Animal Kingdom

- **Aristotle :-** He is known as the "father of zoology" or ancient taxonomy.
  When you look around, you will observe different animals with different structures and forms. As over a million species of animals have been described till now, the need for classification becomes all the more important. The classification also helps in assigning a systematic position to newly described species.
  What Do We Know?

Important Phyla

1.	**Protozoa (Included in kingdom – Protista)**	– e.g. Amoeba, Paramoecium etc.
2.	**Porifera (Kingdom – Animalia)**	– Sponges
3.	**Coelenterata/ Cnidaria**	– Hydra, Jellyfish etc.
4.	**Ctenophora** (minor phylum)	– Pleurobrachia
5.	**Platyhelminthes**	– Flat worms (eg : Tape worm)
6.	**Nemathelminthes/Aschelminthes**	– Round worm (eg : Ascaris)
7.	**Annelida**	– Earthworm, Leech etc.
8.	**Arthropoda**	– Insects, Scorpion, Prawn etc.
9.	**Mollusca**	– Pila, Octopus etc.
10.	**Echinodermata**	– Star fishes
11.	**Hemichordata**	– Balanoglossus
12.	**Chordata**	– Fish, Frog, Snake, Birds, Monkey, Human etc.

Basis of Classification

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

1. Level of body organization :

Cellular level → Cells are arranged as loose cell aggregates and division of labour occurs

↓

Tissue level → Cells of a group performing the same function are arranged into tissues (Organs absent).
E.g. Cnideria, Ctenophora

↓

Organ level → Tissues are grouped together to form organs.
[Digestive system is either absent or incomplete]
E.g. Platyhelminthes

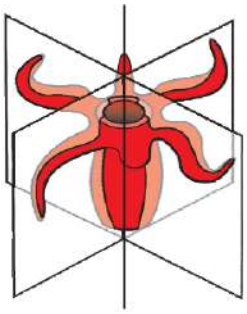
↓

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

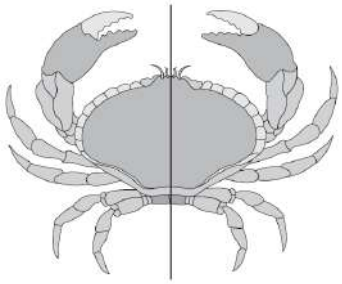
2. Symmetry :

(a) Asymmetry : When any plane that passes through the centre does not divide the body of animals into two equal halves. e.g. : most of the sponges.

(b) Radial symmetry : When any plane passing through the central axis of the body divide the animal into two identical halves e.g. Coelenterates, Ctenophores and Echinoderms (adult)



Radial symmetry



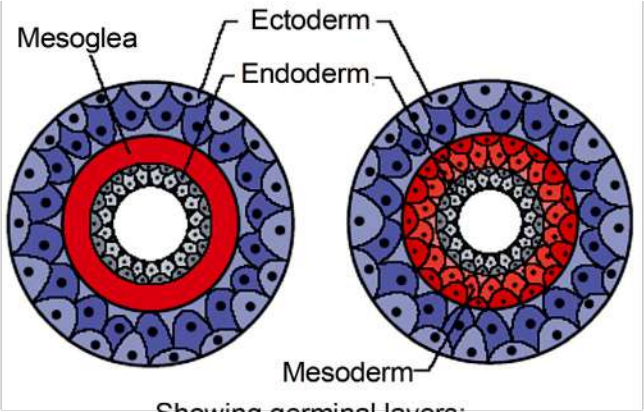
Bilateral symmetry

(c) Bilateral symmetry: When the body can be divided into identical left & right halves in only one plane. e.g.: Platyhelminthes to Chordates (except adult echinodermata), Larva of echinodermata

3. Germinal layers : -

(a) Diploblastic : Animals in which the cells are arranged in two embryonic layers ectoderm and endoderm with an intervening undifferentiated mesoglea e.g. Coelenterates and Ctenophores.

(b) Triploblastic : Those animals in which the developing embryo also has a third germinal layers- Mesoderm in between the ectoderm and endoderm e.g. Platyhelminthes to Chordates.



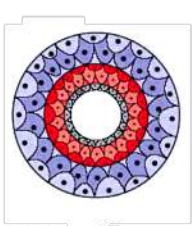
Showing germinal layers:
(a) Diploblastic (b) Triploblastic

4. Body Cavity or Coelom :

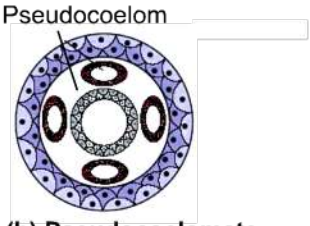
Presence or absence of a body cavity or coelom between the body wall and gut wall is very important in classification.

(a) Acoelomates : Animals in which the body cavity or coelom is absent e.g. Platyhelminthes

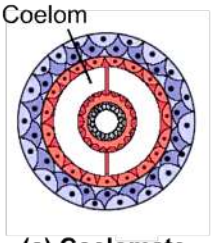
(b) Pseudocoelomates : Animals in which body cavity is not lined by mesoderm, instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is called pseudocoelom. e.g. Aschelminthes



(a) Acoelomate



(b) Pseudocoelomate



(c) Coelomate

(c) Coelomates : Animals possessing coelom i.e. the body cavity which is lined by mesoderm on all sides

- On the basis of embryonic development, the coelom is of two types
  - **(i) Schizocoel -** Coelom formed by splitting of a mesodermal mass
    e.g. Annelida, Arthropoda, Mollusca.
  - **(ii) Enterocoel -** Coelom formed by fusion of gut pouches (archenteron) during embryonic stag

5. Body plan:

(a) Cell-aggregate type e.g. Sponges :

(b) Blind Sac type : Animals in which digestive system is incomplete, it has only single opening to the outside of the body that serves as both mouth and anus. e.g. Coelenterates to Platyhelminthes

(c) Tube-within-tube type : Found in those animals having complete digestive tract i.e. with separate opening mouth and anus. e.g. Aschelminthes to Chordates

6. Segmentation:

Metameric segmentation : In Annelids, Arthropods and Chordates.

In these animals, the body is externally and internally divided into segments with a serial repetition of at least some organs, this is called metameric segmentation and the phenomenon is known as **Metamerism.**

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

(a) Non-chordates- Animals without notochord e.g. Porifera to Hemichordata

(b) Chordates : Animals with notochord. eg. Phylum Chordata.

8. Circulatory system:

(a) Open type - In which the blood remain filled in tissue spaces or blood sinuses due to absence of blood capillaries e.g. Arthropods, Molluscs, Echinoderms, Hemichordates and some lower Chordates like tunicates

(b) Closed type : In which the blood is circulated through a series of vessels of varying diameters i.e. arteries, veins and blood capillaries e.g. Annelids, Cephalopod molluscs, Vertebrates etc.

9. Embryonic development :

(a) Protostomiates- Animals in which mouth is formed first (Blastopore - Mouth)
e.g. Platyhelminthes to Mollusca.

(b) Deuterostomiate: Animals in which anus is formed earlier than mouth (Blastopore → Anus)
e.g. Echinoderms, Hemichordates and Chordates.

10. (a) Direct development - If larval stages are absent
eg. : Earthworm.

(b) Indirect development - If larval stages are present
eg. : Flukes, Tape wrom.

Concept Builder

1. Which of the following statement is **true**?

(1) Animal cells posses a cell wall (2) Animals are unicellular eukaryotes

(3) Animals have autotrophic nutrition (4) All animals are heterotrophic

2. Match the phyla listed under **column-I** with the level of organization given under **column-II**, Choose the answer which gives the correct combination of the alphabets of the two columns:

	Column-I (Phylum)		**Column-II** (Level of Organization)
A	Porifera	p	Tissue
B	Platyhelmilthes	q	organ
C	Cnidaria	r	Organ-system
D	Chordata	s	Cellular

(1) A = s, B = q, C = p, D = r (2) A = q, B = r, C = s, D = p

(3) A = s, B = r, C = q, D = p (4) A = r, B = q, C = s, D = p

3. Which of the following groups is deuterostome ?

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

(3) Arthropoda, Mollusca, Echinodermata (4) Echinodermata, Hemichordata, Chordata

4. Segmentation is found in :

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

5. Pseudocoelom is found in :

(1) Platyhelminthes (2) Urochordata (3) Nematoda (4) Arthropoda

Concept Builder (Answer-Key)					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	4	1	4	2	3

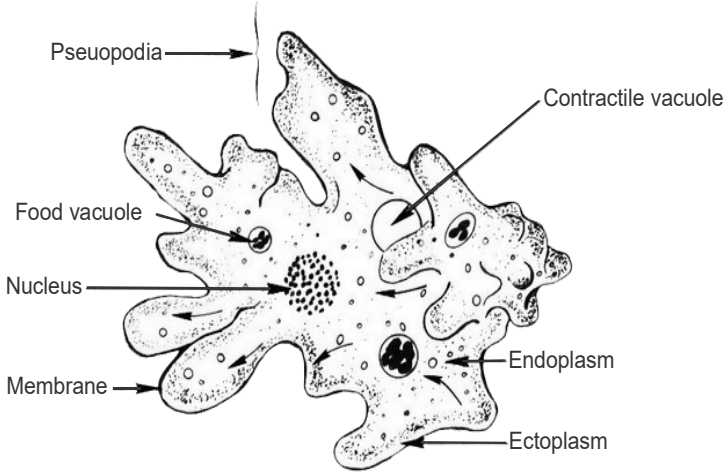
Phylum - Protozoa (Kingdom-Protista)

- They are world wide, Cosmopolitan mostly **Microscopic** , mostly **Aquatic, and free living** (***Amoeba***) or **parasitic *(Plasmodium)***. These causes serious diseases.
- They have varying body shapes and are mostly **asymmetrical.**
- They have **Protoplasmic level of body organisation**.
- Some are **naked,** have body bounded by delicate membrane or a firm **pellicle/shell.** In few groups of protozoa Silica & $CaCO_3$ shell is found..
- Locomotion structure are :
  (i) Finger-like Pseudopodia e.g. ***Amoeba*** (ii) Whip like Flagella e.g. ***Euglena***
  (ii) Hair like cilia e.g. ***Paramoecium*** (iv) Absent in some parasites e.g. **Plasmodium**
- **Nutrition** of Protozoans are mainly **holozoic** (Amoeba), (Euglena), **Parasitic** (***Plasmodium***). Digestion is **intracellular** take place in **food vacuole**.
- **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** takes place by

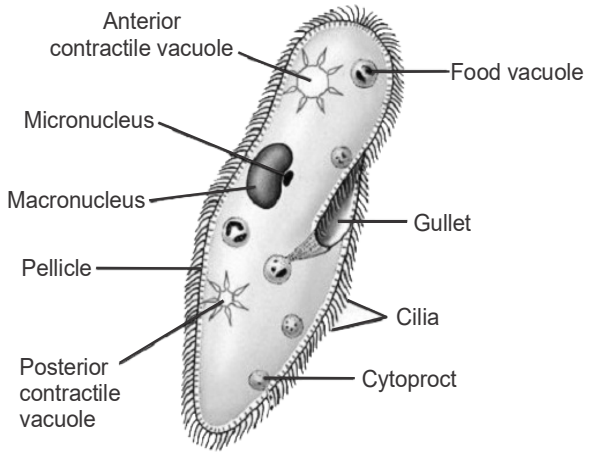
	Asexual		**Sexual**
(1)	Binary fission	(1)	Syngamy **(Plasmodium)**
	(a) Simple fission **(Amoeba)**		
	(b) Transverse fission **(Paramoecium)**		
	(c) Longitudinal fission **(Trypanosoma)**		
(2)	Multiple fission **(Plasmodium)**	(2)	Conjugation **(Paramoecium)**
(3)	Budding **(Ephelota/ Sessile protozoan)**		

- They do not have natural - death because in unicellular animals there is no differentiation of somatoplasm & germplasm so these are considered as **immortal.** Some also form cyst which help in unfavourable condition for reproduction of organism.

Few Common Protozoans



Structure of Amoeba proteus



Paramecium caudatum

PROTOZOA

4 Classes (on the basis of locomotory organs)

(1) Mastigophora or Flagellata (Flagellated Protozoa)

- Free living (aquatic) or parasitic
- Locomotion by 1 or 2 thread like flagella.
- Body covered by pellicle.
- Reproduction-
  Asexual by binary fission but sexual absent

e.g.

1. **Proterospongia** - Between protozoa and porifera.
2. **Leishmania donovani** - Causes - **Kala azar / Dum-dum fever / Leishmaniasis**
   Carrier-sandfly (**Phlebotomus**)
3. ***Trypanosoma gambiense*** - Causes ***Sleeping sickness*** *or* ***African trypanosomiasis***
   Carrier -
   *Tse-Tse fly (**Glossina**)*
4. ***Euglena*** **-** Connecting link between plant and animal

(2) Sarcodina / Rhizopoda (Amoebic protozoa)

- Free living (aquatic) or parasitic
- Locomotion by different types of pseudopodia
- Body-naked or with shell
- Reproduction-Asexual by binary fission but sexual absent

e.g.

1. **Amoeba** - finger-like pseudopodia called ***lobopodia***
   → Cytoplasm differentiated into ectoplasm and endoplasm.
2. ***Entamoeba histolytica*** **-** Causes - **"Amoebic dysentry" :**

(3) Ciliata (Ciliated protozoa)

- Free living (aquatic) or parasitic
- Locomotion by numerous cilia
- Body covered by pellicle
- Reproduction-
  → Asexual by binary fission
  → Sexual by conjugation

e.g. ***Paramoecium***
(slipper animalcule)

Binucleated **meganucleus** for somatic functions and **micronucleus** for reproductive function.

