ii) Secondary host - Garden snail (*Planorbis, Lymnea*)

Adult fluke is found in the bile ducts and liver of sheep and causes Liver-rot or Cirrhosis disease.



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

- Flat, white, ribbon like
- *T. solium* is human gut parasite, attached to intestinal wall by hooks & suckers.
- Anaerobic respiration, Hermaphrodite, Self-fertilization.
- Life history involves two hosts (Digenetic)
  (1) Primary host – Man (2) Secondary host – Pig
- It causes the disease **Taeniasis** and **Cysticercosis**



(d) ***Schistosoma*** **(Blood fluke) :** Found in veins of human bladder and intestine.
It damages the liver & causes intestinal disorder - Schistosomiasis or Bilharzia disease.

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

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

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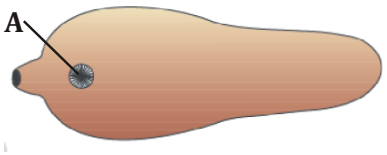
3. Which one of the following has mesoderm but no coelom ?
(1) Flatworm (2) Earthworm (3) Roundworm (4) Leech

4 Function of suckers cell in liver flulke
(1) Defense (2) Reproduction
(3) Locomotion (4) Absorb nutrients

5. In the given diagram what does 'A' represent ?
(1) Hooks
(2) suckers
(3) Flame cell
(4) Ostia



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

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.

8. Which of the following statement is incorrect about Planaria?
(1) Organ system level of organisation.
(2) Found in fresh water.
(3) Pharynx can be everted.
(4) Nocturnal, cannibalic, slow creeping, omnivorous animal.

9. Which of the following is not an example of Phylum Platyhelminthes?
(1) Planaria (2) Fasciola hepatica
(3) Schistosoma (4) Wuchereria

10. Which of the following statement is not related with *Taenia solium*?
(1) T. solium is human gut parasite
(2) It causes the diseases like Taeniasis and Cysticercosis
(3) Excretory organs are flame cells
(4) Development is direct

11. Which of the following is not a triploblastic acoelomate animal?
(1) Taenia solium (2) Fasciola hepatica
(3) Ctenoplana (4) Schistosoma

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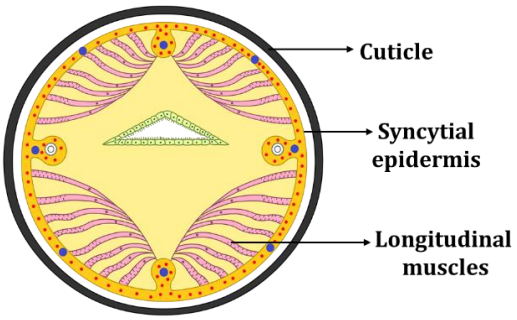
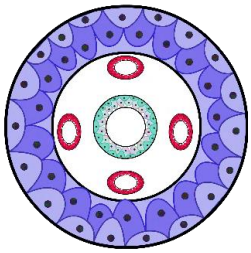
7. Phylum – Aschelminthes :

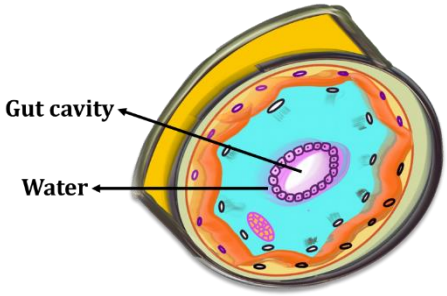
- The body of members is circular in cross section and tapering at both ends, without segmentation. So also called Roundworms.
- **Habit and habitat** - Nematodes are found everywhere, they may be free living (aquatic and terrestrial) or parasite in plants and animals.
- **Shape** - They have long, cylindrical body with tapering ends and without segmentation.
- **Symmetry** - Bilateral.
- **Germ layers** – All three primary germ layers are present so animals are triploblastic.
- **Level of organisation** - Organ-system level and having tube within tube body plan.
- Anterior end does not show distinct head (Cephalisation absent).
- Body wall consists of
  - **(i) Cuticle** - Non-living, thick, and resistant to digestive enzymes of host.
  - **(ii) Epidermis** - Syncytial i.e. a continuous layer of cytoplasm having scattered nuclei.
  - **(iii) Muscle layer** - Only longitudinal muscle fibres present.

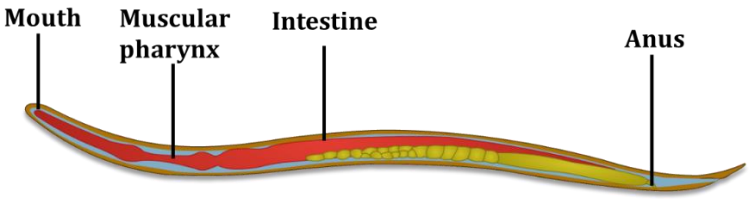


- They are pseudocoelomate animals, body cavity is there between body wall and digestive tract which is not lined by mesodermal epithelium i.e. Pseudocoel.

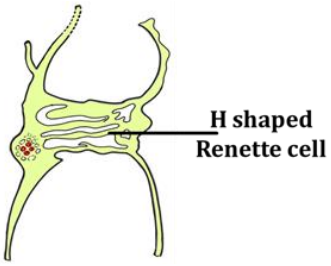


- Skeleton is absent but fluid pressure in the pseudocoelom maintains body shape. It is called Hydro skeleton.
- Digestive tract is complete and differentiated into mouth, pharynx, intestine and anus. Pharynx is muscular and well developed. It is used to suck the liquid food. Intestine is non muscular.

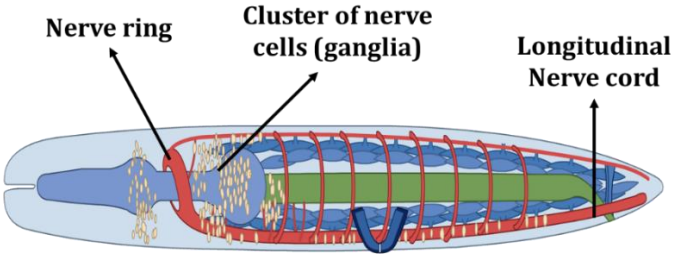




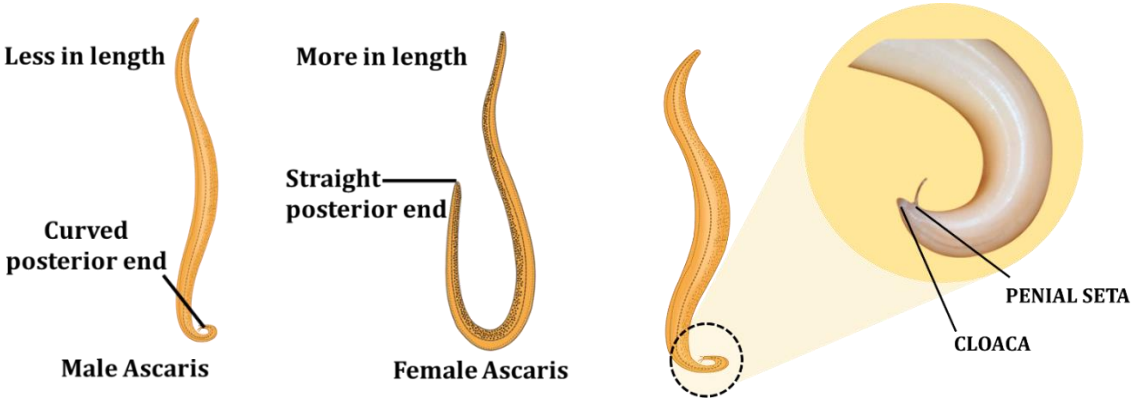
- Respiration is through body surface by diffusion.
- Circulatory system is absent.
- Excretory system is H-shaped and consists of excretory canals (Protonephridia) which removes body wastes from body cavity through excretory pores. They develop from an embryonic "Renette cell". Excretory matter is ammonia.



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



- 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.



Examples:

(i) ***Ascaris*** - Round worm (in small intestine), larva - Rhabditiform/Rhabditid

(ii) ***Ancylostoma*** - Hookworm (in 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*** – Pin worm or seat worm (in large intestine)

BEGINNER'S BOX-5 — ASCHELMINTHES

1. Which of the following endoparasite of man is viviparous ?
(1) *Ascaris* (2) *Wuchereria* (3) *Taenia* (4) *Enterobius*

2. Which of the following is pseudocoelomate animal ?
(1) Whip worm (2) Fluke (3) Flat worm (4) Tape worm

3. Ascaris is found in -
(1) Body cavity (2) Tissue (3) Alimentary canal (4) Lymph nodes

4. Identify the given animal in the diagram ?

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

5. The pseudocoelomate among these is -
(1) Porifera (2) Annelida (3) Mollusca (4) Aschelminthes

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

Column - I	Column - II
(p) *Ascaris*	(i) Hook worm
(q) *Wuchereria*	(ii) Round worm
(r) *Ancylostoma*	(iii) Flat worm
(s) *Tapeworm*	(iv) Filaria worm

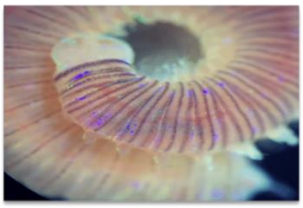
(1) p–(ii), q–(iv), r–(iii), s–(i) (2) p–(ii), q–(i), r–(iii), s–(iv)
(3) p–(ii), q–(iv), r–(i), s–(iii) (4) p–(i), q–(ii), r–(iv), s–(iii)

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

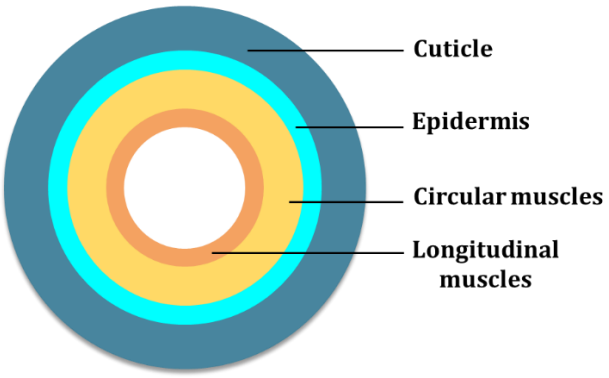
8. Scientific name of pinworm is: -
(1) Enterobius (2) Ascaris (3) Wuchereria (4) Ancylostoma

8. Phylum – Annelida

- Their body surface is distinctly marked out into segments or metameres (Latin, annulus: little ring) and hence, the phylum name Annelida.

- **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*)
- Body cavity is true coelom lined by mesodermal coelomic epithelium.
- It is filled with coelomic fluid that serves as a hydrostatic skeleton.
- **Body wall** consist of
  - **(i)** **Cuticle** - Moist and elastic.
  - **(ii)** **Epidermis** - Living layer that secretes dead cuticle outside.
  - **(iii)** **Muscle layer** - Contains circular and longitudinal muscles which help in locomotion.



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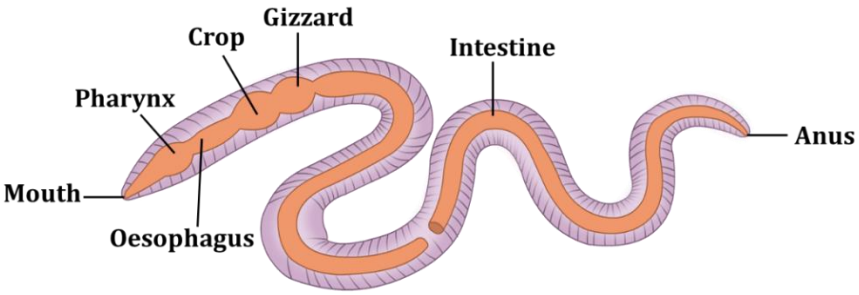
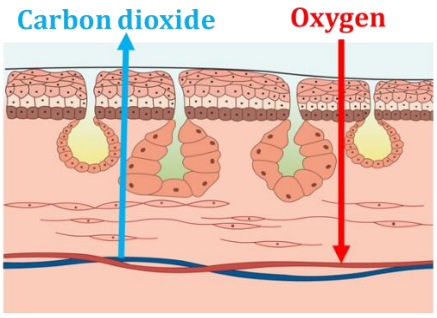
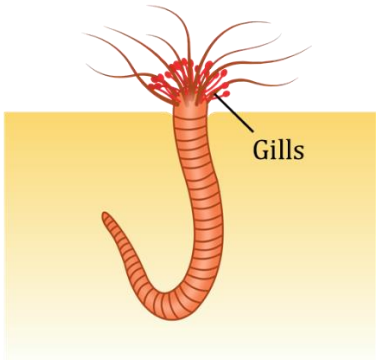
- **Locomotion** - Annelids have chitinous setae and lateral muscular appendages called Parapodia for locomotion. Parapodia are found in *Nereis*. In some organisms, locomotory organs are absent e.g. leech.
- Digestive tract is complete, straight and extends through entire body. Digestive glands are developed for the first time in Annelida.

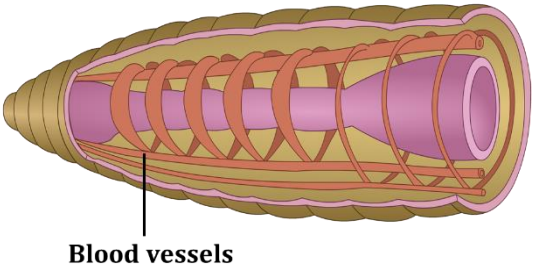


- Respiration is through moist skin (Cutaneous respiration), Some have gills (Branchial respiration).

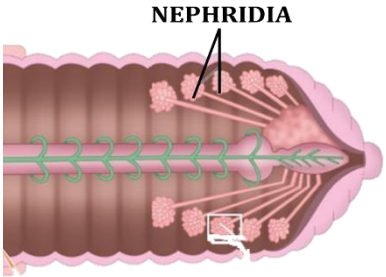




- **Circulatory system-**
  - In annelids circulatory system is closed type.
  - Heart is neurogenic.
  - Some blood vessels enlarge to act as pumping heart.
  - Heart appear first time in annelids.
  - Blood is red in colour but haemoglobin is dissolved in plasma (RBC absent).



- Excretory organs are Nephridia (sing. nephridium). Nephridia are coiled tubules. They also help in osmoregulation.
  Excretory matter
  (a) Ammonia in aquatic form
  (b) Urea in land form



- Skeletal system - Absent but hydrostatic skeleton is present.

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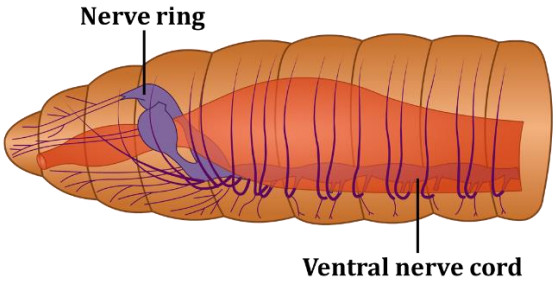
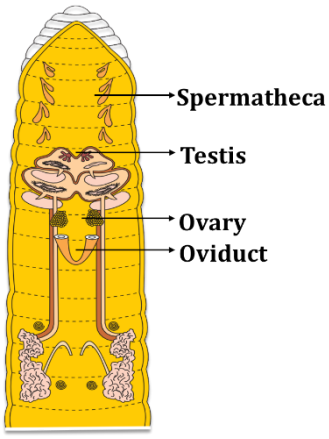
- Nervous system consists of a nerve ring (Brain) and a solid, double, and ventral nerve cord with ganglia.





- **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.

Larva of *Nereis* is Trocophore

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

Examples :

(i) *Nereis* - Sandwarm/Ringworm	**(ii) *Pheretima* -** Earthworm	**(iii) *Hirudinaria* -** Fresh water leech (Blood sucking leech)	**(iv) Aphrodite -** Sea mouse
(a) Cephalisation is present. (b) Parapodia helps in locomotion. (c) Unisexual (d) Larva is trochophore	(a) Cephalisation absent (b) Setae for locomotion (c) Bisexual or hermaphrodite	(a) Cephalisation and setae absent (b) Parapodia and setae absent (c) Bisexual (d) Hirudin (anticoagulant) present	
			

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BEGINNER'S BOX-6 — ANNELIDA

1. Parapodia are locomotary structures in :
(1) *Fasciola* (2) *Nereis* (3) Centipede (4) Earth worm

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

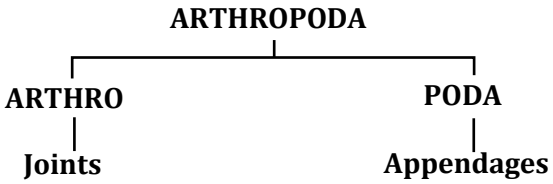
3. *Aphrodite*, commonly known as "sea mouse" is an :
(1) Annelid (2) Mollusc (3) Insect (4) Mammal

4. Which is correct for earthworm
(1) Segments (2) Monoecius (3) Nephridia (4) all of given

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

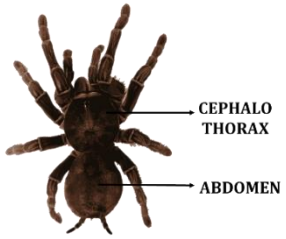
6. Blood sucking animal is
(1) *Nereis* (2) Earthworm (3) 1 & 2 (4) Leech

9. Phylum – Arthropoda :

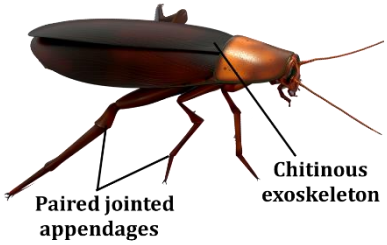


- Arthropoda is the largest phylum of animalia which includes insects.
- Over two-thirds of named species on earth are arthropods.
- **Habit and Habitat** -They may be aquatic (marine and fresh water) or terrestrial, free living and sometimes parasitic (mosquito), solitary, colonial (bee), gregarious (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.



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- 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.

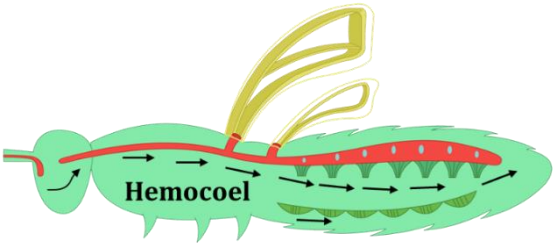
GILLS in Crustacea (Prawn)

BOOK GILLS in King Crab

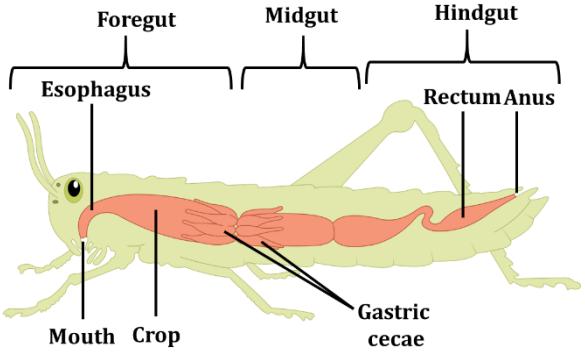
BOOK LUNGS in Arachnida (Scorpion)

TRACHEAL SYSTEM in Insecta (Cockroach)

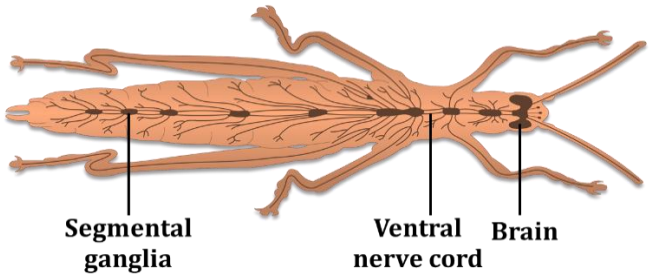
- Circulatory system is Open type i.e. blood flows in open tissue spaces and haemocoel instead of blood vessels. Blood is colourless called Haemolymph (**e.g.** Insect). Respiratory pigment absent. Copper containing pigment hemocyanin is found in some arthropods (**e.g.** Prawn). Body cavity around viscera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

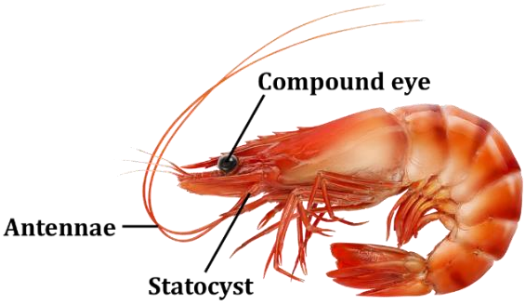


- Digestive tract is complete, and they can feed upon all kind of food substances.
- Excretory organs are –
  - (i) Antennary or green glands (**e.g,** Prawn),
  - (ii) Coxal gland (**e.g,** Scorpion),
  - (iii) Malpighian tubules (**e.g,** Insects) opening into the gut.
- Excretory matter is ammonia 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.





- 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.

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- Animals of Arthropoda are most successful invaders of terrestrial environment among invertebrates due to presence of -
  (i) Cuticle (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) etc.

I	CLASS	Insecta	Arachnida	Crustacea
II	**BODY DIVISION**	Head, Thorax and Abdomen	Cephalothorax and Abdomen	Cephalothorax and Abdomen
III	**RESPIRATION BY**	Trachea	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 –Mosquitoes :

Anopheles
Disease :- Malaria

Aedes
Disease :- Dengue

Culex
Disease :- Elephantiasis

Gregarious pest – *Locusta* (Locust)

Living fossil – Limulus (King crab)

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Economically important insects :-

***Apis* (Honey bee)**

***Bombyx* (Silk worm)**

***Laccifer* (Lac insect)**

BEGINNER'S BOX-7 — ARTHROPODA

1. Green glands are found in :-

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

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, external segmentation and paired jointed appendages

3. Excretion in Arthropod animals takes place by :-

(1) Malpighian tubules (2) Green glands

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

4. Book - lungs are found in :-

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

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

6. Number of walking legs in a spider are :-

(1) Three pairs (2) Four pairs (3) Six pairs (4) Two pairs

7. Which of the following is a wingless insect?

(1) *Lepisma* (2) Termite (3) Moth (4) *Apis*

8. Book gills for respiration are found in ?

(1) House - fly (2) Termites (3) Ant (4) King-Crab

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

10. Which of the following animal is not an insect ?

(1) Tick (2) Honey bee (3) Beetle (4) Silkworm

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

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

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

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

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

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.
- Study of molluscs is known as Malacology & study of shells of molluscs is known as Conchology.
- Molluscs are bilaterally symmetrical. Few are secondarily asymmetrical (snail) due to twisting / torsion during growth.
- 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.