(4) Sporozoa (Sporozoans)

- All are endoparasite and pathogenic
- Locomotory organelles absent
- Thick pellicle for protection
- Reproduction-
  → Asexual by multiple fission
  → Sexual by syngamy

e.g. **1.** ***Plasmodium***
→ Most notorious protozoan
Causes - malaria
→ Carrier - female anopheles

2. Nosema - Causes Pebrine disease in silk worm

Kingdom – Animalia

Phylum – Porifera (Sponges)

- Members of this phylum are commonly known as **"Sponges".**
- All are **aquatic and Sessile,** mostly **marine** but few are found in **fresh water** also. Entire body with pores i.e. numerous small **Ostia** for entry and one large opening **Osculum** for exit of water.
- Sponges are **mostly Asymmetrical.** (Radial symmetry in ***Sycon).***
- Sponges are most primitive multicellular animals and have **cellular level** of organisation with two germ layer i.e. **Diploblastic.**

  Body wall consists of

  (i) ***Outer Pinacoderm***

  – Consists of (a) Pinacocytes (Flat cell) (b) Porocytes (oval)

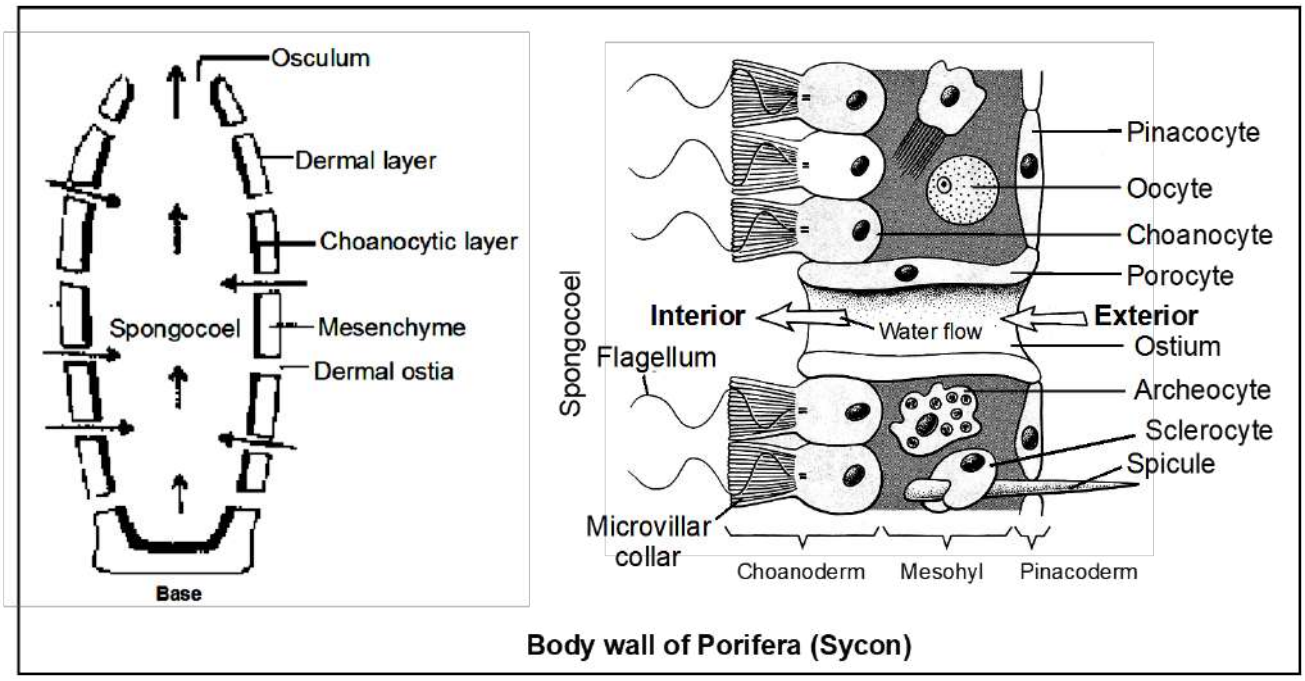
  (ii) ***Inner Choanoderm***

  – Consists of **flagellated collar cell** or **choanocytes (Unique Characteristic of Porifera)**

  (iii) Between these two layers gelatinous material **Mesenchyme** is present which contains certain Amoebocytes cells like.

  Scleroblast – For formation of skeleton elements (Spicules)

  Archaeocytes – Totipotent cells (High power of regeneration, formation of ova & spermatozoa)
- Body wall encloses a large central cavity the **spongocoel** or **paragastric cavity** with small hollow canals.



Body wall of Porifera (Sycon)

- **Canal system or water transport system :** It is **unique feature of sponges**, water enters through ostia of 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).
- Choanocytes forms lining of Spongocoel and canals. Continuous beating of flagella helps in maintaining flow of water current.

- Digestion is intracellular and occurs in food vacuoles of choanocytes.
- Skeleton is internal, consist of **tiny Calcarious** or **siliceous spicules or fine spongin fibre** located in mesenchyme.
- Respiration and Excretion takes place by diffusion of gases through body surface. Excretory matter is Ammonia.
- **Reproduction** :

  (A) <u>Asexual</u> - By budding/ Fragmentation / Special cell mass **Gemmules** containing Archaeocytes. Endogenous buds of asexual reproduction in sponge are known as Gemmules (In unfavourable condition).

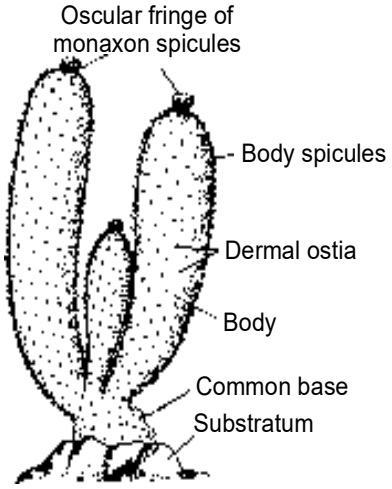
  (B) <u>Sexual</u> - Sponges are **Hermaphrodite, fertilization internal** and **cross** due to **Protogynous condition** and **development is indirect** having a larval stage which is morphologically distinct from adult.

Porifera

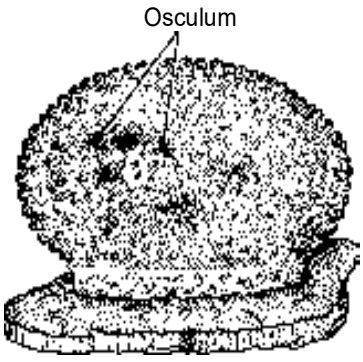
(3 classes – On the basis of skeleton)

	Calcarea/Calcispongae	**Hyalospongia or Hexactinellida**	**Demosphongia**
Skeleton	- Calcareous spicules (Lime sponge)	6 rayed siliceous spicules **(Glass sponge)**	1 or 4 rayed silicious spicules or spongin fibre or both
Habitat	- All marine and found in shallow water	All marine and found in deep sea water	Marine or fresh water sponges
e.g.	***Leucosolenia (smallest sponge)*** ***Scypha or Sycon* - (Urn sponge)**	***Euplectella* -** (Venus flower basket, Bridal gift in Japan)	***Euspongia* -** (Bath sponge) **Spongilla -** (Fresh water sponge) **Cliona -** (Boring sponge) harmful to pearl Oyster

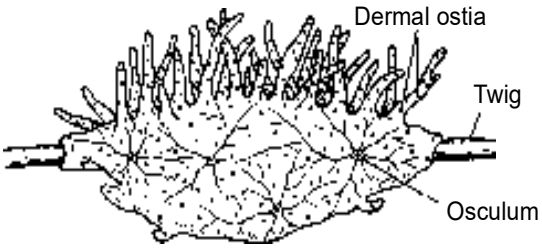
Few Common Sponges



Sycon (= Scypha)



Euspongia



Spongilla around a twig

Concept Builder

1. Protozoans are not included in kingdom Animalia because these are:
(1) mostly asymmetrical (2) unicellular eukaryotes
(3) unicellular prokaryotes (4) multicellular prokaryotes

2. Members of the phylum porifera are:
(1) all marine (2) all freshwater
(3) mostly freshwater and few marine (4) mostly marine and few fresh water

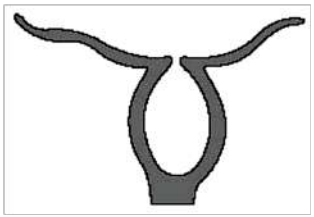
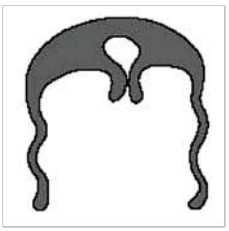
3. Porifera is characterized by the presence of:
(1) coelom (2) pseudocoelom (3) coelenteron (4) Collar cells

4. Euspongia is known as:
(1) Fresh water sponge (2) Urn sponge
(3) Bath sponge (4) Boring sponge

Concept Builder (Answer-Key)				
Que.	**1**	**2**	**3**	**4**
Ans.	2	4	4	3

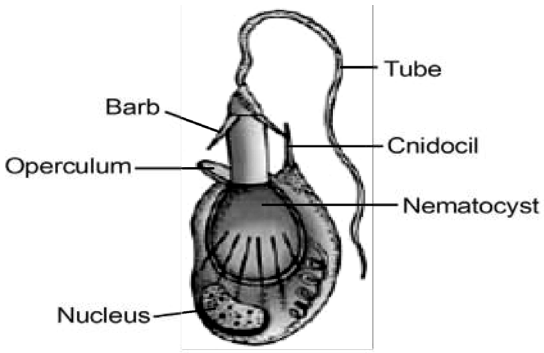
Phylum – Cnidaria (Coelenterata)

- Coelenterates are also known as **Cnidarians** due to presence of stinging cells called **Cnidoblast** or **Cnidocytes.**
- Mostly **marine**, **few fresh-water** *(Hydra.)*
- **Radial symmetry**
- **Tissue level of organisation.**
- They are Diploblastic. They develop from two germinal layers (1) Ectoderm (2) Endoderm (mesogloea between two layers) Interstitial cells are totipotent cells found in both layers of body wall.
- Coelenterates have **two basic or morphological** of **forms** (Dimorphic)

(1) Polyp	(2) Medusa
- Cylindrical and sessile form - May be solitary or Colonial - Mouth directed upward - Asexual form - Like - Hydra, Adamsia	- Umbrella shaped and free swimming - Always solitary - Mouth directed downward - Sexual form - Like - Aurelia
	
Adamsia (Polyp)	**Aurelia (Medusa)**

- If both forms are found in a species, and alternate in life cycle, Polyps produce medusae asexully and medusae form the polyps sexually, this alternation of generation is called **Metagenesis** eg : **Obelia**

- Cnidoblast or Cnidocyte (contain stinging capsule as Nematocyst) present on the tentacles and Whole body are used for **anchorage** (Attachment)**, defence** and for the capture of Prey (**Offence**).



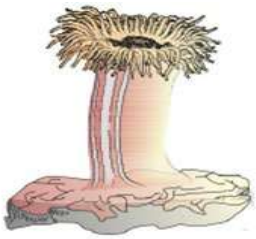
Cnidoblast

- Body of coelenterates may be covered by <u>calcareous</u> exoskeleton. eg. :- Corals
- They have a large central cavity called **Coelenteron** with single aperture, i.e. **Incomplete digestive tract (Blind sac)** and Mouth serve both purpose.
- **Digestion** is **extracellular** as well as **Intracellular** i.e. takes place in Coelenteron as well as in food vacuole.
- Coelenteron is also responsible for distribution of food besides partly digesting it. This dual role named coelenteron as **Gastrovascular** cavity.
- **Respiration** and **Excretion** takes place by diffusion of gases through **body surface**.
  Excretory matter is **Ammonia.**
- **Nervous system** diffused type and consist of **non-polar** neurons (Nerve net).
- **Reproduction :-**
  – Asexual reproduction by budding
  – Sexual by production of gametes
  – Development is indirect with larval stages
  – Larva of ***Obelia*** - **<u>Planula</u>** (free living).

  Example :

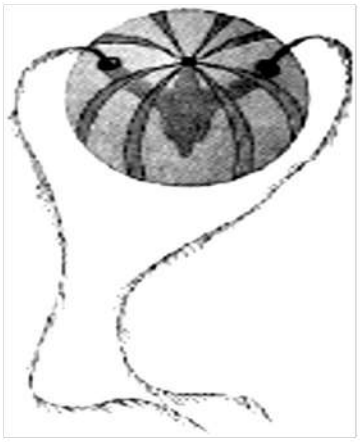
  1. Hydra - Fresh water polyp.
  2. Obelia - Sea fur, Shows metagenesis
  3. Physalia - Portuguese man of war
  4. Aurelia - Jelly fish,
  5. Sea Anemones
     (i) Adamsia
     (ii) Metridium
  6. Coral (Only coelentrate with $CaCO_3$ covering)
     (i) Pennatula - Sea pen
     (ii) Gorgonia - Sea fan
     (iii) Meandrina - Brain coral

(a) Aurelia (Medusa)



(b) Adamsia (Polyp)

Phylum – Ctenophora



Pleurobrachia

- They are known as “Comb-jellies” or “Sea-walnuts”.
- Nematoblasts are absent, so they are also called **"acnidarians"**. They are exclusively **marine.**
- **Bioluminescence** (The Property of a living organism to emit light) is well marked.
- They are **radial symmetrical. 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 nematablasts on the tentacles a special type of cells are present called **Lasso-cells** 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 swimming **Cydippid** larva.

  e.g. ***: Pleurobrachia***

  : Ctenoplana

  : Beroe – Swimming eye of Cat.

Concept Builder

1. Aurelia is known as :
(1) catfish (2) jellyfish
(3) silverfish (4) cuttlefish

2. An animal which is diploblastic and radially symmetrical :
(1) Ascaris (2) Spongilla
(3) Pheretima (4) Gorgonia

3. Name the larval form of ctenophores :
(1) ephyra (2) planula
(3) cydippid (4) scyphistoma

4. Which of the following is Comb jelly ?
(1) Pennatula (2) Hydra
(3) Taenia (4) Pleurobrachia

5. Both extracellular and intracellular digestion is found in :
(1) Hydra (2) Taenia
(3) Sypha (4) Round worm

Concept Builder (Answer-Key)					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	2	4	3	4	1

Phylum – Platyhelminthes

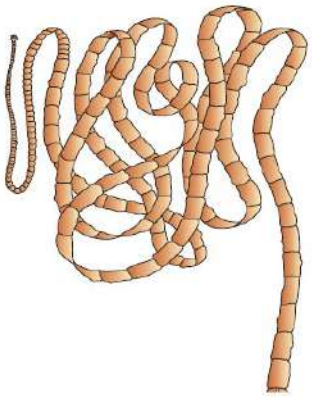
- They have dorsoventrally flattened body hence are called **flat worms.**
- These are mostly endoparasites found in animals including being human but some are **Free living** (aquatic).
- Study of worms causing parasitic infestation in human is called **Helminthology.**
- Body is **Bilaterally symmetrical** and body organisation is of organ level.
- 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**, **hook** etc. are present in parasitic form.
- Epidermis is some times ciliated. On the body wall of parasitic animals a thick cuticle or Tegument is present i.e. 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** muscle fibres are present.
- These are **acoelomate**. In between various organs a solid, loose mesodermal tissue called **Parenchyma** is present.
- Digestive system **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 in internal parasite like Tapeworms.
- **Excretion** occurs through specialised cells called **flame-cells or Solenocytes (protonephridia)**. They also help in **osmoregulation** and **excretion**.
- Nervous system is **ladder like**, consist of a nerve ring and longitudinal nerve cords.• They
- **They are Bisexual.** Reproductive system is **complex** and well-developed. **Fertilization** is **internal**. Development **indirect** through many larva stages.
- Some members like **Planaria have high regeneration capacity**.
  E.g. :

  (1) Planaria : Found in fresh water, nocturnal, omnivorous and ciliary locomotion. Reproduce sexually as well as asexually (Transverse binary fission), **good power of regeneration**.