Neopilina

- 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.
- 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. Digestion gland is called hepato pancreas.

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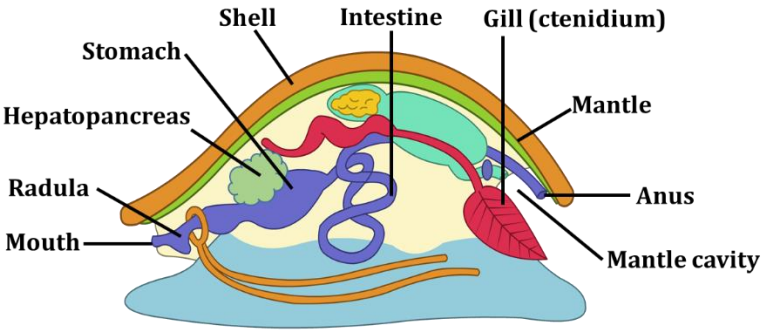
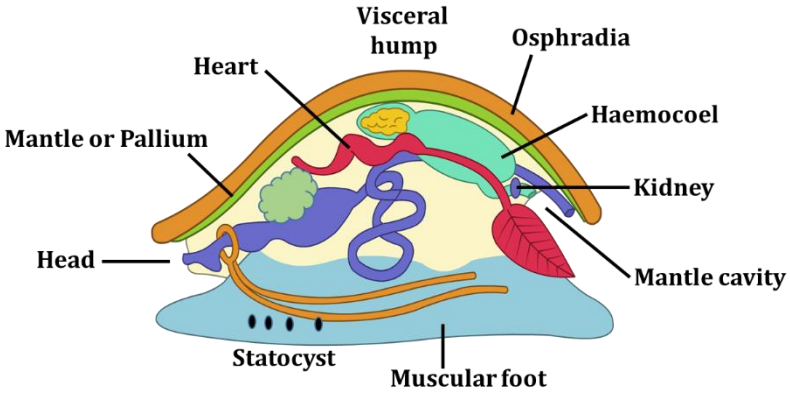
- Respiration is usually by feather like gills (Ctenidia) located in the mantle cavity which also helps in excretion. Pila respire by pulmonary sac on land and by gills in water.

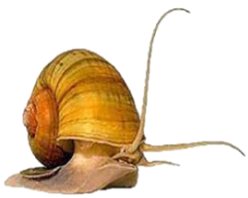


- Circulatory system is open type. It includes dorsal pulsatile heart and a few arteries that open into sinuses. (Cephalopoda has closed type of circulatory system e.g. *Octopus, Sepia, Loligo*) Coelom is greatly reduced. Spaces among the viscera contain blood and form haemocoel.
  Blood usually has a copper containing respiratory pigment called haemocyanin (Blue or green).
- Excretory system includes 1 or 2 pairs Keber's organs or Organ of Bojanus, which open into the mantle cavity. Excretory matter is ammonia or uric acid.
- 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).



- They are usually dioecious, they are mostly oviparous. Fertilization may be external or internal.
- Development is - Mostly indirect.
- Trochophore is very common larva of Molluscs, [Glochidium (Larva of Unio) and Veliger (Larva of Pila).]

Examples :-


***Pila* (Apple Snail)**


***Pinctada* (Pearl oyster)**


***Sepia* (Cuttle fish)**

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Loligo(Squid)

Dentalium
(Tusk shell)

Octopus (Devil fish)

Aplysia (Sea hare)

Chaetopleura
(Chiton)

Connecting link between mollusca and annelida

Neopilina

BEGINNER'S BOX-8 — MOLLUSCA

1. The connecting link between Annelida and Mollusca is :-
(1) *Peripatus* (2) *Hirudinaria* (3) *Neopilina* (4) *Teredo*

2. **Organ of Bojanus** are found in :-
(1) Chordata (2) Echinodermata
(3) Annelida (4) Mollusca

3. Which animal becomes assymetrical due to torsion in body and shell :-
(1) Land snail (2) Apple snail (3) Sea lemon (4) All of the above

4. Which of the following is a mollusc ?
(1) Sea-horse (2) Sea-mouse (3) Sea-hare (4) Limulus

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

6. Coat of mail shell is :-
(1) *Chiton* (2) *Dentalium* (3) *Pila* (4) *Pinctada*

7. Which mollusc is commonly called "tusk shell"?
(1) *Doris* (2) *Dentalium* (3) *Unio* (4) *Teredo*

8. The mouth of mollusc contains a file like rasping organ for feeding is called :-
(1) Parapodia (2) Gill (3) Radula (4) Hypostome

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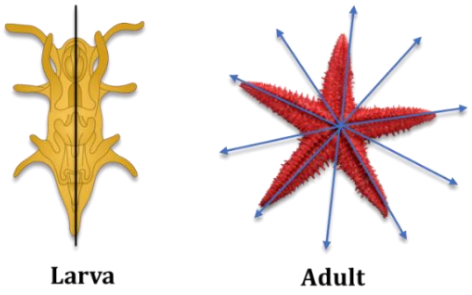
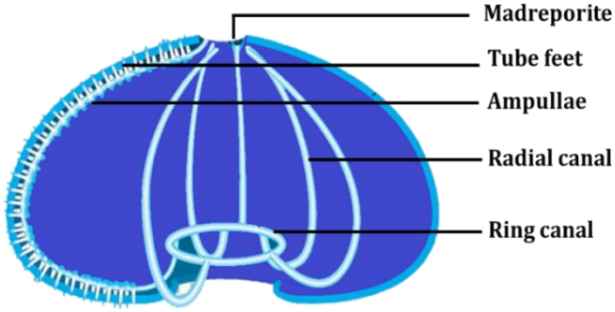
11. Phylum – Echinodermata :

- 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, cylindrical, melon-like or disc-like. Star like (Star fish), Cylindrical (*Holothuria*), Melon like (Sea urchin), Flower like (Sea lily)

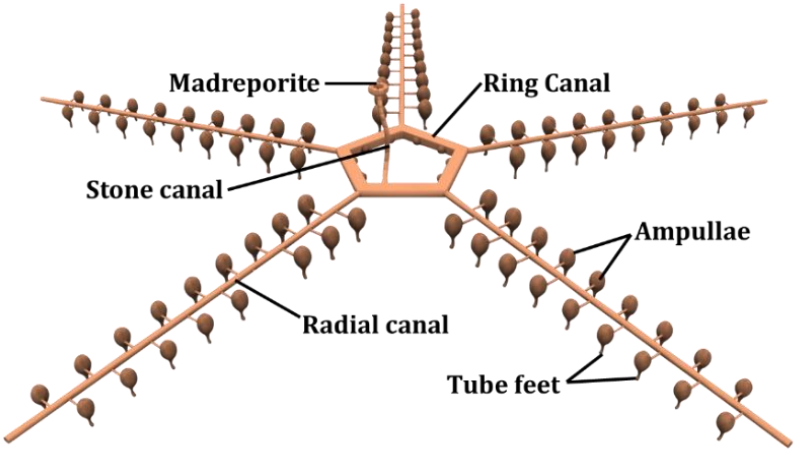


- The adult Echinoderms are radially symmetrical but larvae are bilaterally symmetrical.
- Animals are triploblastic with three primary germ layers.
- Coelomate animals with organ-system level of organisation. Echinoderms have true coelom. They do not have distinct head. Tube within tube body plan.

- 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). Incomplete digestive tract is found in Brittle star (*Ophiura*)



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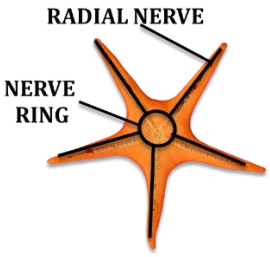
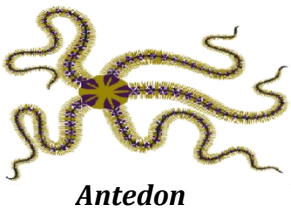
- Respiration takes place by body surface or gills called dermal branchiae or papulae in most of Echinoderms like Starfish.
- Circulatory system is reduced and open type. No heart or pumping vessel.
- There is no excretory system. Nitrogenous waste ammonia diffuses out through body surface.
- Nervous system is simple and less developed includes a Nerve ring and radial nerves with simple sense organ.
  They don't have head and brain.



- 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
(Sea cucumber)



Antedon
(Sea lily)

Asterias
(Star fish)

Echinus
(Sea urchin)

Ophiura
(Brittle star)

- **Autotomy** - Few echinoderms have great power of regeneration. They break off arms for defense purpose. This phenomenon is called autotomy.

- **Evisceration** - Few echinoderms in anger or in frightened state vomit out viscera (internal organs). This phenomenon is known as Evisceration. *e.g. Holothuria.*

★ Golden Key Points ★

- Echinoderms have some chordate like characters like **enterocoelic coelom, mesodermal skeleton** and **deuterostomic embryonic development.**
- Few echinoderms (Star fish) have great power of **regeneration**. They break off their arms for defence purpose. This phenomenon is known as **Autotomy**.

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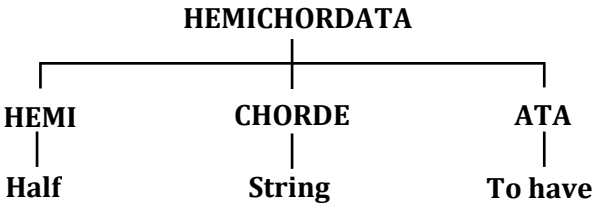
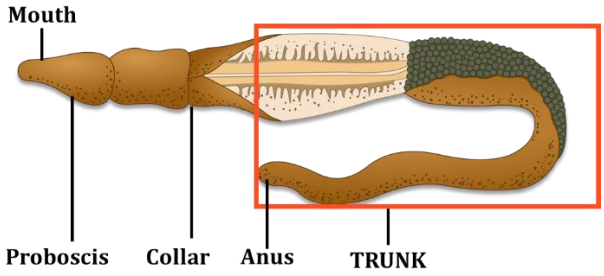
12. Phylum – Hemichordata :

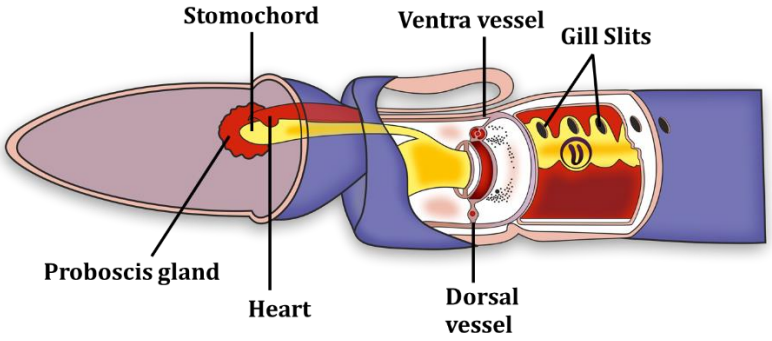
- Hemichordata is a connecting link between Non - chordata & Chordata.
- Why named so?
  Hemichordata was earlier considered as a subphylum under phylum chordata, but now it is placed as a separate phylum under non chordata.



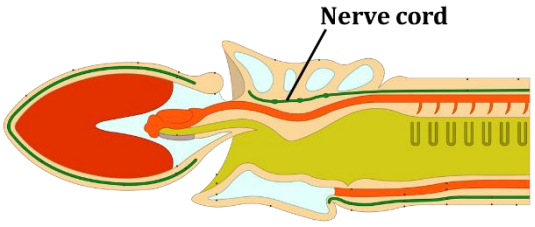
- This phylum consists of a small group of worm like marine animals with organ system level of organisation.
- They are bilaterally symmetrical, triploblastic and coelomate animals.
- The body is cylindrical, unsegmented and divided into three parts : anterior proboscis, middle collar and a posterior 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) Fertilization is external.

(ii) Development is indirect with tornaria larva which is similar to bipinnaria larva of echinodermata in their developmental stages.

e.g. 1. *Balanoglossus* :-Tongue worm or Acorn worm
2. *Saccoglossus*

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BEGINNER'S BOX-9 ECHINODERMATA, HEMICHORDATA

1. Water vascular system is found in :-
(1) Sycon (2) Leech (3) Fish (4) Star-fish

2. The animal with tube-feet is :-
(1) Star-fish (2) Jelly-fish (3) Silver-fish (4) Cray-fish

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

4. Excretory organ of *Balanoglossus* is :-
(1) Protonephridia (2) Supra neural gland
(3) Solenocytes (4) Proboscis gland

5. The larval form of Hemichordata is called :-
(1) Trochophore (2) Tornaria
(3) Tadpole (4) Ammocoete

6. In echinodermata, tube feet are related with
(1) Excretory system (2) Water vascular system
(3) Reproductive system (4) Respiratory system

7. Respiration by dermal gills (branchiae) and respiratory tree is performed by the animals of
(1) Mollusca (2) Echinodermata
(3) Protochordata (4) Arthropoda

8. The most distinctive feature of echinoderms is
(1) Water vascular system (2) Water canal system
(3) Paired jointed appendages (4) Radula in mouth

9. Which of the following is an example of Echinodermata?
(1) Prawn (2) Locust (3) Star fish (4) Apple Snail

10. Members of Hemichordata are :-
(1) Burrowing marine animals (2) Exclusively fresh water animals
(3) Fresh water worms (4) Terrestrial

11. Balanoglossus belongs to :-
(1) Hemichordata (2) Cephalochordata
(3) Urochordatra (4) Cyclostomata

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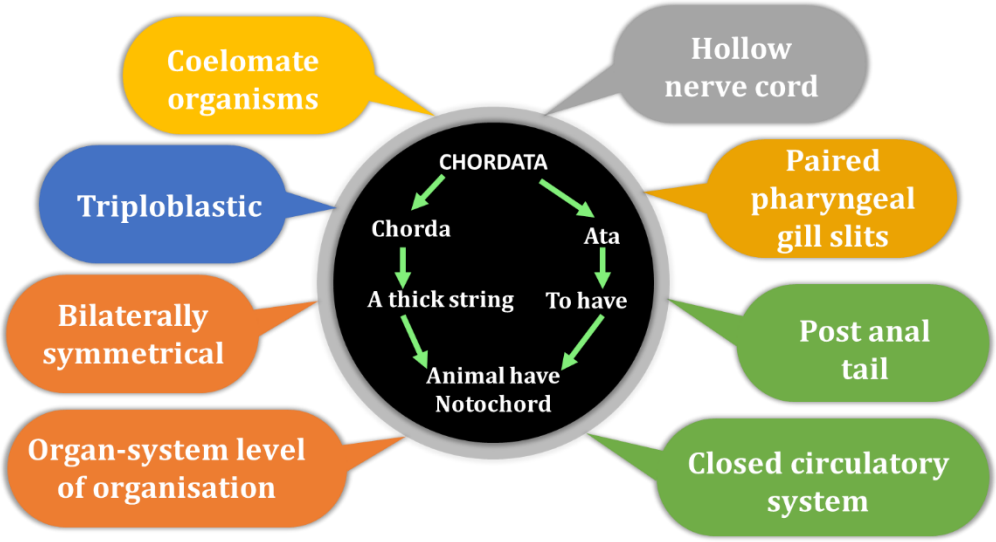
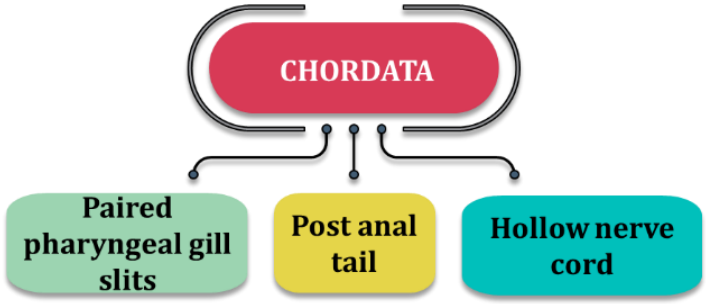
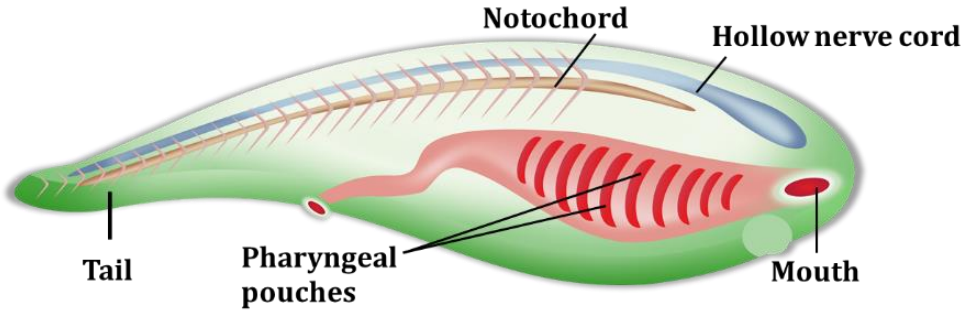
13. Phylum – Chordata :







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.

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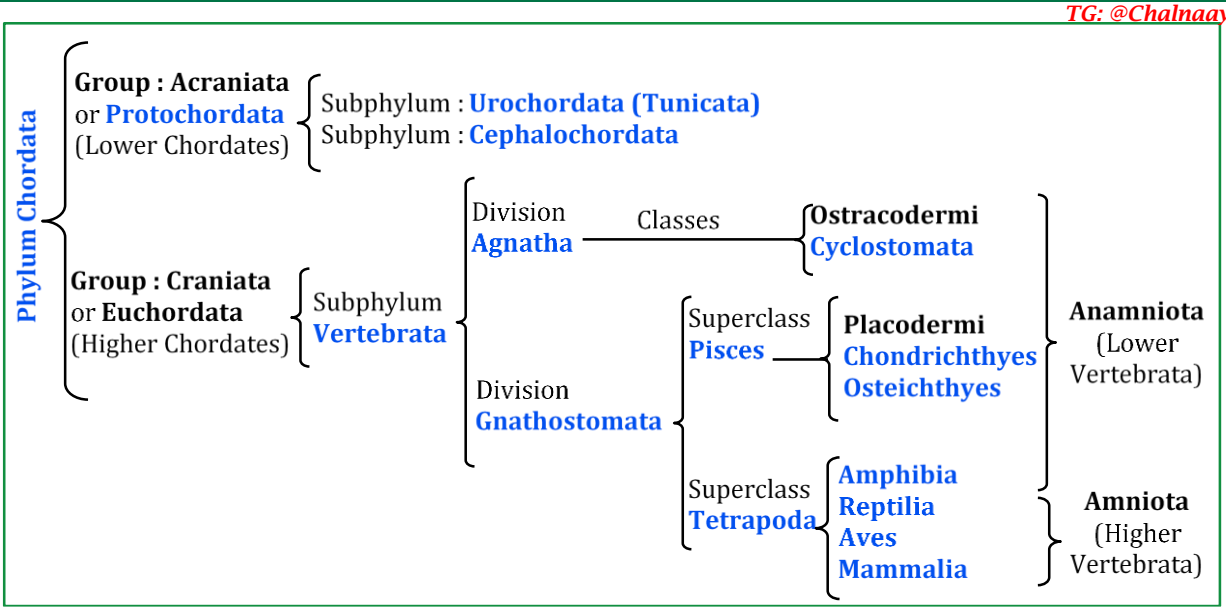

Characters	Group acraniata (Protochordata)	Group craniata (Euchordata)
Habitat	Exclusively marine	Aquatic and Terrestrial
Respiration	Gills	Gills and lungs
Notochord	Persistent	Persist throughout life
Paired appendages	Absent	Mostly present
Sexes	Unisexual/Bisexual	Unisexual
Fertilization	External	External 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

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

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

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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

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

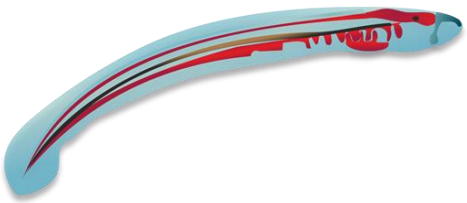
6. Which of the following is incorrect difference between chordata and nonchordata?
(1) Chordates have dorsal heart but nonchordates have ventral heart
(2) Chordates have pharyngeal gill slits which is not found in nonchordates
(3) Chordates have post anal tail which is not found in nonchordates
(4)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

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

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

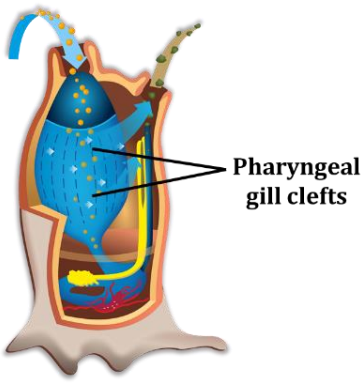
9. Vertebrates have :-
(1) Ventral muscular heart with 2, 3 or 4 chambers.
(2) Kidneys for excretion and osmoregulation.
(3) Paired appendages which may be fins or limbs.
(4) All of these

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.



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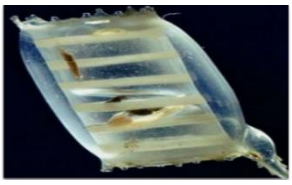
- Adult members have test over their body, made up of tunicin hence animals are also called Tunicates.

Examples of urochordata :

Ascidia

Herdmania
(Sea-potato/Sea-squirts)

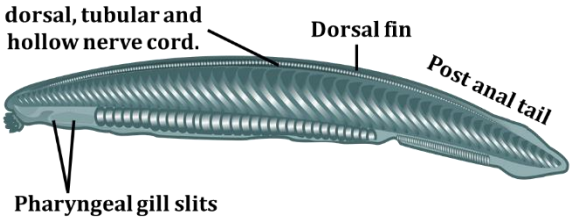


Dolilum

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.