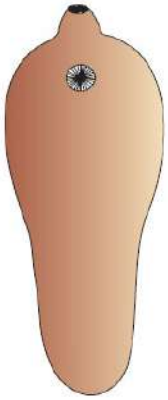
  (2) *Fasciola* hepatica (Liver fluke)
  - Life history involve two hosts (Digenetic)
    (1) Primary host - Sheep and Goat
    (2) Secondary host - Garden - snail (**Planorbis)**
  - Disease **Liver-rot or Cirrhosis disease.**

  (3) *Schistosoma* (Blood fluke) :
  - Life history involve two hosts (Digenetic)
    (1) Primary host - Human
    (2) Secondary host - Garden - snail (**Planorbis)**
  - Disease - **Schistosomiasis** or **Bilharzia disease.**

  (4) *Taenia solium* (Pork tapeworm) :
  - Life history involve two hosts (Digenetic)
    (1) Primary host - **Man**
    (2) Secondary host – **Pig**
  - Disease - Taeniasis (Caused by Eating undercooked Pork)



Taenia



Fasciola

Phylum – Aschelminthes (Nemathelminthes)

- Phylum includes **round worms** which appears circular in cross section.
- **Nematods** are found everywhere they may be free living (aquatic and terrestrial) or parasite in plants and animals.
- **Symmetry** - **Bilateral**, **Germ layer** - **Triploblastic**, **Level of organisation** - **Organ-system** level and having **tube within tube body plan**.
- **Body wall** consist 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 (multinucleated).
  (iii) **Muscle layer** - Only Longitudinal muscle fibers present, circular muscle absent.
- They are **Pseudocoelomate animals. Pseudocoel** is developed from embryonic blastocoel.
- **Skeleton** is absent.
- **Digestive tract** is **complete** and differentiated into mouth, pharynx, intestine & 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 (Anaerobic in parasitic)
- **Excretory system** is H-shaped and consists of **excretory canals** (Protonephrtidia) 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. Sense organs like **Papillae** (tangoreceptors), **Amphids** (chemoreceptor) are present on lips while **Phasmids** (chemoreceptor) are found on tail.
- **Reproduction system** is developed and sexes are separate **(Dioecious).**
  Sexual dimorphism is present.
  Male is smaller than female and curved from its caudal end.
  Male has Penial setae for copulation. Genital tract joins with digestive track to form cloaca.
  Female is larger than male and straight at both ends.
  Genital and digestive tract open independently (Cloaca absent), Female lays a large number of fertilised eggs.

- Fertilization is **internal** and development may be **direct** or **indirect (i.e. - Ascaris have Rhabditiform larva).**

  E.g.

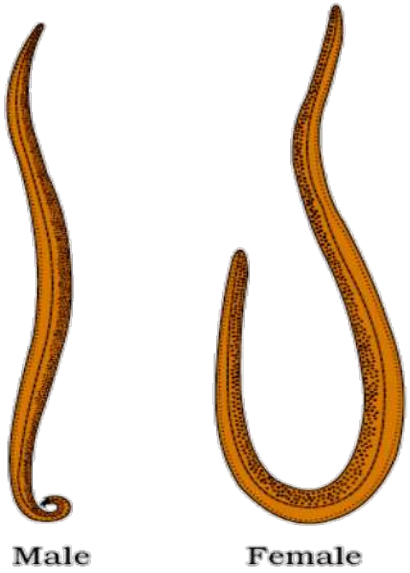
  (1) Ascaris - Intestinal round worm (in small intestine), Monogenetic and Causes **"Ascariasis disease"** larva - **Rhabditiform/Rhabditoid.**

  Mode of infection - by contaminated water and food.

  (2) Ancylostoma - Hookworm, **Monogenetic, intestinal parasite that causes severe aneamia.**

  (3) Wuchereria - Filarial worm

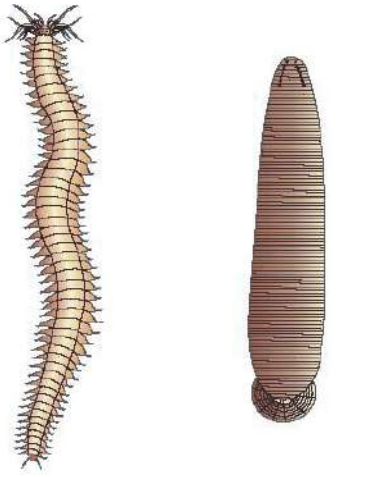
  - Viviparous and digenetic parasite that cause **filarisis/Elephantiasis** disease.
  - Carrier host is female **Culex** mosquito.
  - Adult mainly infects lymph vessels and lymph nodes in humans.
  - **Infective stage microfilarae**
- Viviparous worms are **Trichinella**, **Wuchereria** etc.



Male Ascaris Female Ascaris

Phylum – Annelida

- Mostly free living found in moist soil, fresh water or sea but few are parasitic.
- Body is Soft elongated, cylindrical divided into **segments** or **metameres** by ring like grooves called Annuli.
- **They are bilaterally symmetric, 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 organ in few annelids.
    (eg : **Nereis**)
- They have **Chitinous Setae** and lateral muscular appendages called **Parapodia** for locomotion.
  Parapodia present in aquatic annelid like Nereis



(a) Nereis **(b) Hirudinaria**

- **Body wall** consist of
  (1) **Cuticle** - moist and elastic.
  (2) **Epidermis** - Living layer that secretes dead cuticle outside.
  (3) **Muscle layer** - Contains circular and longitudinal muscles which help in Locomotion.
- **Body cavity** is **true coelom** lined by mesodermal coelomic epithelium. **(Schizocoel/First Eucoelomate).**
- **Digestive tract** is complete, straight and extends through entire body. Digestive gland are developed for the first time in Annelida.
- **Respiration** is through **moist skin (Cutaneous respiration)**. Some have **gills** (branchial respiration).
- **Circulatory system is closed** type and pulsatile heart present (In leech open circulary system).
- The blood is red with **haemoglobin** like pigment which remain dissolved in plasma **(Erythrocruorin)**. It has amoeboid corpuscles only. (RBCs absent).
- **Excretory organ is Nephridia** (sing. Nephridium). They helps in osmoregulation and excretion.
  Excretory matter:-
  (1) **Ammonia** in aquatic form (2) **Urea** in land form
- **Nervous system** consist of a nerve ring (Brain) and a solid, double and **ventral nerve cord** with Segmental ganglia.
- Reproduction is sexual, Nereis is dioecious but earthworms and leeches are monoecious.
- Development is direct or indirect with free swimming ciliated **trochophore** larva. e.g. : Nereis
  During course of evolution metameric segmentation, True coelom, closed circulatory system and pumping heart appeared first in annelids.
  Example :
  (1) Nereis - Sand worsm (3) Hirudinaria (Blood sucking leech)
  (2) Pheretima (Earthworm) (4) Aphrodite - Sea mouse

Concept Builder

1. Bilaterally symmetrical but acoelomate animal is:
(1) comb jelly (2) jellyfish (3) liver fluke (4) roundworm

2. How male and female Ascaris can be identified?
(1) Anterior end of male is curved while that of female is straight
(2) Anterior end of female is curved while that of male is straight
(3) Posterior end of male is curved while that of female is straight
(4) Female has cloaca

3. A character common to earthworm and leech:
(1) sucker (2) Segmentation (3) Ectoparasite (4) Open circulation

4. Parapodia are found in:
(1) Leech (2) Earthworm (3) Nereis (4) both (2) and (3)

5. Excretory organ in annelids:
(1) Nephridia (2) Protonephridia (3) Flame cells (4) Kidney

Concept Builder (Answer-Key)					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	3	3	2	3	1

Phylum – Arthropoda

- Arthropoda is **the biggest phylum.** of animalia which includes insects, over two-third of known species on earth are Arthropods.
- They may be aquatic (marine and fresh water) or terrestrial, free living and sometimes parasitic.
- Body is **Bilateral symmetric**, **Triploblastic** with **organ system level** of organisation
- They are **metamerically segmented** and **coelomate** animals.
- Body is divided into three region **Head, thorax** & **abdomen**, but in some head and thorax fused to form cephalothorax (Prosoma).
- **Unique features**
  (i) They have **jointed appendages** for different function hence named arthropoda (arthro- joints, poda - foot/appendages).
  (ii) The body of Arthropods is covered by **Chitinous exoskeleton.**
- **Body cavity** around viscera contain 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.
- **Respiration** by **gills** (e.g. Prawn), **Book-gills** (e.g. King crabs). **Trachea system** (e.g Insects), **Book-lungs** (e.g. Scorpion), Trachea carry oxygen direct to the tissue cells. (Direct respiration).
- **Circulatory system** is **Open** type i.e. blood flows in open tissue spaces and hoemocoel instead of blood vessels. Blood is colourless called **Haemolymph**. (e.g. Insect). Respiratory pigment absent. Copper containing pigment **haemocyanin** is found in some arthropods (e.g. Prawn).
- **Excretory organs** are **Antennary** or **green glands** (e.g. Prawn), **Malpighian tubules** (e.g. Insects) opening into the gut or coxal gland - e.g. : spiders.
- Excretory matter is **Ammonia** in aquatic animal and **Uric acid** in land animal
- **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 Eyes (Simple or compound), antennae, statocyst and anal cerci are found.
- They are mostly **dioecious.** Fertilization is **usually internal** but few aquatic form has external fertilization. Gonads have ducts. Sexual dimorphism may be present. They are mostly **oviparous**
- Development may be direct or indirect.
- Animals of **Arthropoda** are most **successful invaders of terrestrial** environment among invertebrates due to presence of
  (1) **Chitineous Cuticle** (2) **Jointed Appendages** (3) **Chitineous Wings**
- Muscles are stripped/striated/voluntary (first time developed in Arthropods)
- Due to presence of joints, muscles are separate or arranged in bundles in them.

  Example :

  (1) Arachnida (Octapods) - Four pair legs
  Body divided into cephalothorax and abdomen
  Respiration by book lungs
  Excretion by coxal gland
  E.g. Scorpion, Spider

(2) Crustacea - Body divided into cephalothorax and abdomen

Antennae - two pairs

Respiration by - Gills

Excretion by - Green gland/Antennal gland

e.g. Prawn (Palaemon)

(3) Insecta (Haxapoda) - Members are called as insects.

Three pairs of legs

Body divided into head thorax and abdomen

Antennae - one pair

Compound eye present

Respiration by trachea

Excretion by malpighian tubule

e.g. (a) Economically important insects – Apis (Honey bee), Bombyx (Silkworm), Laccifer (Lac insect)

(b) Vectors – Anopheles, Culex and Aedes (Mosquitoes)

(c) Gregarious pest – Locusta (Locust)

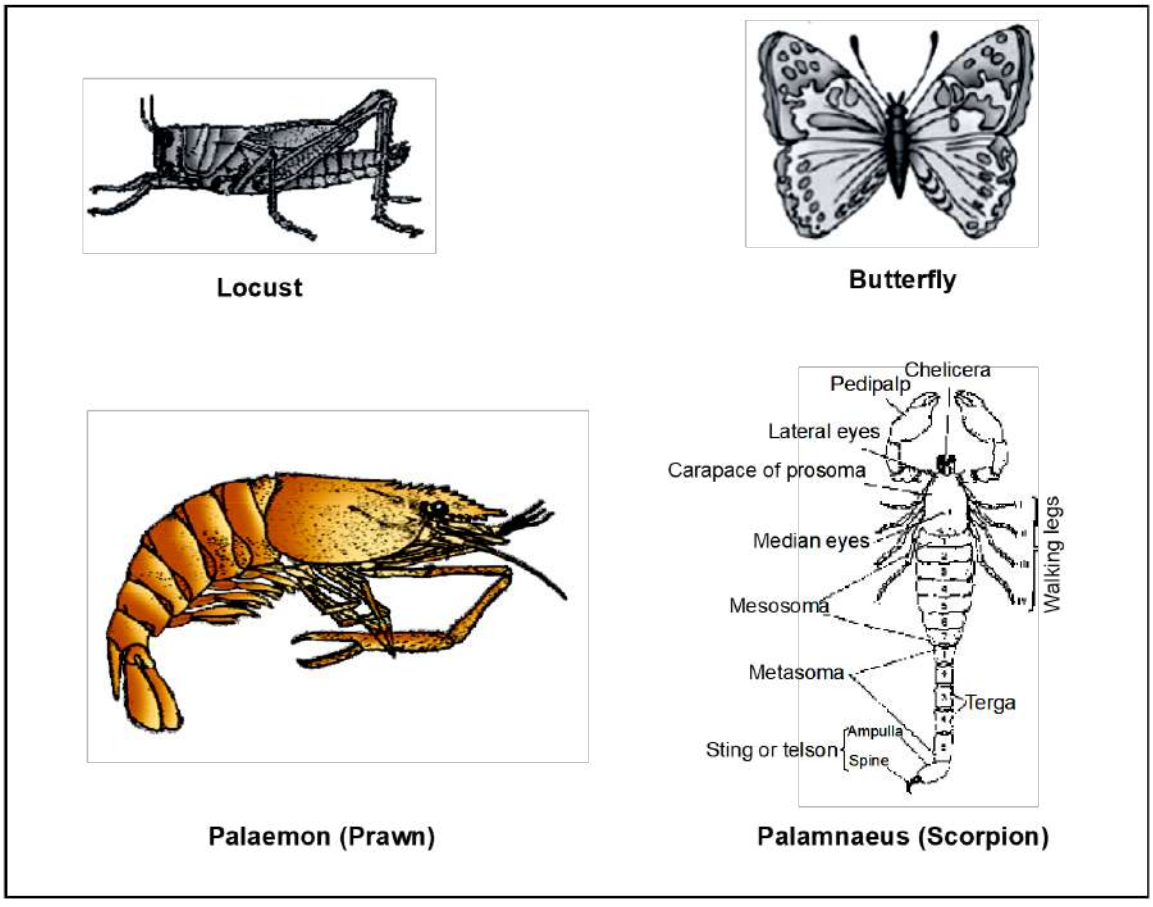
(d) Cockroach

(4) Julus - (Millipede)