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

2. Cephalochordate is :-
(1) *Amphioxus* (2) *Ascidia* (3) *Salpa* (4) *Herdmania*

3. First complete/typical chordate is :-
(1) *Herdmania* (2) *Amphioxus* (3) *Balanoglossus* (4) All the above

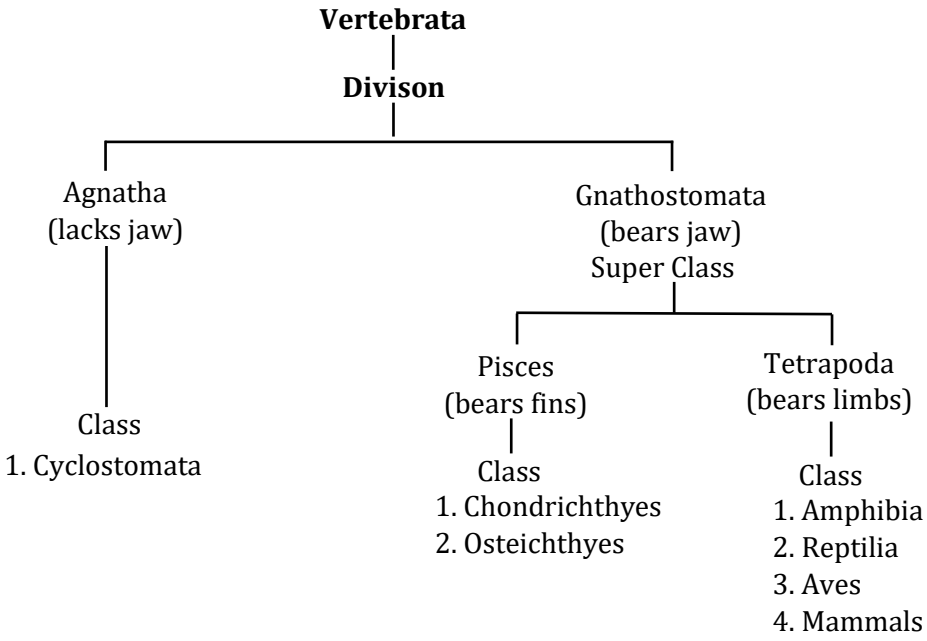
4. "Sea - squirt" is common name of :-
(1) *Balanoglossus* (2) *Herdmania* (3) *Amphioxus* (4) *Ascidia*

5. Notochord is found only in the tail of Larva in -
(1) All chordata (2) Hemichordata
(3) Urochordata (4) Cephalochordata

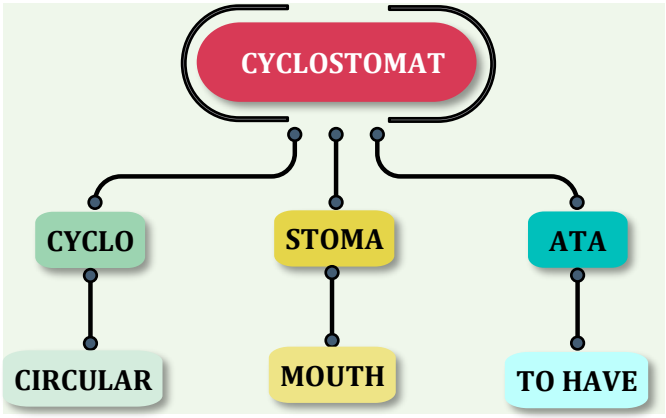
6. The other name of Branchiostoma is :-
(1) Amphioxus (2) Lancelet
(3) Both (1) and (2) (4) Petromyzon

Subphylum Vertebrata :

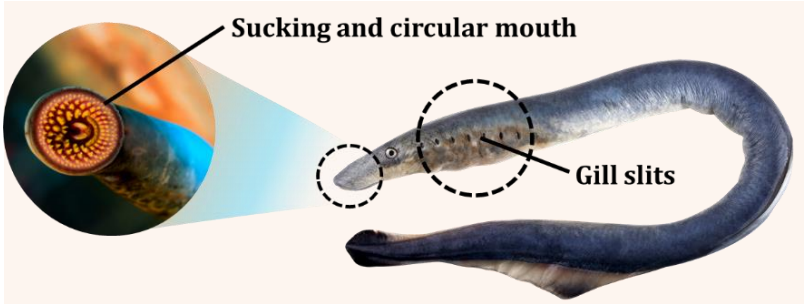
- The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult.
- Thus all vertebrates are chordates but all chordates are not vertebrates. Besides the basic chordate characters, vertebrates have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



15. Class – Cyclostomata :



- 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.

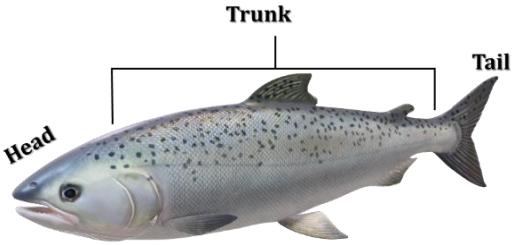


- Cyclostomes have a sucking and circular mouth without jaws.
- Their body is devoid of scales and paired fins.
- Cranium and vertebral column are cartilaginous.
- Circulation is of closed type. Heart is two chambered.
- Animals are unisexual.
- Fertilisation is external.
- Larval stage is usually absent 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.

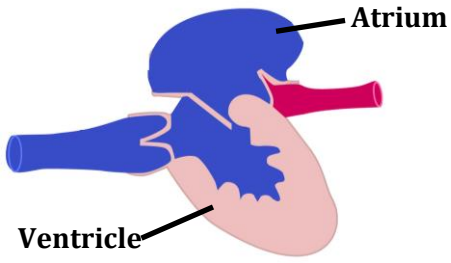
  Examples :- Petromyzon (Lamprey) and Myxine (Hagfish).

16. Super Class Pisces :

- This super class includes **true fishes**.
- Study of fishes is **Ichthyology**.
- 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. Sinus venosus, renal and hepatic portal systems are found in circulatory system.
- 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.

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- Development is direct i.e. larval stage is lacking during development.
- Baby fishes are called Fry or Hatchling.
- **Migration in fishes -**

  (i) Catadromous migration :- Migration of fishes from fresh water to marine water ***e.g.*** *Anguilla.*

  (ii) Anadromous migration :- Migration of fishes from marine water to fresh water.

  e.g. (1) *Salmon* (2) *Hilsa*
- Super class pisces classified into three classes :-

  (A) Placodermi (B) Chondrichthyes (C) Osteichthyes

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 ctenoids	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

Examples of Oeteichthyes :

Exocoetus **(Flying fish)**

Hippocampus **(Sea horse)**

Catla **(Katla)**

Clarias **(Magur)**

Pterophyllum **(Angel Fish)**

Betta **(fighting fish)**

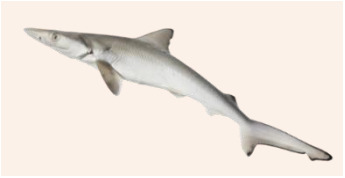
Examples of Chondrichthyes :

Torpedo
(Electric ray)

Trygon
(Sting ray)

Pristis
(Saw fish)

Carcharodon
(Great white shark)



Scoliodon
(Dog fish)

★ Golden Key Points ★

- ***Cod liver*** oil is rich in Vitamin D,Shark liver oil is rich in Vitamin A
- Smallest fish ***Mystichthyes*** – Goby fish – Pandaka (8–10 mm)
- Stone fish is the most poisonous fish.
- Fishes can change their direction suddenly, with help of caudal fin.
- Fishes show a **seasonal migration** in a particular season.

(A) **Catadromous migration :** Migration of fishes from fresh water to marine water.
e.g. *Anguila*

(B) **Anadromous migration :** Migration of fishes from marine water to fresh water.
e.g. (1) *Salmon,* (2) *Sturgeon,* (3) *Hilsa*

- *Pyrosoma* - Bioluminescence is found. (Strongest light among marine organism)
- *Rhincodon* **:** Whale shark - It is the **largest true fish.** Its length is 13 - 14 meters.
- King of Herrings is the common name of *Chimaera*.

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

2. Circular and suctorial mouth is present in :-
(1) *Labeo* (2) *Petromyzon* (3) *Scoliodon* (4) All the above

3. Jaw less fishes are included in :-
(1) Chondrichthyes (2) Osteichthyes (3) Cyclostomata (4) Lung fishes

4. Air bladder is present in :-
(1) Dog fish (2) Flying fish (3) Hag fish (4) Electric fish

5. Ampulla of Lorenzini are found in :-
(1) *Scoliodon* (2) *Labeo* (3) *Rattus* (4) *Hippocampus*

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6. Which of the following fish is a connecting link between cartilaginous and bony fishes
(1) *Chimaera* (2) *Betta* (3) *Latimaria* (4) Whale

7. Which of the following are viviparous usually :-
(1) Lung fishes (2) Frog (3) Sharks (4) Bony fishes

8. "King of Herrings" is a common name of :-
(1) *Scoliodon* (2) *Chimaera* (3) *Torpedo* (4) *Trygon*

9. The fish that swims vertically :-
(1) *Scoliodon* (2) *Hippocampus* (3) *Exocoetus* (4) *Trygon*

10. All living members of which class is ectoparasite on fishes?
(1) Turbellaria (2) Chondrichthyes (3) Cephalopoda (4) Cyclostomata

11. 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

12. 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

13. Which of the following are marine but migrate for spawning to fresh water. After spawning, within a few days, they die. Their larvae, after metamorphosis, return to ocean.
(1) Petromyzon (Lamprey) (2) Scoliodon
(3) Trygon (4) Torpedo

14. 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.

15. Select the correct matching :-
(1) Betta – Fighting fish (2) Hippocampus – Flying fish
(3) Pterophyllum – Fighting fish (4) Clarias – Labeo

16. Which of the following is a marine bony fish?
(1) Exocoetus (Flying fish) (2) Hippocampus (Sea-horse)
(3) Both (1) and (2) (4) Saw fish (Pristis)

17. Which of the following is a fresh water bony fish?
(1) Labeo (Rohu) (2) Catla (Katla) (3) Clarias (Magur) (4) All of these

18. The scales found in chondrichthyes is/are :-
(1) Placoid (2) Cycloid (3) Ctenoid (4) All of these

19. Select the difference which is wrongly written:
Cartilaginous fish Bony fishes
(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

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20. Which of the following fish possess poison sting?
(1) Dog fish (2) Electric ray (3) Sting ray (4) Fighting fish

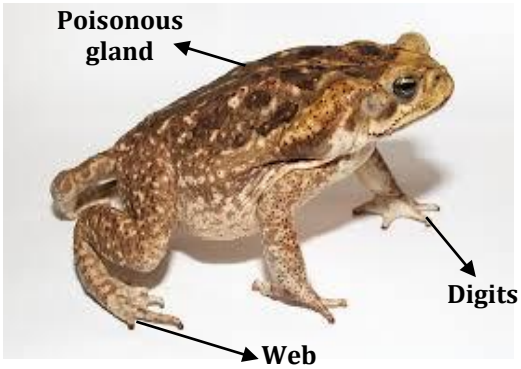
21. Males possess claspers in pelvic fins in class ____ :-
(1) Cyclostomata (2) Chondrichthyes
(3) Osteicthyes (4) Amphibia

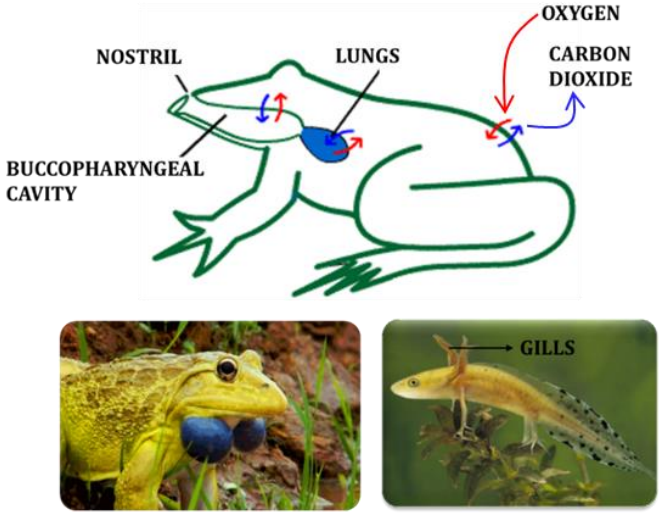
22. Number of chambers in the heart of fishes :-
(1) One (2) Two (3) Three (4) Four

23. Common name of Exocetes is :-
(1) Fighting fish (2) Saw fish (3) Flying fish (4) Electric ray

17. Class – Amphibia (Amphi = Dual, Bios = Life) :

- Class amphibia includes animals which can live on both the places at 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, they depend on water for their reproduction. Their eggs do not have protective covering to check the 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 also Poisonous glands are present in skin.
- Pigment cells are also found as chromatophore for colouration, and also found colour changing ability known as metachrosis
- Respiration by gills, skin, lungs or buccopharyngeal cavity.





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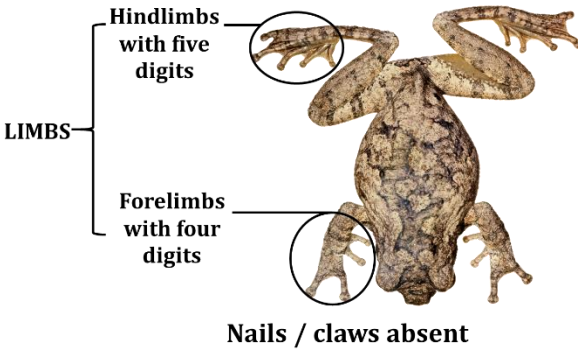
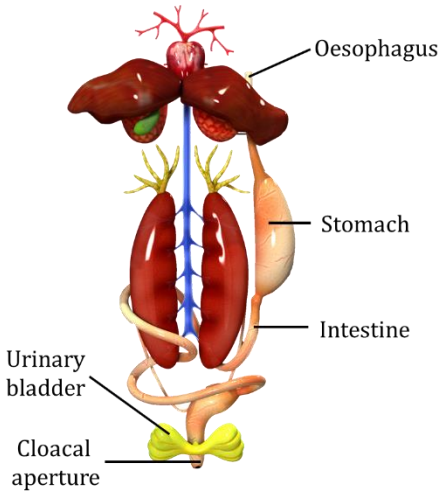
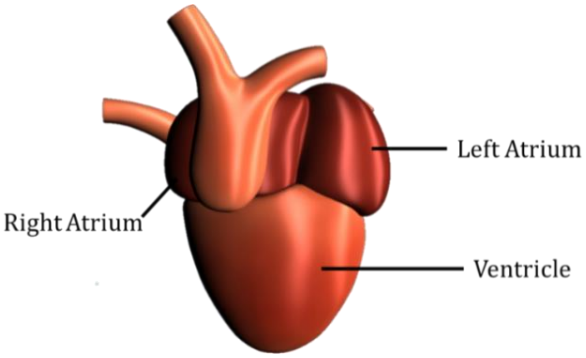
- Most of them have two pairs limbs. Forelimbs have four digits and hindlimbs have five digits.
- A well developed and complete alimentary canal along with digestive glands are present in digestive System (Salivary glands are absent in frog).



Nails / claws absent



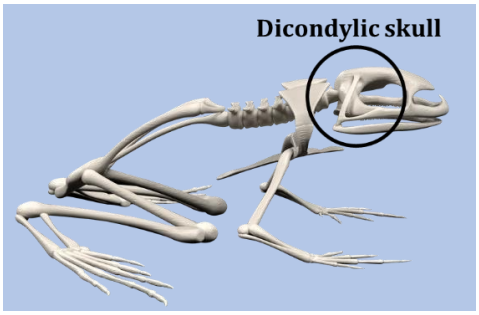
- Alimentary canal, urinary bladder and genital ducts open into a common chamber called cloaca, which opens to the exterior.
- These are cold blooded or poikilothermal animals.
- Heart is three chambered, 2 atria and 1 ventricle. Incomplete double circulation.
- R.B.Cs are biconvex, oval and nucleated.
- Renal portal system and hepatic portal system are present.



Excretory organs : One pair of kidneys

Excretory matter : Ammonia in aquatic forms, Urea in terrestrial forms

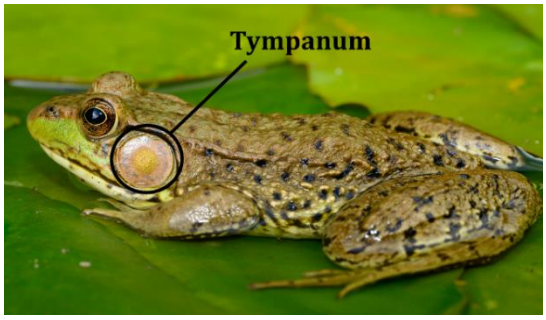
- Cranial nerves are ten pairs in number.



Skeletal system : Dicondylic skull.
Ribs are absent.
(Skull has two occipital condyles)

Eye : The eyes have eyelids.

Ear : Only one ear ossicle (Columella) in middle ear. A tympanum represents the ear.



Reproduction : Sexes are separate. Animals return to water from land for their reproduction.

- Fertilisation is external, takes place in water
- In some amphibians fertilisation is internal.

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- 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 tigrine* (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

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

3. Tree frog is –
(1) *Salamandra* (2) *Hyla* (3) *Alytes* (4) *Icthyophis*

4. *Rana tigrina* is scientific name of
(1) Tree frog (2) Common toad (3) Indian bull frog (4) Sting ray

5. Terrestrial amphibians are :-
(1) Ammonotelic (2) Ureotelic (3) Uricotelic (4) Excrete TMAO

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

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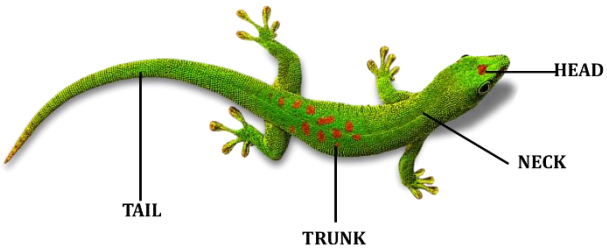
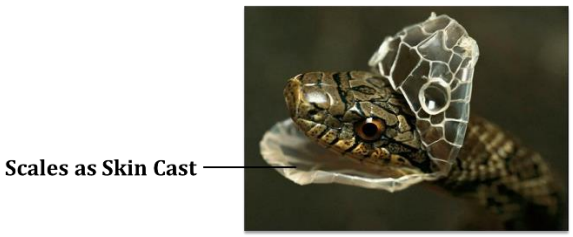
18. Class – Reptilia :

- Study – Study of reptiles is called herpatology.
- Reptiles are first successful terrestrial animals/vertebrates.
- Why called reptiles?
  Class name refers to creeping or crawling mode of Locomotion.
  (Latin reptum - To creep or Crawl)

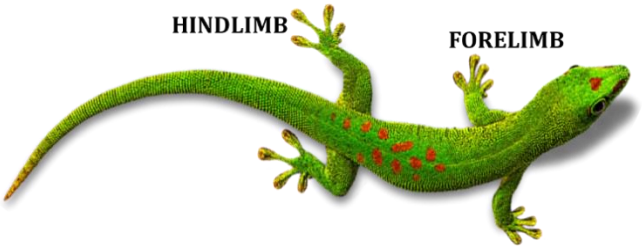
Body parts :



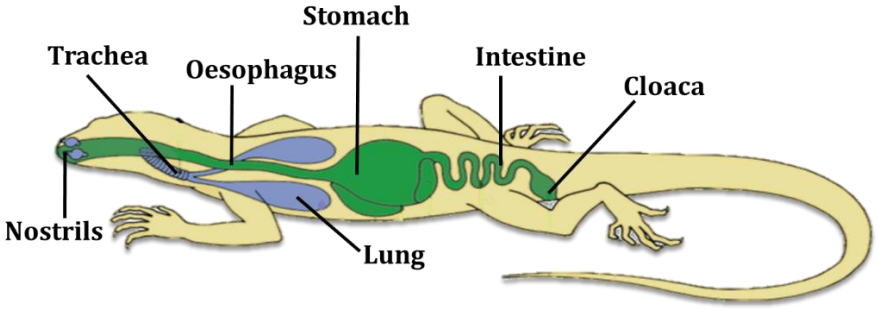
- Body is divided into head, neck, trunk and tail.
- These are Cold blooded/ Poikilothermal animals.
- Reptiles were the first successful terrestrial vertebrates but some are also found in aquatic habitat.
- Skin is dry, cornified, rough and nonglandular.
- Exoskeleton is made up of horny epidermal scales or scutes.
- Snakes & 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, right and left both systemic arches are present.

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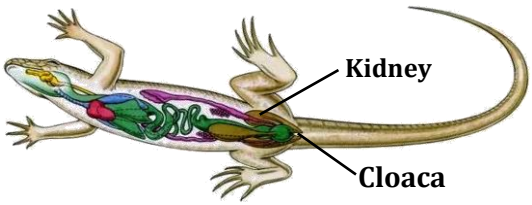
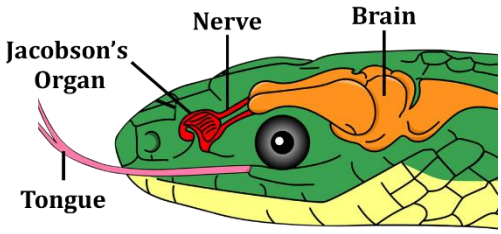
- RBCs are oval and nucleated.
- Only one occipital condyle is present in skull (monocondylar skull).
- Ribs are present in neck and thorax region.
- One pair of kidneys are present for excretion and osmoregulation. These animals are uricotelic for water conservation.



- 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)
- Lateral line system is absent. At the roof/cieling of buccal cavity Jacobson's organ (olfactory) is present.



- Ureters, genital ducts and alimentary canal open into a single cloacal aperture.

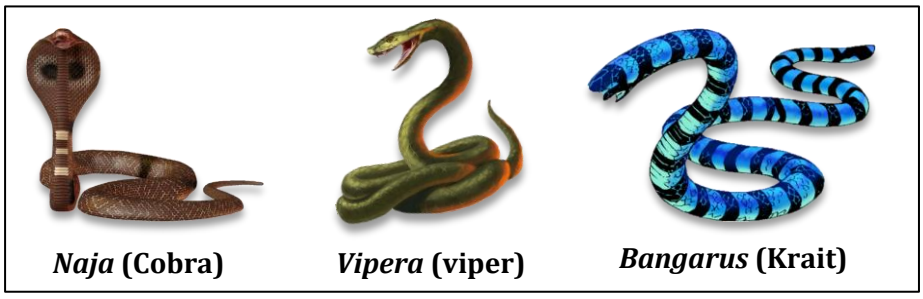
Reproduction :

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

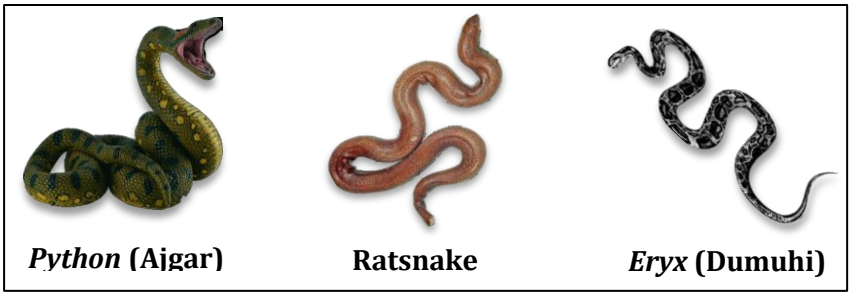
- Eggs are Megalecithal (with large amount of yolk) and cleidoic. Eggs are leathery in snakes. Poikilothermal (cold blooded animals). Body temperature changes according to the environment.
- Development is direct i.e. larval stage is absent. Parental care present in this class.