(5) Scolopendra (Centipede)

(6) Limulus (King crab)-Living fossil

(7) Peripetus-Connecting link between annelida and arthropoda



Phylum – Mollusca

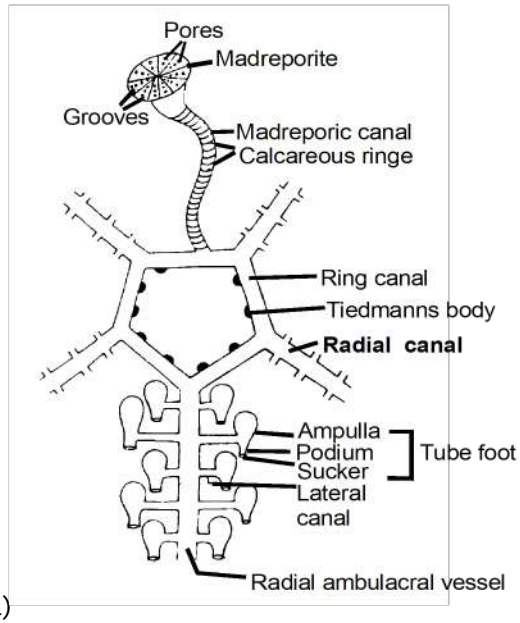
- It is **second largest** Phylum which includes. **"Soft bodied and shelled"** animals.
- The are aquatic **(marine or fresh water)** or terrestrial. • They
- Study of molluscs is known as **Malacology** & study of shells of molluscs is known as **Conchology.**
- Molluscans are **bilaterally symmetrical.** 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 segmented like annelids).
- Body is dividable into three parts :
  (1) **Head** distinct with Eyes and sensory Tentacles.
  (2) Dorsal **visceral mass/ hump** containing all visceral organ of body.
  (3) 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 <u>shell</u>**. Shell is made up of **Calcium carbonate and Concheolin protein.**
- **Digestive tract** is complete. Buccal cavity contain a **file-like rasping organ** for feeding called **<u>Radula</u>**, with transverse row of teeth. Anus opens into the mantle cavity.
- **Respiration** is usually by feather like small **gills** called **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**. **(Cephalopoda** has **closed** type of circulatory system)
- Blood usually has a copper containing, respiratory pigment called **haemocyanin (Blue or green)**.
- **Excretory system** includes 1 or 2 pairs of **kidneys** known as **Kaber'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 and connective nerves**.**
- Senses organ includes :
  (1) **Eye** - Movable, present over a stalk called **ommatophore** (Gastropoda).
  (2) **Statocyst/Lithocyst** - For body equilibrium in foot
  (3) **Osphradia** - 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 Mollusca, **Glochidium** (Larva of **Unio**) and **Veliger** ***(****Larva of* ***Pila).***
- **"Nacre layer"** is called **"Mother of Pearl"**: This layer secretes $CaCO_3$ and choncheoline protein.
- Molluscs are classified on the basis of **shell and foot into six classes.**
  Example :
  (1) Neopilina - Living fossils, Connecting link between annelida and mollusca
  (2) Chaetopleura (Chiton),
  (3) Dentalium (Tusk shell),
  (4) Pila (Apple snail),
  (5) Aplysia (Seahare),
  (6) Turbinella - Shankh,
  (7) Unio - Fresh water mussel,
  (8) Pinctada (Pearl oyster),
  (9) Teredo - Ship worm,
  (10) Sepia (Cuttlefish),
  (11) Loligo (Squid),
  (12) Octopus (Devil fish),

(a) Pila

(b) Octopus

Phylum – Echinodermata

- All are **Marine.** Generally live at **bottom** and slow moving.
- Body shape is **star like**, **cylindrical like**, **melon-like disc-like**, **flower like**.
- The adult Echinoderms are **radially symmetrical** but larvae are **bilaterally symmetrical.**
- They are **triploblastic** and **coelomate** animals with **organ - system level** of organisation.
- **Skin** of echinoderms is rough and spiny, It contains calcareous **spines**, pedicellariae and endoskeleton 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 echinoderm 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 **medreporite** permits entry of water into ambulacral system and reaches into tube feet's through ring and radial canals.
- **Digestive tract** is **complete**, with mouth on lower side (ventral) and anus on the upper side (dorsal).
- **Respiration** takes place by body surface or **gills** called **dermal branchiae** or papulae in most of Echinoderms like Starfish.
- **Circulation system** is reduced and **open type.** Heart absent and blood colourless.
- There is no **excretory system**. Nitrogenous waste (ammonia) diffuses out through body surface.



Water vascular system

- **Nervous system** is simple and less developed includes a Nerve ring and radial nerves with simple sense organ. They don't have distinct head and brain.
- Reproduction is sexual, sexes are separate (unisexual).
- Fertilization is usually **external** and development is **indirect** with free swimming larva.
- **Examples:**
  (1) Asterias (Star fish),
  (2) Ophiura (Brittle,
  (3) Echinus (Sea urchin), have masticating organ **Aristotle's Lantern,**
  (4) Cucumaria (Sea cucumber) and
  (5) Antedon (Sea lily), star).

Asterias

Ophiura

Important Points

- Echinoderms have some chordate like characters like enterocoelic coelom, mesodermal skeleton and deuterostomic embryonic development.
- Few echinoderms have great power of **regeneration**. Star fishes have an ability of voluntary breaking of their arms for defence. This phenomenon is known as **Autotomy**.

Phylum – Hemichordata

Hemichordata is a connecting link between Non-chordata & Chordata.

- Hemichordata was earlier considered as a sub-phylum of 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 **bilateral symmetrical, triploblastic** and **coelomate animals. (Enterocoelomate)**
- The body is cylindrical, unsegmented and divided into **three parts** :- anterior **proboscis, middle collar** and a posterior long **trunk.**
- Digestive tract is complete.
- A notochord like structure is found in their **buccal cavity**, that is called "**Buccal diverticulum**" or "**Stomochord**" (outgrowth of buccal cavity) but **true notochord** is **absent**.
- Respiration takes place through **gill.**
- Circulatory system is **open type.** Blood is colourless with amoeboid corpuscles. **Heart** is situated **dorsally.**
- **Excretion** occurs through a **single glomerulus** or **proboscis gland.**
- **Central nervous system** is just **like non chordates**. (Nerve ring and ventral nerve cord.)
- Reproduction is sexual and Mostly animals are **unisexual.**
- Fertilization is **external**.
- **Development** is **indirect** with **tornaria larva** (similar to **bipinnaria larva** of echinodermata in their developmental stages).

Balanoglossus

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

Concept Builder

1. Which of the following pigments, is present in the blood of some arthropods ?
(1) Haemoglobin (2) Chlorophyll (3) Haemocyanin (4) All of these

2. Which of the following is **not correctly** matched?
(1) Gregarious pest –– *Locusta* (locust)
(2) Living fossil –– *Limulus* (king crab)
(3) Economically important insects –– *Apis* (honey bee), Bombyx (silkworm)
(4) Vectors –– Mosquitoes (*Anopheles, Culex and Aedes*) and Lac insect (*Laccifer*).

3. Fill in the blanks:
(a) In round worm often males are ...K... than females.
(b) Over ...L... of all the named species on earth are arthropods.
(c) Molluscs contains a file like rasping organ for ...M... called radula.
(1) a––Longer, b––1/3rd, c––Locomotion (2) a––Longer, b––2/3rd, c––feeding
(3) a––Smaller, b––2/3rd, c––feeding (4) a––Smaller, b––1/3rd, c––Locomotion

4. Which is associated with pearl formation ?
(1) *Pila* (2) *Octopus* (3) *Nautilus* (4) *Pinctada*

5. Which one belongs to Mollusca?
(1) Devil Fish (2) Dog Fish (3) Silver Fish (4) Jelly Fish

6. In echinoderms the excretory system is
(1) Malpighian tubules (2) Nephridia
(3) Proboscis gland (4) Excretory system absent

7. *Proboscis* gland in Balanoglossus is associated with
(1) Digestion (2) Respiration (3) Excretion (4) Reproduction

Concept Builder (Answer-Key)							
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ans.	3	4	3	4	1	4	3

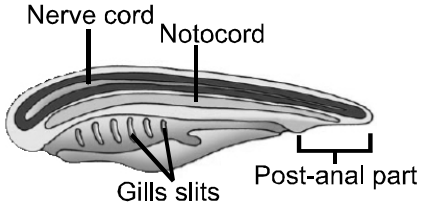
Phylum – Chordata

1. The term chordata is originated by the two words of Greek language the **'Chorda'** and the **'Ata'.** Meaning of **'Chorda'** is **'a thick string'** and meaning of **'ata'** is **'to have'** and over all meaning of chordata is animals having **notochord**.

2. So, chordates are the animals in which notochord is present in any stage of their life – span.

3. According to taxonomists, **Almost 95% animals are non-chordates** of the total animals present on earth, and rest of the **5% animals are chordates.**

4. In chordates, species of maximum live animals is **Pisces group** and minimum live animals is **Amphibia group**.



Fundamental Characters of Chordates :-

1. **Presence of notochord (Chorda dorsalis) :–** In the embryonal stage of chordate animals there is a solid rod like structure (Just below the central nervous system and above the alimentary canal), this is called **notochord**.
   - **Notochord** is extended from anterior end to posterior end of the body at the dorsal surface.
   - **Notochord** is **mesodermal** in origin. It forms a primary endoskeleton which gives support to central nervous system and muscles.
   - In - **Protochordata** group , notochord is present through out the life span but in **vertebrata**, it is replaced by **vertebral column or back bone in adults.**

2. **Presence of Dorsal Tubular Nerve Cord :**–
   - In chordate animals, **nervous system** is situated at the **dorsal surface** of body.
   - In these animals, a **hollow**, **tubular** nerve cord is situated just **beneath the bodywall** and just **above the notochord.**
   - **Nerve cord** is **ectodermal** in origin.

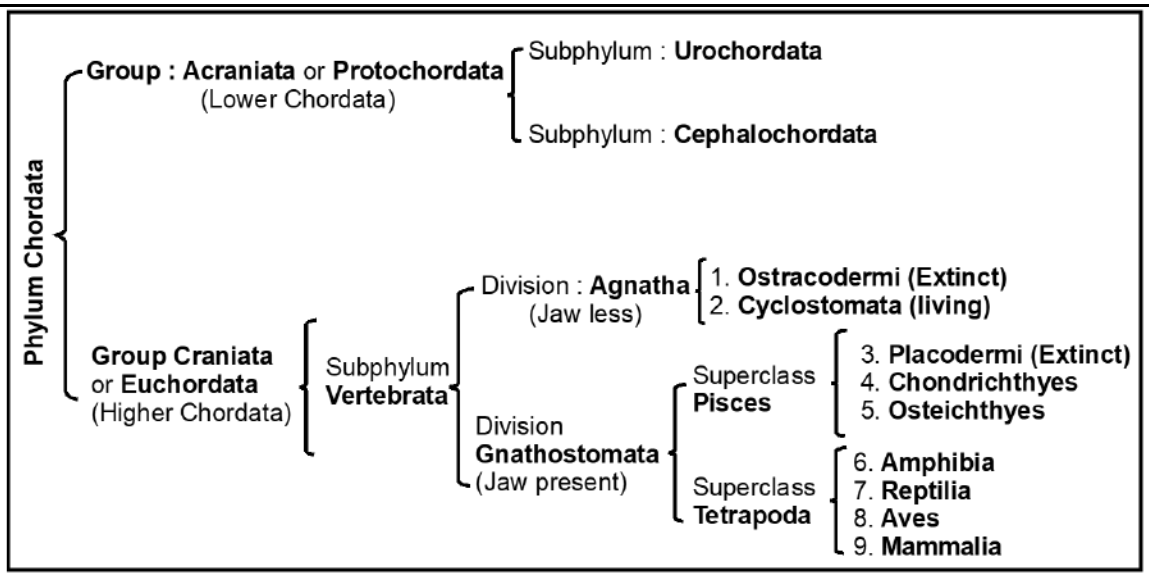
3. **Presence of pharyngeal gill slits :-**
   - In each chordate animal, there are paired, lateral **gill slits** in the walls of pharynx for **respiration** in any stage of its life span.
   - In **aquatic** and **lower chordates**, pharyngeal gill slits are present **throughout their life span** for respiration.
   - In **terrestrial chordates**, gill slits are found only in embryonic stage and are replaced by lungs in adults.

4. **Post anal tail :–** In chordates tail if present is the post anal part of the body. Tail is reduced or absent in many adult 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 in position.	Heart is dorsal or lateral in position. (if present).
5.	A post-anal part (tail) is	Post-anal tail is absent

   - Chordates are bilaterally symmetrical, triploblastic, coelomate with organ system level of organisation. They have a closed circulatory system.

Classification of Chordata



Group : Acraniata or Protochordata

- They are exclusively **marine**.
- **Skull**, **brain** and **vertebral column** are **absent**.
- Notochord is not replaced by vertebral column, hence they **are chordate but not vertebrate.**
- **Protochordata** is divided into **two subphylum** :-

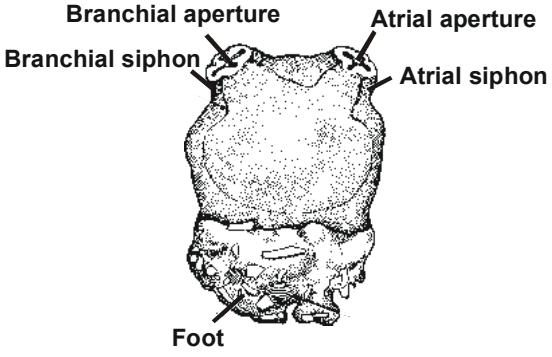
  Subphylum – 1–**Urochordata**

  Subphylum – 2–**Cephalochordata**

Sub-Phylum – Urochordata or Tunicata

- All the members of this subphylum are marine, free swimming or attached with rocks.
- **Adults** are normally **fixed** and larva is free swimming.]