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 sankes :



Non-poisonous sankes :



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Golden Key Points

- Biggest **Serpentarium** is located in India - **Chennai**
- **Characteristic features of poisonous snakes** :-
  (1) Small scales are found on head or hood.
  (2) Laterally compressed tail is present in marine snake.
  (3) Ventrally placed scales of the body are broad.
  (4) Two deeper teeth mark is of poisonous snake. (•• - shaped - ⋮ Non posionous)

BEGINNER'S BOX-14 REPTILIA

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

2. Which of the following is a non poisonous snake:-
(1) Cobra (2) *Eryx* (3) Viper (4) Krait

3. Group amniota includes:-
(1) Birds and mammals (2) Birds and reptiles
(3) Mammals and reptiles (4) Reptiles, birds and mammals

4. 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

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

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

7. Chelone belongs to:-
(1) Amphibia (2) Reptilia (3) Protochordates (4) Fishes

8. Flying lizard is –
(1) *Chameleon* (2) *Draco* (3) *Exocetus* (4) *Varanus*

9. Poikelothermic amniotes are :-
(1) Birds (2) Amphibians (3) Reptiles (4) Mammals

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

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

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12. 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

13. 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	Bungarus

(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

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

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

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

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"
- Study of BIRDS is called "**ORNITHOLOGY**"
- Birds are also known as "Feathered bipeds or glorified reptiles"
- The characterstic features of birds are presence of feathers all over the body and most of them can fly except flightless bird. Feathers keep them warm and also make body weight light. Feathers are modification of epidermal scales.

Functions of feathers :

(i) **Protection :** They protect the underlying tender skin from all types of mechanical, chemical, pathological, and ecological injuries.

(ii) **Heat Retention:** The birds have a consistent body temperature level, the feather serve the most essential function of retention of heat.

(iii) **Protective Coloration:** The feathers of various birds have rather characteristic protective coloration like the pigmentation of their surroundings, that make them indistin-guishable from their regular environments and, thus, serve to safeguard them from their opponents.

(iv) **Sexual Dimorphism:** Feathers provide protective pigmentation and also sexual display.

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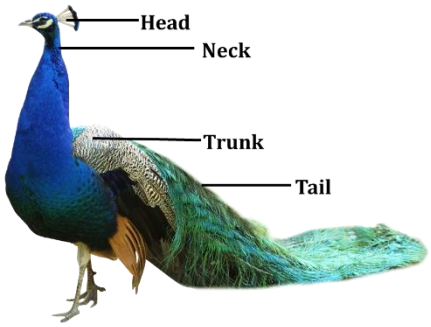


- Birds are warm blooded or Homeothermic or endothermic animals i.e. Body temperature remains almost constant.
- Body is boat shaped. It is divided into head, neck, trunk and tail. Neck is long and flexible.

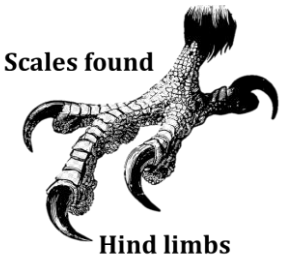
Skeletal system :

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

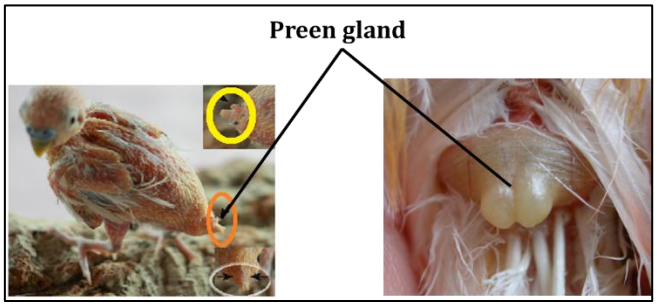
Most of the birds can fly - Except flightless birds (e.g., Ostrich, kiwi, Penguin)

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 on tail or Uropygium. 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) A three chambered cloaca is present.
(vi) Teeth are absent. Beak is present.

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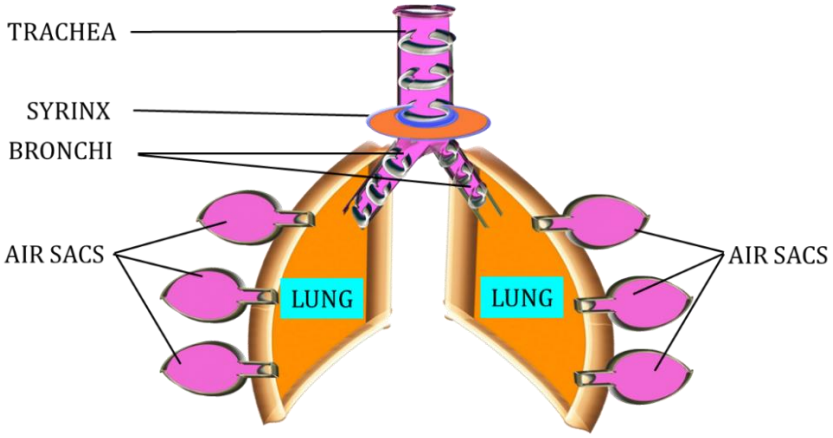
Respiratory system :

(i) Spongy lungs are present for respiration.
(ii) Air sacs are also found. Air sac connected to lungs suppliment respiration.
(iii) Syrinx : Sound producing organ at the junction of trachea and bronchi.



Circulatory system :

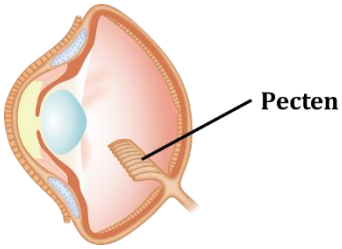
(i) Heart is completely four chambered.
(ii) Only right aortic arch is present.
(iii) Hepatic portal system is well developed in birds.

Excretory system :

(i) Excretory organs are Kidneys
(ii) Urinary bladder absent
(iii) Ureters open into cloaca
(iv) Excretory waste is semisolid uric acid (URICOTELIC)
(v) Animals are uricotelic.

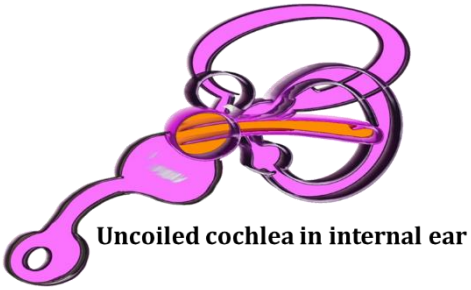
Eye :

(i) In eyes comb like structure Pecten is present, which provides nutrition to eye ball.
(ii) Pecten is found in all birds except Kiwi's eyes.
(iii) Pecten helps in acute vision and telescopic vision.
(iv) Pecten controls the pressure of liquid in eye.



Ear :

(i) External ears are present but ear pinnae absent.
(ii) Columella bone (stapes) (one ossicle) is found in middle ear.
(iii) Uncoiled cochlea in internal ear



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.

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Reproduction :

(i) Birds are unisexual.
(ii) Sexual dimorphism is present.
(iii) Copulatory organ is usually absent in males.
(iv) Birds are monodelphic i.e. only left ovary and left oviduct are functional in females.
(v) Fertilisation is internal.
(vi) They are egg laying i.e. Oviparous.
(vii) Eggs are wlarge, megalecithal (large amount of yolk) and cleidoic (covered with calcium carbonate). Calcareous shell which is perforated.
(viii) Embryonic development is direct.
(ix) Birds form nests.
(x) Parental care is well marked.

Examples :

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

Aptenodytes
(Penguin)

Columba
(Pigeon)

Psittacula
(Parrot)

Corvus
(Crow)

Pavo
(Peacock)

Neophron
(Vulture)

Humming bird
smallest bird

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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

2. 'Pecten' is a structure found in the eyes of:-
(1) Reptilies (2) Fishes
(3) Birds (4) Mammals

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

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

5. 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

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

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

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

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

10. Which of the following is the function of feathers?
(1) Protective coloration (2) Sexual dimorphism
(3) Heat retention (4) All of the above

11. 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.

12. All are flying birds from the following except :-
(1) Crow (2) Pigeon (3) Parrot (4) Penguin

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20. Class – Mammalia :

Habit and Habitat :

- The members of this class are cosmopolitan and found in a variety of habitats - polar ice (Polar bear), deserts(Camel), mountains(Mountain goat), forest(Lion), grasslands(Horse) and dark caves(Bat).
- Some of them adapted to fly [Pteropus (Flying fox)] and some are 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 :

- HAIR - 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 :

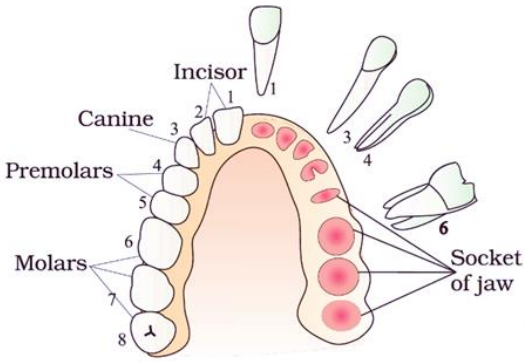
- Horns on Head
- Nails on digits
- Claws or Hoof

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 walking 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, defaecation, micturition and parturition.

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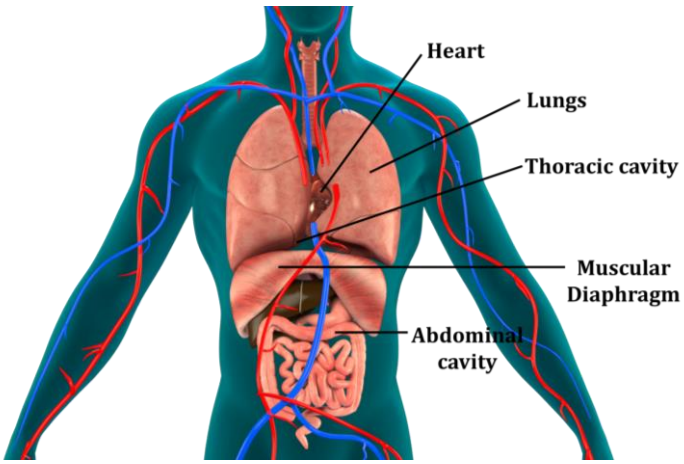
Respiratory Organs :

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

Circulatory System :

- Heart is four chambered (Two atria and two ventricles).
- Double circulatory system is present.
- No sinus venosus.
- Only are left aortic (systemic) arch present.
- RBCs small, circular and enucleated.



Skeletal System :

- Endoskeleton is bony and skull is dicondylic.
- Neck is having 7 cervical vertebrae except: Bradypus/Sloth has 9 or 10 cervical vertebrae and Sea. Cow/Manatee has 6 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
- A special structure is present for the connection of both the cerebral hemispheres of brain, that is called corpus - callosum. (Present only in higher mammals)
- Cranial nerves are 12 - pairs

Ear :

- External ear is present in the form of ear pinna.
- Malleus, Incus and stapes are the three ear ossicles in middle ear.

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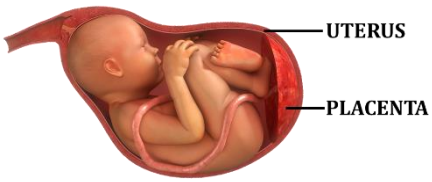
Reproductive System :

- 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
CORPUS CALLOSUM	Absent	Absent	Present	Present
CLOACA / ANUS	Cloaca present	Anus present	Anus present	Anus present
				

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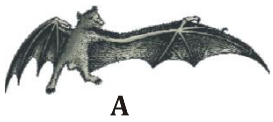
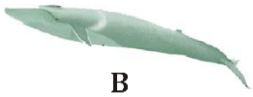
BEGINNER'S BOX-16 MAMMALIA

1. Which of the following animal has poison glands:-
(1) Male platypus (2) Female lizard (3) Male rabbit (4) Male rat

2. External ear pinna is found in:-
(1) Reptiles (2) Mammals (3) Amphibians (4) Fishes

3. Respiratory organs of whale are:-
(1) Book lungs (2) Lungs (3) Gills (4) Skin

4. Character found only in mammals:-
(1) Homeothermy (2) Viviparity (3) Dicondylic skull (4) Muscular diaphragm

5.  A  B  C
A, B, and C animals are respectively :-
(1) Pteropus, Balaenoptera, Macropus (2) Macropus, Balaenoptera, Pteropus
(3) Balaenoptera, Pteropus, Macropus (4) Balaenopter, Macropus, Pteropus

6. A trait is found in all mammals :-
(1) Muscular diaphragm (2) Mammary glands
(3) 4 chambered heart (4) All

7. 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

8. Select the incorrect matching:
(1) Kangaroo – Macropus (2) Blue whale – Balaenoptera
(3) Monkey – Macaca (4) Camel – Elephas

9. Which of the following is an aquatic mammal?
(1) Panthera tigris (2) Balaenoptera (3) Pteropus (4) Macropus

10. Which one of the following is oviparous?
(1) Platypus (2) Flying fox (Bat) (3) Elephant (4) Whale

11. Type of teeth in mammals are
(1) Heterodont, Thecodont, Diphyodont
(2) Homodont, Thecodont, Diphyodont
(3) Heterodont, Thecodont, Polyphyodont
(4) Homodont, Thecodont, Polyphyodont

12. Which of the following is not the feature of mammals?
(1) Ear pinna (2) Muscular diaphragm
(3) Animals are poikilothermal (4) Hair on body

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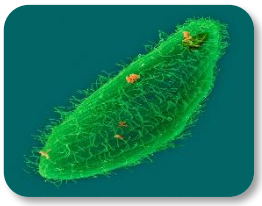
21. Phylum – Protozoa :

PHYLUM PROTOZOA

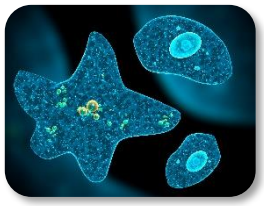
Proto **Zoan**

So they are termed as "Acellular" organisms, proposed by Dobell.

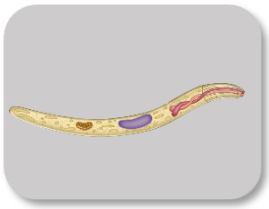
- It is 3rd largest phylum.
- In includes unicellular eukaryotes
- One celled body performs all the biological activities like multicellular animals.
- **Microscopic :**



Mostly aquatic



Free living (Amoeba)

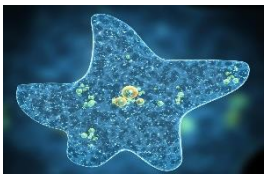


Parasitic (Plasmodium)

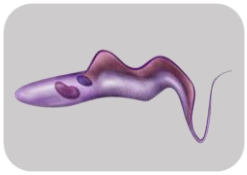
solitary or colonial (Proterospongia)

- They have varying body shapes and are mostly asymmetrical.
- Body level of organisation is protoplasmic level. Few show nuclear dimorphism. e.g. Paramoecium.
- Their protoplasm is uninucleated or multinucleated.
- Some are naked, some have body bounded by delicate membrane or a firm pellicle/Test/shell.
- In few groups of protozoa Silica shell & $CaCO_3$ exoskeleton is found.
  e.g. Radiolarian group (silica) & Foraminiferan group ($CaCO_3$). (e.g : Globigerina)

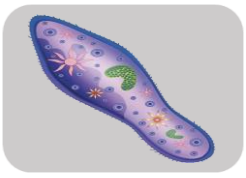
- Locomotory structures.



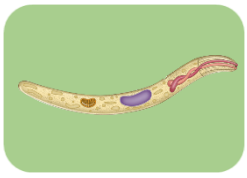
(i) Finger-like Pseudopodia e.g. *Amoeba*



(ii) Whip-like Flagella e.g. *Trypanosoma*



(iii) Hairy Cilia e.g. *Paramoecium*



(iv) Absent in sporozoan e.g. *Plasmodium*

- **Digestion** : Nutrition in Protozoans is mainly holozoic (*Amoeba*) and Parasitic (*Plasmodium*). Digestion is intra cellular takes place in food vacuole.
- Holozoic nutrition is the process of **nutrition** that takes place in organisms that take solid or liquid food inside their body. Amoeba follows holozoic nutrition.
  Steps of holozoic nutrition
  (i) Ingestion (ii) Digestion (iii) Absorption
  (iv) Assimilation (v) Egestion

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- Respiration and excretion take place by general body surface.
- Some excretion may occur through contractile vacuole. Nitrogenous waste is Ammonia.
- Some fresh water protozoans get rid of excess water through contractile vacuole by the process known as Osmoregulation.

Reproduction :

Reproduction

Asexual Reproduction | **Sexual Reproduction**

Asexual reproduction :

Binary fission	Multiple fission	Budding
Simple *e.g. Amoeba*	*e.g. Plasmodium*	*e.g. Ephelota*
Transverse *e.g. Paramoecium*		
Longitudinal *e.g. Trypanosoma*		

Sexual reproduction :

Syngamy	Conjugation
e.g. Plasmodium	*e.g. Paramoecium*

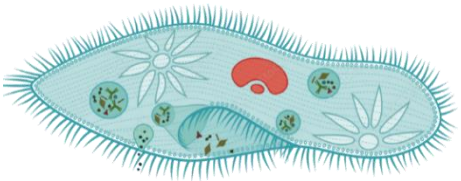
Amoeboid protozoans :

(i) Live in fresh water , sea water or moist soil
(ii) Move and capture their prey by putting out pseudopodia (false feet) as in Amoeba
(iii) Marine forms have silica shells on their surface.
(iv) Some of them such as *Entamoeba* are parasites.

Flagellated protozoans :

(i) The members of this group are either free-living or parasitic.
(ii) They have flagella.
(iii) Example: *Trypanosoma.*
(iv) The parasitic forms cause diseases like sleeping sickness.

Ciliated protozoans :



(i) These are aquatic, actively moving organisms because of the presence of thousands of cilia.
(ii) They have a cavity (gullet) that opens to the outside of the cell surface. The coordinated movement of rows of cilia causes the water laden with food to be steered into the gullet.
Example: *Paramoecium*

Sporozoans :

(i) This includes diverse organisms that have an infectious spore-like stage in their life cycle.
(ii) The most notorious is Plasmodium (malarial parasite) which causes malaria, a disease which has a staggering effect on human population.

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BEGINNER'S BOX-17 PROTOZOA

1. The vector for causing sleeping sickness in man is :
(1) House fly (2) Mosquito (3) Tse-tse fly (4) Sand fly

2. In which of the following protozoans locomotory structure are absent ?
(1) Sarcodina (2) Sporozoans (3) Ciliata (4) Mastigophores

3. Kala azar disease in man is caused by :
(1) *Leishmania donovani* (2) *Trypanosoma gambiense*
(3) *Trichomonas* (4) *Giardia*

4. Grand old man of intestine is :
(1) *Giardia* (2) *Paramoecium* (3) *Entamoeba* (4) *Amoeba*

5. Which of the following pair is correctly matched ?
(1) *Leishmania* - kala azar (2) *Giardia* - sleeping sickness
(3) *Entamoeba* - Malaria (4) *Plasmodium* - Dysentery

6. Locomotory structure are whip like flagella is :-
(1) *Paramoecium* (2) *Plasmodium* (3) *Trypanosoma* (4) *Amoeba*

7. Nitrogenous wate in Amoeba is :-
(1) Ammonia (2) Urea (3) Uric acid (4) Guanine

8. Locomotory structure are hairy cilia in :-
(1) *Paramoecium* (2) *Plasmodium* (3) *Trypanosoma* (4) *Amoeba*

9. Body level of organisation in phylum protozoa are :-
(1) Protoplasmic level (2) Cellular level
(3) Tissue level (4) Organ system level

10. Protozoans have varying body shape and are mostly :-
(1) asymmetrical (2) radially symmetrical
(3) bilaterally symmetrical (4) biradially symmetrical

11. Which of the following is not the property of amoeboid protozoan?
(1) Live in fresh water, sea water or moist soil
(2) Move and capture their prey by putting out pseudopodia (false feet) as in Amoeba
(3) Marine forms have silica shells on their surface
(4) Some of them such as Entamoeba are free living

12. Which of the following is not the property of ciliated protozoan?
(1) These are aquatic, actively moving organisms because of the presence of thousands of cilia.
(2) They have a cavity (gullet) that opens to the outside of the cell surface.
(3) The coordinated movement of rows of cilia causes the water laden with food to be steered into the gullet.
(4) The parasitic forms cause diseases like sleeping sickness.

13. Which of the following causes malaria?
(1) Plasmodium (2) Amoeba (3) Trypanosoma (4) Paramoecium

14. Which of the following causes sleeping sickness?
(1) Plasmodium (2) Amoeba (3) Trypanosoma (4) Paramoecium

15. Reproduction by binary fission takes place in :-
(1) Amoeba (2) Trypanosoma (3) Paramoecium (4) All of the above

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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	10
	Ans.	4	2	1	1	2	1	3	2	2	1
	Que.	11									
	Ans.	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	14						
	Ans.	2	1	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	8
	Ans.	3	4	4	3	3	1	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	1	1	3	2	2	4
	Que.	11	12	13	14	15	16	17	18	19	20
	Ans.	4	3	1	1	1	3	4	1	4	3
	Que.	21	22	23							
	Ans.	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	2	4	1	4	3	2	2	3	2
	Que.	11	12	13	14	15	16				
	Ans.	4	2	2	4	3	1				

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

BEGINNER'S BOX-16	Que.	1	2	3	4	5	6	7	8	9	10
	Ans.	1	2	2	4	1	4	1	4	2	1
	Que.	11	12								
	Ans.	1	3								

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