Ascidia

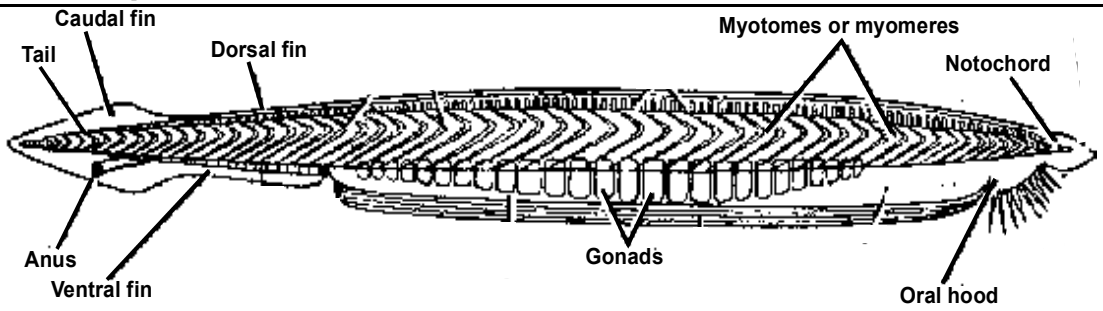


Herdmania

- All the adult members have test all over their body, made up of a **cellulose like** substance called **tunicin**. so these animals are also called **tunicates.**
- **Notochord is found only in tail of tadpole larva** which is lost during metamorphosis. So the name **Urochordata** was given to this subphylum.
- Dorsal tubular nerve cord is found only in larval stage. In adult stage, this nerve cord is replaced by a **neural ganglion.**

- All chordate characters are found in larva. Only one chordate character is found in adults i.e. **pharyngeal gill slits.**
- Blood vascular system is **open type,** heart is situated at **ventral** surface of body.
- Excretion is by **supra neural gland or pyloric gland or nephrocytes**.
- Most of the animals are bisexual.
- Fertilisation is **external** and mostly **cross-fertilisation.**
- A free swimming larval stage is found in this group called **tadpole larva.**
- All the members of this subphylum show **"Retrogressive metamorphosis"**. During this metamorphosis, a well developed free swimming larva is changed into less developed adult.
  e.g. :
  - **Herdmania -** (Sea Potato or sea squirts).
  - **Ascidia**
  - **Doliolum**
  - **Salpa**
  - **Pyrosoma -** Bioluminescence is found. (Strongest light among marine organism)

Sub-Phylum - Cephalochordata



Branchiostoma : Entire animal in right side view

- They all are found in shallow **sea water.**
- Both larva and adult are free swimming forms.
- Notochord and nerve cord remain extended from anterior to tail region. Notochord persists throughout life.
- Alimentary canal **complete.** Buccal opening is covered by oral hood and this collectively termed as **"Wheel organ"** or **"Ciliated organ of Muller"**. This organ helps in the ingestion of food by producing circular currents in water.
- Blood vascular system is **closed type** and respiratory pigment **absent.**
- For excretion **protonephridia** are present in the form of **solenocytes or flame cells. (Hatschecks nepheridium).**
- Fundamental chordate characters remain through out life. Larva and adult both show chordate characters.
  There fore, they are considered as **first complete chordate animals or typical chordates.**
- These are **unisexual** animals.
- Fertilisation is **external.**
- Development is **indirect** i.e. larval stage is found.
  e.g. : **Branchiostoma** or **Amphioxus (Lancelet).**

Sub Phylum - Vertebrata

- It includes higher chordates which possess notochord only during the embryonic period and 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.

  Sub-phylum Vertebrata is further divided into two divisions :-

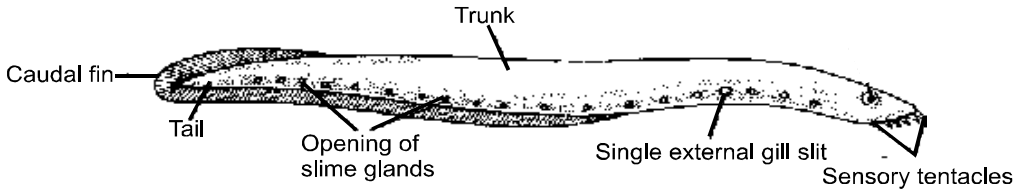
  (1) Agnatha = Jaw are absent (2) Gnathostomata = Jaw present
- Group Agnatha is divided into two classes.

  [A] **Ostracodermi (Extinct)** [B] **Cyclostomata (living)**

Class - Cyclostomata

- This class includes living **Jaw less fishes (false - fishes)**.
- Most of the members of this class are marine but migrate for spawning to fresh water. After spawning within few days they die. Their larvae, after metamorphosis, return to Ocean.
- These fishes are **ectoparasite** as well as **scavenger**.
- They have elongated body bearing **6–15 pair** of gills slits for respiration.
- They have a sucking and circular mouth **without jaws.**
- **Scales** and **paired fins** are **absent.**
- Notochord and vertebral column both are present. Cranium and vertebral column are cartilaginous. Bones are absent.
- Circulation is closed type, Heart is two - chambered. It is called **Venous - heart.**
- Kidneys are **protonephric** type.
- Three eyes are found on the head, one median **pineal eye** and two lateral eyes.
- Only one Nostril **(Monorhynous)**.
- Internal ear contains **one** or **two semicircular canals.** Internal ear works as **statoreceptor** only. ie. organ of balance.
- Animals **unisexual**, fertilization **external**, larval stage absent. Except **Ammocoete** larva is found during development of ***Petromyzon*.**

Petromyzon



Myxine

e.g.

(1) ***Petromyzon*** **or Lamprey** :- It is an ectoparasite (Sanguivorous) on true fishes. Many teeth are found in mouth and it shows **Anadromous** migration. It's larva is **Ammocoete.**

(2) ***Myxine*** **or Hag fish**

Super Class - Pisces

- This super class includes **true fishes**.
- They are **cold blooded (Poikilothermous)** animals i.e. they lack the capacity to regulated 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.
- Body is covered by **dermal scales**. But Cat fish, ***Torpedo*** & ***Wallagonia*** fish are **scale less.**
- **Paired fins** are present for swimming. e.g. Pectoral and pelvic fins are paired. Along with these unpaired fins are also found on the body e.g. mid dorsal fin and caudal fin.
- External nares are one pair. **(Dirhynous condition).**
- External and middle ears are absent, only internal ear is present in which work as statoreceptor. (For balancing)
- Respiration **by gills**, gills are **4 to 7 pairs** and **naked** or covered by **operculum**.
- Teeth are Acrodont and homodont.
- Heart two chambered, known as **"Venous heart", (Single circulation of blood)**
- In the skull of fishes only one occipital condyle is present, so their skull is called **monocondylar type**.
- Cranial nerves are **10 - pairs**.
- **Lateral line sensory system** is present in the body of all fishes and tadpole larva which includes many receptor organs which can detect vibrations **(Rheoreceptor)** and Electric field.
- Kidneys in fishes are **mesonephric** type, Urinary bladder is absent.
- Fishes are **unisexual.**
- Fertilization is **internal** or **external**.
- Development is **direct.**
- Super class Pisces (living members) classified into two classes :-
  (A) **Chondrichthyes** (B) **Osteichthyes**

[A] Class – Chondrichthyes Or Elasmobranchi

- This class includes **cartilagenous fishes**.
- They are exclusively **marine**.
- Endoskeleton is made up of exclusively **cartilage.** Notochord is persistant through out the life.
- Exoskeleton over the skin is made up of **placoid** scales. Teeth are modified placoid scales, which are backwardly directed.
- In these fishes, **5 - 7 pairs** of gills are present, which open direct outside the body by gill slits. operculum is normally absent in these fishes.
- Mouth is present at the **ventral surface** of head. **Jaws are very powerful**. These Fishes are **predaceous.**
- Due to absence of air - bladder they have to swim constantly to avoid sinking.
- A **spiral valve** or **scroll valve** is found in intestine.(To increase absorptive surface area)
- Cloacal aperture is present. Genital ducts open into cloacal aperture.
- There is a special structure at the dorsal surface of head in these fishes, which is called "**Ampulla of Lorenzini**", this works as **thermoreceptor**.
- Male fishes have "**Claspers**" as copulatory organs, which are developed on pelvic fins.
- They have internal fertilisation and many of them are **Viviparous.**

e.g. :–

1. ***Scoliodon* :-** Dog fish - Dog like sense of smell. It is also known as common **Indian shark.** It is **viviparous**
2. ***Pristis* :-** Saw - fish
3. ***Trygon* :-** Sting ray - Its dorsal fin has poisonous spines for protection.
4. ***Torpedo* :- Electric ray - In this fish** an electric organ is found which is a modified muscle, it can give shock of about 100 volts (Scaleless fish).
5. **Carcharodon** – Great white shark.
7. ***Chimaera* :-** "Rat fish" or "King of herrings" or Ghost fish. Connecting link between bony & cartilagenous fish. Operculum present and cloaca absent like in bony fishes.

[B] Class – Osteichthyes Or Teleostomi

- This class includes **Bony fish.**
- They are found in fresh water as well as marine water.
- **Endoskeleton** is made up of **bones**, so these fishes are called "**bony - fishes**"
- Their **exoskeleton** is made up of scales, which maybe **cycloid** or **ctenoid** or **ganoid** type. **(Placoid** scales absent).
- Respiration by **4 - pairs** of gills. These gills are covered by **operculum** at each side of body.
- Mouth is terminal.
- Helping respiratory organs **"air bladders"** are present. These air bladders are **hydrostatic** i.e. help in maintaining balance of body and provide Buyoncy.
- Scroll valve in intestine is absent.
- Cloaca absent, **anus** and genital ducts open outside the body through separate apertures.
- Ampulla of Lorenzini is absent.
- Fertilization is **usually external**, **claspers** are absent in male fishes.
- They are mostly **oviparous.**

Examples :–

1. ***Hippocampus*** – **"Sea - horse"** or **"Pregnant male"** : It swims in sea water in its vertical position. A pouch like structure is present at the abdomen of male fishes known as **"Brood - pouch"** in this pouch male collects the eggs. Secondary vivipary and parental care is found.
2. ***Exocoetus*** (Flying fish) - Its **dorsal fin** is long, it can fly (glide) over 400 metre in sea water with the help of enlarged pectoral fin.
3. ***Labeo*:** "Rohu"or "Indian carp"
4. ***Clarias*: "Cat fish"** or **Magur**
5. ***Catla*** – Katla

Fresh water fish

6. ***Betta*** – Fighting Fish
7. ***Pterophyllum*** – Angel Fish

Aquarium fish

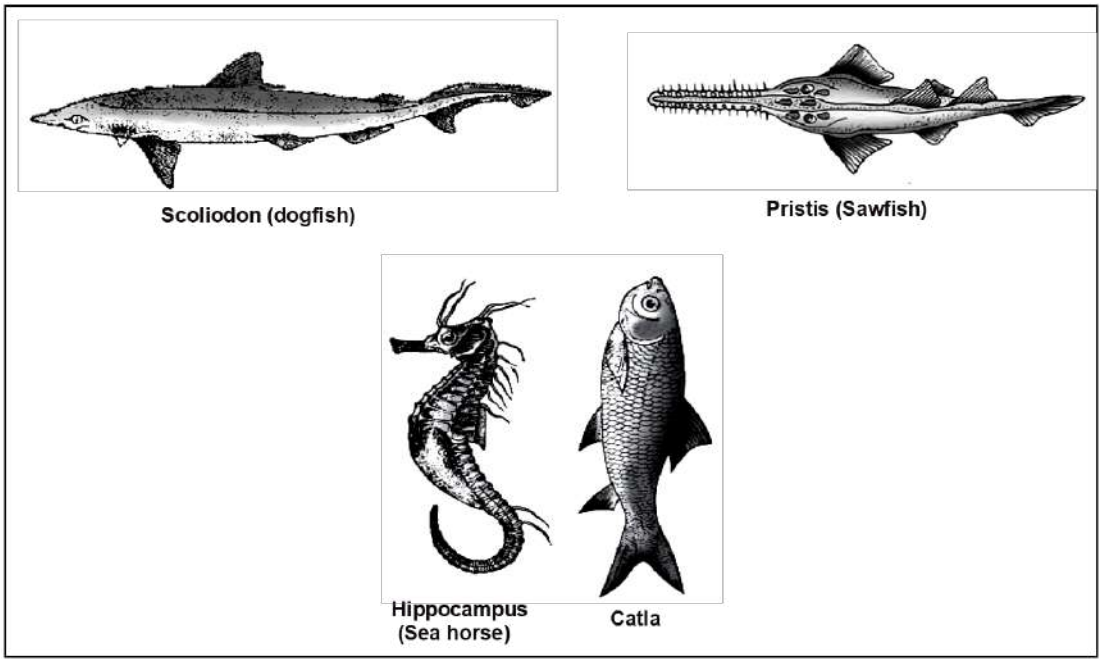
9. ***Latimeria or coelocanth*** – **Living fossil** or **oldest living vertebrate** known till now.
10. ***Gambusia*** – Larvivorous fish, feeds on larva of mosquitoes.

Lung Fishes (Group - Dipnoi):

- Air bladder helps in respiration and can survive out of water.
- These are freshwater bony fishes and have some amphibian like characters.
- Three chambered heart present.

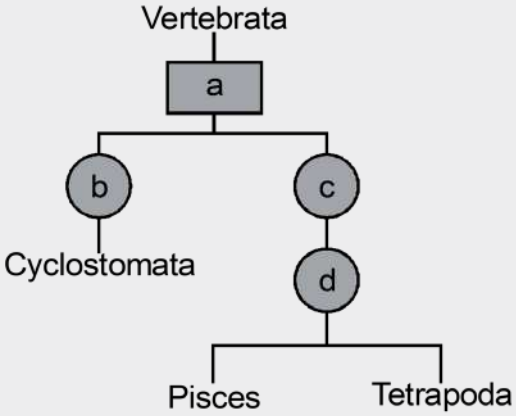
  e.g. :–

  - ***Protopterus*** : African lung fish :- It is living fossil fish.
  - ***Lepidosiren*** :- South American lung fish.
  - ***Neoceratodus*** :- Australian lung fish.



Concept Builder

1. Fill in the blanks :



(1) a – subphylum, b–chondrichthyes, c–osteichthyes, d–class
(2) a – subphylum, b–agnatha, c–gnathostomata, d–class
(3) a–superclass, b–agnatha, c–gnathostomata, d–class
(4) a–division, b–agnatha, c–gnathostomata, d–superclass.

2. Read the following statments and find out the incorrect statement.
(1) *Ascidia, Salpa and Doliolum* belongs to phylum Urochordata
(2) *Branchiostoma* belongs to phylum Cephalochordata
(3) All chordates are vertebrates but all vertebrates are not chordates
(4) All of the above

3. Beside the mammals, vivipary is also found in members of
(1) Chondrichthyes (2) Osteichthyes
(3) Amphibians (4) Aves

4. Read the following statements and find out the incorrect statement.
(1) Dog fish have teeth that are modified placoid scales
(2) In Fighting fish gills are covered by operculum while in sting ray gill covering is absent
(3) Air bladder is present in saw fish which regulates buoyancy, while in Angel fish air bladder is absent
(4) Mouth of flying fish is terminal while that of great white shark is ventral.

5. Which of the following animal do not belong to division Gnathostomata ?
(1) Hag fish (2) Dog fish
(3) *Labeo* (4) All of the above

6. In chondrichthyes, claspers are seen on
(1) Pelvic fins of male (2) Pelvic fins of female
(3) Operculum of both sexes (4) Pectorial fin of male

7. Notochord occurs all through the length of body and throughout life in
(1) Hemichordata (2) Urochordata
(3) Cephalochordata (4) Vertebrata

8. Which among the following is true ?
(1) Chordates have ventral hollow nerve cord
(2) All vertebrates have open circulatory system
(3) All chordates are vertebrates
(4) All vertebrates are chordates.

9. Jawless vertebrates belongs to the division
(1) Agnatha (2) Gnathostomata
(3) Cephalochordata (4) Prototheria

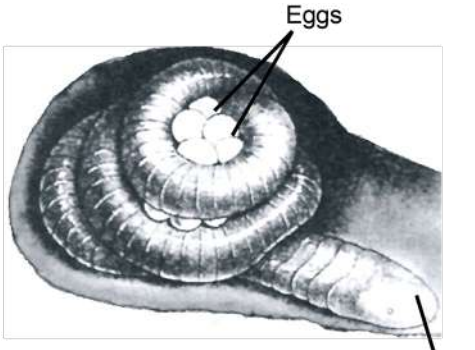
10. Retrogressive metamorphosis is found in -
(1) Sea cow (2) Sea lion
(3) Sea walnut (4) Sea potato

Concept Builder (Answer-Key)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	4	1	3	1	1	3	4	1	4

Class - Amphibia

- They are amphibious animals which can live on both the places at ease ***i.e. –*** under water and on the land. (No marine amphibian)
- These are the first chordate animals which come out of water but these depend on water for their reproduction. Their eggs do not have protecting covering to check the evaporation.
- These are cold blooded or **poikilothermal** animals.
- These animals undergo **hibernation** or **aestivation** to prevent themselve from extreme cold and heat and to overcome unfavourable conditions.
- Body is divided into **head** & **trunk**. Tail may be present in some. Neck is totally absent.
- Skin is **moist, smooth** and **scale less**.
- Numerous **mucus glands** are found in skin which help in moistering the skin. So these animals respire through moist skin **(Cutaneous respiration).**
- Most of them have two pairs of limbs. Forelimbs have four fingers and hindlimbs have five fingers.
- Teeth are **pleurodont**, **homodont** and **polyphyodont**. (Frog - Acrodont)
- A well developed and **complete** alimentary canal along with digestive glands are present in digestive system (Salivary glands are absent in frog).
- Alimentary canal, urinary bladder and genital ducts open into a common chamber called **cloaca**, which opens to the exterior.
- Respiration by **gills**, **skin**,**lungs** or **buccopharyngeal** cavity.
- Heart is **three chambered,** 2 auricles and 1 ventricle.
- **Renal portal system** and **hepatic portal system** are present.
- 1 pair of kidneys are **mesonephric** or **opisthonephric** type. They are mostly **Ureotelic**. But tailed amphibians and larvae are **Ammonotellic.**
- Skull has two occipital condyles **(dicondylic skull).**
- Vertebrae, in these animals are **procoelus** type, in which centrum is **concave** from anterior side and **convex** from posterior side.
- A Tympanum represent the ear. Only one ear ossicle **columella (stapes)** is present in middle ear. External ear absent.
- Eyes have eyelids.
- Cranial nerves are **10 - pairs.**
- Sexes are separate.
- Fertilization is usually **external**, but some animals show **internal** fertilization.
- These are **oviparous**, which lay their eggs in water.
- Development is **indirect through larva**
  i.e. **Tadpole larva** - In Frog and toads
  Axolotle larva - In Salamander



Ichthyophis

Example :

(1) ***Ichthyophis (Limbless amphibia)*** **(blind or deaf worm) :-** Eyes covered by skin and tympanum absent.

(2) ***Salamandra* :–** It is viviparous. Its larva is called **Axolotal** larva. It sometimes show neoteny. (Longest gestation period – 36 months)

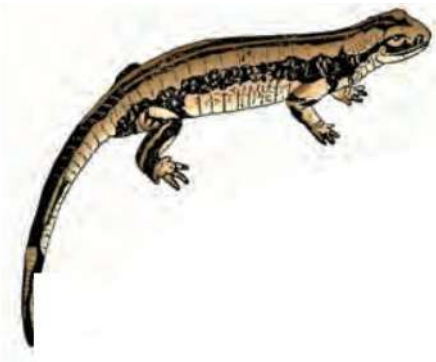
(3) ***Necturus* –** Water dog or mud puppy : It shows **permanent neoteny**.

(4) ***Amphiuma* -** Congo-eel :- Largest RBC is present. [75–80 μ]

(5) ***Rana tigrina*** – Indian bull frog.

(6) ***Bufo*** – Common toad → Poison glands are found in skin which are modification of parotid salivary gland.

(7) ***Hyla*** – Tree frog



(a) Salamandra

(b) Rana

Class – Reptilia

- Class name refer to creeping or crawling mode of locomotion. (Latin reptum - To creep or Crawl)
- These are **Cold blooded/Poikilothermal animals**.
- Reptiles were the **first successful terrestrial** vertebrates but some are also found in aquatic habitat.
- Body is divided into head, neck, trunk and tail.
- Exoskeleton is made up of horny **epidermal scales** or **bony scutes.**
- Skin is **dry, cornified, rough and nonglandular,** Snakes & Lizard shed their scales as skin cas
- 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.
- Teeth are **acrodont, pleurodent** and **thecodont** type.
- Respiration occurs through lungs through out the life.
- Heart is usually **3 chambered** but **4 chambered** in crocodiles, **right and left both systemic arches** are present.
- Only **one occipital** condyle is present in skull (**monocondyl** skull). Ribs are present.
- One pair of **Metanephric** kidneys are present for excretion and osmoregulation.
- These animals are **uricotelic** for water conservation.
- Brain is well developed and **12 - pairs** of cranial nerves present. They do not have external ear opening. Tympanum represent ear.

- 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.**
- These are unisexual animals. Fertilization is **internal**.
- One or two penis is found in male animals as copulatory organ.
- Females are mostly **oviparous.**
- Eggs are leathery and cleidoic, i.e. eggs are covered by a shell made up of $CaCO_3$.
- Development direct .

Example :

(1) *Testudo* – Land tortoise

(2) *Chelone* – Marine Turtles

(3) Sphenodon punchtatum – **living fossil**

(4) *Hemidactylus* – Common lizard, **wall lizard**. It can shed its own tail at the time of emergency. It is called **autotomy**. Power of regeneration is well marked.

(5) *Calotes* – **Garden lizard/Blood sucker/Girgit.** It can change its colour according to environment.

(6) *Chameleon* – **Tree lizard** (Viviparous).

(7) *Heloderma* – **Gila - monster.** It is the **only poisonous lizard**. Its poison glands are modified sublingual salivary glands (Maxico & USA).

(8) *Crocodilus (Crocodile)* – It is only found in Indian subcontinent.

(9) *Alligator* – Maxican crocodile.

(10) *Snakes*

(a) Non poisonous snake

(i) *Python molurus* – Ajgar, The **largest non-poisonous snake** (25 feet). Rudiments of hind limbs are found on the body.

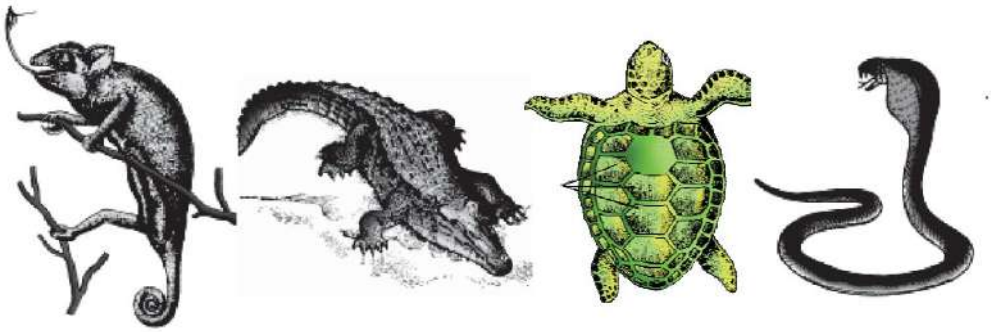
(b) *Poisonous snake*

(i) *Naja naja* – **Indian cobra**. **(Neurotoxic).**

(ii) *Bangarus* – **Krait :** Poisonous snake **(neurotoxic).**

(iii) *Vipera* – Viper snake : Head is differentiated from body. Poisonous and viviparous snake. Its venom is **haemotoxic**/ **Cardiotoxic**.

(iv) *Hydrophis* – Marine and **deadly poisonous,** tail is laterally compressed and viviparous snake.



Chameleon **Crocodilus** **Chelone** **Naja**

Concept Builder

1. Which one of the following is a non-poisonous snake ?
(1) Cobra (2) Python (3) Krait (4) Viper

2. The limbless amphibian is :
(1) Salamandra (2) Ichthyophis (3) Hyla (4) Bufo

3. Dry skin with scales or scutes without gland is a characteristic of :
(1) Aves (2) Fishes (3) Reptilia (4) Amphibia

4. Which of the following is/are correct about amphibians ?
(1) Body is divisible into head and trunk, while tail may be present in some
(2) Eyes have eyelids and tympanum represents the ear.
(3) Oviparous animals with external fertilisation and indirect development
(4) All of the above

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

Concept Builder (Answer-Key)					
Que.	**1**	**2**	**3**	**4**	**5**
Ans.	2	2	3	4	1

Class - Aves

- All types of **birds** are included in this class.
- Birds are **warm blooded** or **Homeothermic** or **endothermic animals** i.e. Body temperature remains almost constant. (Approx 102°F).
- Body is boat shaped. It is divided into **head**, **neck**, **trunk** and **tail**. Neck is **long** and **flexible**.
- The characteristic 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 makes body weight light. Feathers are modification of epidermal scales.
- Skin is **dry and without glands.** But oil glands or **Preen glands** are found on tail. These glands secrete oil, which lubricates feathers.
- Forelimbs are modified into wings, which help in flying.
- Hind limbs are best adapted for clasping the branches of trees or for perching or for walking or swimming. Scales are found only on hind limbs.
- Digestive tract has additional chambers - the **crop** and **gizzard.**
- **Oesophagus** is modified into **Crop** for quick food ingestion and storage and **Gizzard** for crushing the food which is swallowed unmastigated. **Pigeon** or **crop milk** is secreted by **both sexes** (Crop product).
- A three chambered **cloaca** is present in the birds.

- Jaws are modified **into horny beak which is toothless.**
- **Spongy lungs** are present for respiration. Air sac connected to lungs suppliment respiration.
- Sound producing organ at the junction of trachea and bronchi of birds is called **syrinx**.
- Heart is four **chambered**. Double circulation is found.
- Hepatic portal system is well developed in birds, but renal portal system and sinus venosus are absent. **Only Right aortic arch is** present R.B.C.s are **nucleated.**
- Endoskeleton is **fully ossified (bony)**. Long bones are hollow with air cavity, So, these bones are called **pneumatic bones**. These make the body light in weight and help in flying.
- Skull is **monocondylic**.
- Sternum is large. Swollen basal part of sternum is called "**Keel**" This keel offers site for attachment of **flight muscles**.
- Two bones, **clavicle** and **interclavicle** fuse to form V - shaped bone **called furcula** or Wish bone or merry thought bone. Which Act as a spring between two pectoral girdles.
- Pygostyle, Keel and Furcula are absent in flight less birds.
- Kidneys **metanephric**. Ureters open into **cloaca**. They are mostly **Uricotelic.**
- Most of the birds do not have **urinary bladder** and **coupulatory organ.**
- Brain is large, smooth, highly developed. **Cerebellum is well developed for aerial mode of life.**
- Cranial nerves are **12 - Pairs**.
- Eyes are large and **nictitating membrane** is present in eye. Vision is **monocular.**
- A specific comb like structure **Pecten** is found in the eyes of all birds except kiwi's eyes. Pecten helps in accommodation of eye and provides nutrition to eye balls. **Acute vision** and **Telescopic vision** of birds is due to pecten.
- External ears are present but ear pinnae are absent. Only one ossicle **Columella** (Stapes) is found in middle ear.
- Olfactory organs are less - developed.
- Birds are **monodelphic** i.e. only left ovary and left oviduct is functional in females.
- Birds are **unisexual. Sexual dimorphism** is well marked. Copulatory organ absent in males.
- Fertilization is **internal.** They are oviparous and development is direct.
- All the birds form nests. **Parental care** is well marked.

Example :

(1) *Archaeopteryx* – **Lizard bird**.

(2) Aptenodytes – Penguin, also called **"Sea bird of Antarctica".**

(3) *Struthio* – African ostrich or Camel-bird - It is the **largest living bird** of modern period. It is almost 8 feet in height. Polygamous, male incubate the eggs (Largest egg).

(4) *Apteryx*/ Kiwi – It is National bird of New zealand. It has hair like feathers all over its body. It is smallest flightless bird.

(5) *Pavo – cristatus* – Peacock - It is the national bird of India.

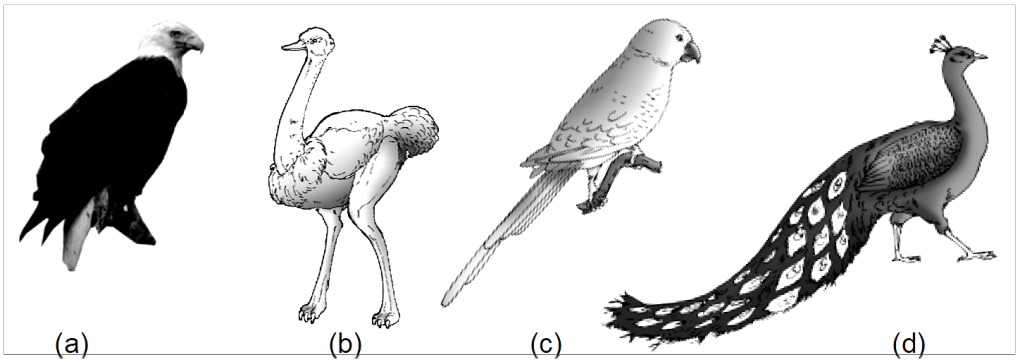
(6) *Psittacula* – Indian parrot. (Upper jaw movable).

(7) *Columba livia* – Blue rock pigeon - Its crop glands secrete pigeon milk.

(8) *Neophron* – Vulture (Scavenger bird)

(9) *Corvus splendens* – Crow

(10) *Passer domesticus* – Sparrow - It shows commonsalism with man.



Some birds : (a) *Neophron* (b) *Struthio* (c) *Psittacula* (d) *Pavo*

Class - Mammalia

- The members of this class are **cosmopolitan** and found in a variely of habitats - polar ice cap, deserts mountains, forest, grasslands and dark caves. Some of them adapted to fly or live in water.
- Mammals are **warm blooded** and **homeothermic** or endothermic animals.
- Body is divided into **head**, **neck**, **trunk** and **tail.**
- The most unique mammalian characterstic is the presence of milk producing glands (Mammary glands) by which the young ones are nourished.
- A horizontal, **diaphragm** is present in between thorax and abdomen of all the members without any exception. Diaphragm helps in **respiration, defaecation, micturition** and **parturition**.
- 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 sewat gland).
- Two pairs of limbs are present in trunk. Limbs are **pentadactylous** which help in swimming, walking running etc. **Hind limbs** are **absent** in some aquatic mammals.
- Alimentary canal is **complete.** Anus and urinogential apertures are separate. Cloaca is absent.
- 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.
- Heart **four chambered**. Double circulatory system is present. No sinus venosus. Only **left aortic** (systemic) arch present.
- RBCs small, circular and **enucleated.**
- Neck is having **7 cervical vertebrae except** : **Bradypus/Sloth** has **9 or 10** cervical vertebrae and **Sea – cow**/**Manatees** has **6** cervical vertebrae.
- One pair of **Metanephric** kidneys are situated in abdominal cavity. They are **ureotelic**.
- 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.**
- External ear is present in the form of **ear pinna.**

- **Malleus**, **Incus** and **stapes** are the three ear ossicles in middle ear.
- Mammals are **unisexual** animals. Testes of males are situted outside the abdominal cavity in the **scrotal sacs.** A distinct penis is present in males for copulation.
- Fertilization is **internal** and it takes place in **fallopian tubes**.
- Embryo is attached through the uterus of mother by placenta , 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 by milk secreted by her mammary glands and looks after her child.
- Livings mammals are classified into following 3 groups :-

(i) Prototherians or Monotremes

- It includes primitive reptile like egg laying mammals (Oviparous).
- Mammary glands are without nipples.
- **Gynaecomastism** is found in these animals. Mammary glands are functional in males and females both.
- **Cloaca** is present.
- **Testes** in males are situated inside the body as their body temperature is low.
- **Corpus** - **callosum** is **absent** in brain.
- A toothless horny beak is found in adult animals, but teeth are present in child hood only **(Monophyodont).**
- They are found in **Australia**, **Newguinea** and **Tasmania**.
- These are considered : As Connecting links between **reptiles** and **mammals.**

  Example :

  (1) ***Ornithorhynchus*** **(Duck billed platypus) :- Poison glands** are present in the claws of **male platypus**.

  (2) Echidna/*Tachyglossus* (spiny anteater).

(ii) Metatheria or Marsupials

- An abdominal pouch called **marsupium** is found in these animals, in which immature young ones are kept after delivery.
- Mammary glands with **Nipple** are situated in **marsupium.**
- Two vigina, two clitoris and two uteri are present in a female animal and bifid penis present in male.
- **Yolk sac** or false placenta are found.
- Corpus callosum is absent.

  Example :

  (1) ***Macropus*** – Kangaroo – Found in Australia only. Saltatorial locomotion.

(iii) Eutherians

- These are **true palcental mammals**, that give birth to a mature baby. A true placenta is found, which provides both attachment and nutrition to baby.
- Nipples are well marked in mammary glands.
- Uterus and vagina are **single** in female.
- **Corpus callosum** is found in brain.

  Example :

  (1) Pteropus (Flying fox) : It is Frugivorous bat. These are true flying mammals. Ecolocation sensory system (Radar system) present.

  (2) Camelus (Camel)

  (3) Macaca (Monkey)

  (4) Rattus (Rat)

  (5) Canis (Dog)

  (6) Felis (Domestic cat)

  (7) Panthera leo = Lion

  (8) Panthera tigris = Tiger (National Animals of India).

  (10) Delphinus = Common dolphin

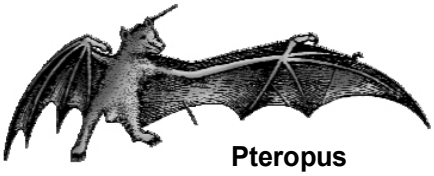
  (11) Balaenoptera musculus - Blue whale - Found in Antarctic ocean. A horny sheet called **Baleen** plate (for filtration) is found in upper jaw instead of teeth.

  (12) *Elephas* - Indian elephant

  (13) Horse = Equus

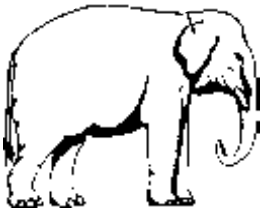
Ornithorhynchus

Macropus



Pteropus

Balaenoptera



Asiatic elephant
(Elephas maximus)

Domestic horse
(Equus caballus)

Indian rhinoceros
(Rhinoceros unicornis)

Concept Builder

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

2. Birds and mammals share one of the following characteristic as a common feature.
(1) Pigmented skin (2) Pneumatic bones (3) Viviparity (4) Warm-blooded body

3. Both male and female pigeons secrete milk through :
(1) mammary glands (2) crop glands (3) salivary glands (4) gizzard glands

4. Animal which has dicondylic skull :
(1) whales (2) chameleon (3) corvus (4) dog fish

5. Select the correct statement about class-aves.
(1) They are warm-blooded (homiothermous) animals and are able to maintain a constant body temperature
(2) Respiration occurs through lungs and air sacs connected to lungs for supplement respiration.
(3) They are oviparous with separate sexes, internal fertilisation and direct development.
(4) All of the above.

6. All mammals without any exception are characterized by :
(1) viviparity and Enucleated RBC.
(2) diphyodont teeth and 12 pairs of cranial nerves.
(3) a muscular diaphragm and milk producing glands
(4) extra abdominal testes and a four chambered heart

Concept Builder (Answer-Key)

Que.	1	2	3	4	5	6
Ans.	1	4	2	1	4	3

Exercise - I

Phylum-Protozoa (Kingdom-Protista)

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. In which of the following nuclear dimorphism is seen –
(1) *Entamoeba* (2) *Leishmania*
(3) *Trypanosoma* (4) *Paramoecium*

5. Slipper animalcule is -
(1) *Entamoeba* (2) *Paramoecium*
(3) *Giardia* (4) *Euglena*

6. Which of the following statement are true/false?
I. Cell aggregate body plan is found in phylum Platyhelminthes.
II. Radial symmetry is the most common symmetry found in animals
III. Pseudocoelom is only found in phylum Aschelminthes.
IV. All triploblastic animals have a true coelom.
V. Haemocoel is sometimes observed in animals belonging to phylum– Platyhelminthes.
(1) I and V are true and II, III and IV are false
(2) II, III and V are true and I and IV are false
(3) I, II and III are true and IV and V are false
(4) I, II, IV and V are false, only III is true

7. Enterocoelic coelom appeared first during the course of evolution in:
(1) Echinodermata (2) Annelida
(3) Chordata (4) Protozoa

8. Which of the following phylum have radially symmetrical organisms?
(1) Coelenterata (2) Platyhelminthes
(3) Aschelminthes (4) Annelida

9. Which of the following phylum possess true coelom?
(1) Aschelmithese (2) Annelida
(3) Ctenophora (4) Platyhelminthes

10. Loose cell aggregate type body plan is found in____.
(1) Protozoa (2) Porifera
(3) Coelenterata (4) Platyhelmenthes

11. 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

12. Which of the following phylum have "Tube within tube" body plan?
(1) Platyhelminthes
(2) Coelenterata
(3) Porifera
(4) Nemathelminthese/Aschelminthes

13. Incomplete digestive tract found in:
(1) Platyhelminthes & Nemathelminthese
(2) Platyhelminthes & Ctenophora
(3) Annelida & Nemathelminthese
(4) Coelenterata & Nemathelminthese

14. Match the following columns.

	Column I		Column II		Column III
A.	Tripoblastic	(i)	Segmentation of external division corresponding with internal divisions	1	Jelly fish
B.	Tissue level Organisation	(ii)	Body divided into two halves by plane passing through the centre from top to bottom	2	Roundworms
C.	Metamerism	(iii)	Presence of ectoderm, mesoderm and endoderm, during embryonic stages	3	*Hydra*
D.	Radial symmetry	(iv)	Specialised cells performing the same function	4	Earth worm

(1) A-(ii)-2, B-(iii)-1, C-(i)-3, D-(iv)-4
(2) A-(i)-4, B-(iv)-1, C-(ii)-2, D-(iii)-3
(3) A-(i)-1, B-(ii)-2, C-(iii)-3, D-(iv)-4
(4) A-(iii)-2, B-(iv)-3, C-(i)-4, D-(ii)-1

15. Which one of the following phyla is **correctly** matched with its general characteristics?
(1) **Porifera –** Cellular level of organisation and external fertilisation
(2) **Coelenterata –** Diploblastic and mostly Asymmetric
(3) **Aschelminthes –** Pseudocoelomates and dioecious
(4) **Hemichordata** Coelomates and closed circulatory system

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

17. Sycon belongs to a group of animals, which are best described as:
(1) Unicellular or acellular
(2) Multicellular without any tissue organization
(3) Multicellular with a gastrovascular Cavity
(4) Multicellular having tissue organization but no body cavity

18. If a food particle is placed near the osculum of a sponge then it will:
(1) Be thrown away
(2) Be ingested
(3) Rotate round osculum
(4) Be ingested first and then thrown out through ostia

19. The canal system is characteristic feature of:
(1) Sponges (2) Helminthes
(3) Echinoderms (4) Coelenterates

20. Which of the following cells of porifera act as totipotent cells and responsible for high power of regeneration?
(1) Pinacocytes (2) Choanocytes
(3) Myocytes (4) Archeocytes

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

22. Canal system in Porifera is not concerned with:
(1) Respiration (2) Nutrition
(3) Sexual reproduction (4) Movement

23. Which of the following is not a Porifera?
(1) *Sycon* (2) *Amoeba*
(3) *Euspongia* (4) *Spongilla*

24. Sea-anemone belongs to phylum:
(1) Protozoa (2) Porifera
(3) Coelenterata (4) Echinodermata

25. Which one of the following is Coelentrate?
(1) Sea cow (2) Sea cucumber
(3) Sea fan (4) Sea horse

26. In *Hydra*, waste material of food digestion and nitrogenous waste material removed respectively:
(1) Mouth and Anus
(2) Anus and body wall
(3) Mouth and bodywall
(4) Mouth and tentacles

27. Which of the following groups of animals have the following feature?
I. Diploblastic
II. Acoelomate
III. Radial symmetry
(1) *Planaria, Physalia, Aurelia*
(2) *Taenia, Fasciola, Wuchereria*
(3) *Adamscia, Hydra, Meandrina*
(4) *Fasciola*, *Sycon*, Sea walnut

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

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

30. "Corals" belongs to the phylum:
(1) Porifera (2) Coelenterata
(3) Mollusca (4) Echinodermata

31. A radially symmetrical dipolobastic animal is:
(1) *Ascaris* (2) Earthworm
(3) Liver Fluke (4) *Hydra*

32. Polyp stage is not found in which coelenterat:
(1) *Hydra* (2) *Aurelia*
(3) *Metridium* (4) *Adamsia*

33. "Portuguese man of war" is:
(1) *Obelia* (2) *Physalia*
(3) *Euplectella* (4) *Meandrina*

34. The characteristic larva of Ctenophora is:
(1) Cydippid (2) Veliger
(3) Nauplius (4) Trochophore

35. **"Comb-jellies"** or **"Sea Walnuts"** belong to the phylum:
(1) Coelenterata (2) Ctenophora
(3) Mollusca (4) Echinodermata

36. Which one of the following is **Ctenophora**?
(1) Sea cow (2) Sea cucumber
(3) *Pleurobrachia* (4) Sea horse

37. Digestion in ctenophora:
(1) Extracellular
(2) Intracellular
(3) Extracellular and intracellular both
(4) Ctenophors are saprotrophic

38. Bioluminiscence is property of:
(1) Coelentrata (2) Ctenophora
(3) Platyhelminthes (4) Ascehelminthes

39. Locomotion in ctenophora occurs with help of:
(1) 8 external tentacles
(2) lasso cell and cnidoblast
(3) 8 internal rows of ciliary comb plate
(4) 8 external rows of ciliary comb plate

40. 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

41. 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

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

43. Rhabditiform larva occurs in:
(1) *Neries* (2) *Ascaris*
(3) *Taenia* (4) *Fasciola*

44. *Taenia solium* has:
(1) Both mouth and anus
(2) Only mouth present but no anus
(3) Only anus present but no mouth
(4) Digestive tract is absent

45. Which of the following is **Monoecious**?
(1) *Neries* (2) *Periplaneta*
(3) *Ascaris* (4) *Pheretima*

46. One of the following animals has unsegmented body:
(1) Earthworm (2) Leech
(3) Cockroach (4) *Ascaris*

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

48. In Annelids formation of larva is usually absent but when present the larva is called:
(1) Tadpole (2) Planula
(3) Trochophore (4) Ephyra

49. Which animal do not possess larval stage in its life cycle?
(1) *Ascaris* (2) Frog
(3) *Taenia* (4) *Pheretima*

50. Which of the following characteristic is shared by all arthropods?
(1) Metamorphosis (2) Wings
(3) Jointed appendages (4) Tracheal system

51. Members of phylum Arthropoda have all features except:
(1) External skeleton made of chitin
(2) Compound eyes
(3) Excretion by malphigian tubules
(4) Usually a close type of blood vascular system

52. Cockroach, house fly and mosquitoes are insect because they have:
(1) Chitinous exoskeleton and body divided into head and cephalothorax
(2) Six legs, compound eyes and body divided into head, thorax and abdomen
(3) Segmented body with jointed feet and chitinousexoskeleton
(4) Three pairs of legs, one pair of antennae and flame cells

53. Which of the following animal is considered as **"Living fossil"**?
(1) *Limulus* (2) Spider
(3) *Eupagurus* (4) Scorpion

54. Select the gregarious pest:
(1) *Locusta* (2) *Culex*
(3) *Aedes* (4) *Apis*

55. Excretion in Arthropod animals take place by:
(1) Malpighian tubules
(2) Green glands
(3) Coxal glands
(4) All of the above

56. 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

57. Book gills for respiration are found in?
(1) House-fly (2) Termites
(3) Prawn (4) King-Crab

58. Choose the **correct** one:-
(1) Prawns – lungs
(2) King crab – cutaneous
(3) Cockroach – Book gills
(4) Scorpion – Book lungs

59. Which of the following animals is not an Insect?
(1) Scropion (2) Honey bee
(3) Cockroach (4) Silkworm

60. Chemoreceptor in *Pila* is?
(1) Ctenidium (2) Radula
(3) Osphradium (4) Statocyst

61. Which mollusca is called **tusk shell**?
(1) *Neopilina* (2) *Pila*
(3) *Dentalium* (4) *Doris*

62. Secretion of shell in molluscs take place by :
(1) Foot (2) Kaber's organ
(3) Radula (4) Mantle

63. Which of the following characteristic is not of phylum mollusca?
(1) Soft body covered usually by a shell
(2) Segmented body
(3) Triploblastic
(4) Presence of coelom

64. Which of following is not charactertics feature of mollusca?
(1) Hard - body (2) Shell
(3) Mantle (4) Foot

65. The connecting link between annelida and mollusca is:
(1) *Peripatus* (2) *Hirudinaria*
(3) *Neopilina* (4) *Nereis*

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

67. Which one of the following is a matching pair of a body feature and the animal possessing it?
(1) **Canal system -** Asterias
(2) **Metagenesis -** Obelia
(3) **Dorsal nerve cord -** Pheretima
(4) **Muscular pharynx -** Taenia

68. Member of Echinodermata has a specific system, which is not found in other phylum, it is:
(1) Canal system
(2) Water vascular system
(3) Respiratory system
(4) Jointed appendages

69. Which of the following is **not related** with Echinodermata?
(1) Madreporite (2) Parapodia
(3) Marine habitat (4) Autotomy

70. Locomotory organs of echinoderms are:
(1) Tube feet (2) Setae
(3) Parapodia (4) Pseudopodia

71. Absence of excretory organs, great power of regeneration and exclusively marine animals belongs to the phylum:
(1) Mollusca (2) Arthropods
(3) Echinodermata (4) Annelida

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

73. 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

74. Stomochord is present in:
(1) *Amphioxus* (2) *Herdmania*
(3) *Balanoglossus* (4) *Asterias*

75. Larva of Balanoglossus is:
(1) Dipleura (2) Tornaria
(3) Tadpole (4) Auricularia

76. In which of the following animal **post anal tail** is found:
(1) Earthworm
(2) Lower invertebrate
(3) Scorpion
(4) Snake

77. All chordates have the following characterstics:
(1) Bilaterally symmetrical, presence of coelom, triploblastic, closed or open circulatory system
(2) Bilaterally symmetrical, presence of coelom diploblastic or triploblastic
(3) Open circulatory system, diploblastic or triploblastic, coelom and bilaterally symmetrical
(4) Bilaterally symmetrical, coelom present, triploblastic with always closed circulatory system

78. Which is the smallest taxonomic group having cranium, vetebral column, ventral heart, pulmonary respiration and two pairs of legs?
(1) Chordata (2) Gnathostomata
(3) Vertebrata (4) Tetrapoda

79. Which of the following group of animals have a constant body temperature?
(1) Reptiles, aves & mammalia
(2) Aves & cyclostomata
(3) Pisces & amphibia
(4) Aves & mammalia

80. The distinguishing feature of all chordates is:
(1) A ventrally placed nerve cord
(2) A water vascular system
(3) A chitinous exoskeleton
(4) Notochord

81. Chordates possess:
(1) Dorsal nerve cord placed ventral to gut
(2) Single hollow nerve cord placed dorsal to gut
(3) Double ventral nerve cord
(4) Single, solid and ventral nerve cord

82. In vertebrates the notochord:
(1) Persists throughout the life
(2) Is partially replaced by vertebral column
(3) Is completely replaced by vertebral column
(4) Is partially or fully replaced By vertebral column

83. Which one is the distinguishing feature of all vertebrates?
(1) An internal bony or cartilagenous vertebral column
(2) A hairy body covering
(3) Presence of mammary glands
(4) Open type of circulatory system

84. Which one of the following is a chordate but not a vertebrate?
(1) *Scoliodon* (2) Hag fish
(3) *Amphioxus* (4) Star fish

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

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

87. Which of the following are **Anamniotes**?
(1) Chondrichthyes, Ostiechthyes, Amphibia
(2) Reptilia, Aves, Amphibia
(3) Amphibia, Aves, Mammals
(4) Reptilia, Mammals, Aves

88. Which of the following character is not found in all the chordates:
(1) Diaphragm
(2) Coelom
(3) Pharyngeal gill clifts
(4) Dorsal nerve cord

89. Notochord is found only in the tail of Larva in:
(1) All chordata
(2) Hemichordata
(3) Urochordata
(4) Cephalochrodata

90. Which of the following is the larva of Petromyzon?
(1) Ammocoete (2) Bipinnaria
(3) Tadpole (4) Tornaria

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

92. Sea horse belongs to:
(1) Amphibia (2) Fishes
(3) Mammals (4) Reptilia

93. Which statement is incorrect for animals belonging to class of Chondrichthyes?
(1) Presence of placoid scales
(2) Absence of air bladder
(3) Presence of cartilaginous endoskeleton
(4) Notochord is persistent only at larval stage, after that it disappears.

94. Match the following columns.

	Column-I		**Column-II**
A.	These possess electric organs	1	*Trygon*
B.	Animals of this class are poikilothermous	2	Cyclostomata
C.	These possess poison sting	3	*Torpedo*
D.	These migrate for spawning to freshwater	4	Chondrichthyes
		5	*Petromyzon*

Codes:

	A	**B**	**C**	**D**
(1)	5	1	3	2
(2)	1	4	6	5
(3)	3	4	1	5
(4)	3	4	6	2

95. Which is a **balancing organ** of fish?
(1) Ampulla of lorenzini
(2) Statocyst
(3) Air bladder
(4) Internal ear

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

97. Which of the following are usually **viviparous**?
(1) Lungs fishes (2) Frog
(3) Sharks (4) Bony fishes

98. The fish that swims vertically:
(1) *Scoliodon* (2) *Hippocampus*
(3) *Exocoetus* (4) *Labeo*

99. Axolotal larva is the name of larva of:
(1) *Amphioxus* (2) Silkworm
(3) Salamander (4) Round worm

100. Tailed amphibian is:
(1) *Icthyophis* (2) Frog
(3) Salamendra (4) Toad

101. Kidney in amphibians and fishes is:
(1) Pronephric (2) Mesonephric
(3) Archinephric (4) Metanephric

102. The amphibians are characterized by:
(1) Only aquatic habit
(2) Monocondylar skull
(3) Scaleless, Smooth, moist and glandular skin
(4) Claws present at the tip of digits

103. Most favourable land adaptation in reptiles is:
(1) Lungs
(2) Scales
(3) Moist skin
(4) Pentadactylous limbs

104. Amniota, Monocondylar, Poikilothermal animals are:
(1) Birds (2) Amphibia
(3) Reptiles (4) Fish

105. Oviparous animal is:
(1) *Scoliodon* (2) Pristis
(3) Monkey (4) Hydra

106. Only poisonous Lizard of the world is:
(1) *Heloderma* (2) *Ophiosaurus*
(3) *Calotes* (4) *Hemidactylus*

107. Which of the following is a non poisonous snake?
(1) Cobra (2) Python
(3) Viper (4) Krait

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

109. In which of the following tympanum is absent:
(1) Birds (2) Frog
(3) Lizard (4) Lamprey

110. *Felis* belongs to:
(1) Mammals (2) Aves
(3) Amphibians (4) Reptiles

111. Which of the following has no teeth in its mouth?
(1) Tortoise (2) Crocodile
(3) *Hemidactylus* (4) Draco

112. Feathers of birds are modified:
(1) Epidermal scales (2) Bony scales
(3) Plates (4) Scutes

113. The character found only in birds is:
(1) Solid skull
(2) Bipedal locomotion
(3) Wings
(4) Feathers

114. Which of the following characters is **not** related to **Aves**?
(1) Homiothermy and presence of oil glands at basal part of the tail
(2) Alimentary canal terminate into anus
(3) Alimentary canal with two additional chamber crop and gizzard
(4) Exoskeleton of feathers

115. Hollow air filled bones (pheumatic bones) occur in:
(1) Mammals (2) Reptiles
(3) Bony fishes (4) Aves

116. Mostly birds are:
(1) Uricotelic and oviparous
(2) Uricotelic and viviparous
(3) Ammonotelic and oviparous
(4) Ureotelic and viviparous

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

118. Which of the following is a "**Lizard- bird**":
(1) *Archaeopteryx* (2) Struthio
(3) *Aptenodytes* (4) Humming bird

119. Which of the following features is **not** found in Aves?
(1) Preen glands on tail
(2) Crop and a gizzard
(3) Air cavities in bones
(4) Teeth inside the beak

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

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

122. Whales are included in the same taxonomic **class** as?
(1) Sharks (2) Crocodile
(3) Sea horse (4) Gorilla

123. Which of the following group of vertebrates have dicondylic skull?
(1) Amphibia & mammals
(2) Reptilia & Aves
(3) Aves & mammals
(4) Reptilia & mammals

124. Which of the following animals have character of both reptiles and mammals?
(1) Platypus (2) Marsupials
(3) Macropus (4) *Canis*

125. Which of the following groups includes Endothermic animals (Homiothermal):
(1) Crocodile, alligator, turtle
(2) Whale, pigeon, bat
(3) Sea-horse, dog fish, cat fish
(4) Toad, frog, salamander

126. Find out correct statement:
(1) All birds can fly
(2) All snakes are poisonous
(3) All amphibians are Poikilothermic
(4) All mammals are viviparous

127. Exclusive pulmonary respiration is found in:
(1) Amphibians and mammals
(2) Amphibians and reptiles
(3) Mammals and reptiles
(4) Birds and mammals

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

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

130. One of the following is a very unique feature of the mammalian body:
(1) Presence of mammary gland & hairs
(2) Four chambered heart
(3) Rib cage
(4) Homeothermy

131. Which of the following animal is radially symmetrical but has a bilaterally symmetrical larva.
(1) *Ascaris* (Round worm)
(2) *Nereis* (Ring worm)
(3) *Pila* (Apple snail)
(4) *Asterias* (Star fish)

132. Match list 'A' and List 'B' correctly and find your answer from the code given below :-

List-A (Animal)	**List-B** (Common name)
(i) *Physalia*	(A) Brain coral
(ii) *Pennatula*	(B) Sea fan
(iii) *Gorgonia*	(C) Sea pen
(iv) *Meandrina*	(D) Portuguese man of war

Code :
(1) (i)-A, (ii)-B, (iii)-C, (iv)-D
(2) (i)-D, (ii)-C, (iii)-B, (iv)-A
(3) (i)-C, (ii)-D, (iii)-B, (iv)-A
(4) (i)-D, (ii)-C, (iii)-A, (iv)-B

133. Fresh water sponge is :-
(1) *Spongilla*
(2) *Scypha*
(3) *Euspongia*
(4) *Leucosolenia*

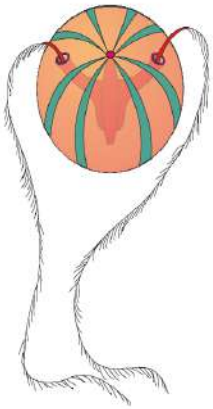
134. Select the pseudocoelomates from the list of organisms given below :-
(1) *Ascaris, Fasciola, Taenia*
(2) *Cules, Locusta, Limulus*
(3) *Wuchereria, Ascaris, Ancylostoma*
(4) *Nereis, Hirudinaria, Wuchereria*

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	3	2	1	4	2	4	1	1	2	2	2	4	2	4	3	2	2	1	1	4	1	4	2	3	3
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	3	3	1	2	2	4	2	2	1	2	3	3	2	4	3	1	1	2	4	4	4	2	3	4	3
Que.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	4	2	1	1	4	3	4	4	1	3	3	4	2	1	3	3	2	2	2	1	3	1	2	3	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	4	1	4	4	4	2	4	1	3	2	4	1	1	3	1	2	2	4	3	4	2	3	2	3	3
Que.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
Ans.	2	3	2	3	4	1	2	1	4	1	1	1	4	2	4	1	3	1	4	4	4	4	1	1	2
Que.	126	127	128	129	130	131	132	133	134																
Ans.	3	4	2	2	1	4	2	1	3																

Exercise - II

1. How can you distingush the animal shown below from coelenterates ?



(1) Presence of Eight external rows of ciliary comb plates
(2) Property of bioluminescence
(3) Absence of stinging cells
(4) All of the above

2. Which one of the following is a radially symmetrical, blind sac body plan and diploblastic animal ?
(1) *Spongilla* (2) *Euspongia*
(3) *Asterias* (4) *Physalia*

3. Which one is **not** a platyhelminthes ?
(1) Tapeworm (2) Liver fluke
(3) *Planaria* (4) Hookworm

4. Consider the following statements :-
(A) Protochordates are exclusively marine
(B) In cephalochordates, Notochord extends from head to tail region.
(C) In urochordates, Notochord is present only in larval tail.
(D) Cranium and vertebral column are bony in cyclostomates.
Which of the above statement is/are **correct** ?
(1) A alone (2) B, C and D
(3) A, B and C (4) All

5. Consider the following characteristic of fishes :-
(A) They have four pairs of gills which are covered by an operculum.
(B) They have air bladder which regulates buoyancy
(C) They are mostly viviparous and development is direct
(D) Their body is streamlined and covered with cycloid/ ctenoid scales
Which of the above characteristics regarding **bony fishes** are **correct** ?
(1) A, B and C (2) C and D
(3) A, B and D (4) B alone

6. Identified the **correct** statement from the following with reference to **Amphibians** :-
(A) They have internal fertilisation and development is direct.
(B) Amphibian skin is moist and without scales
(C) Their body is divisible into head and trunk
(D) They have three chambered heart
Select the **correct** answer :-
(1) A and D (2) A and B
(3) B, C and D (4) D alone

7. Which of the following pairs are **correctly** matched ?
(A) **Poikilothemous** - Birds and mammals
(B) **Agnath** - *Petromyzon* and *Myxine*
(C) **Tunicates** – Ascidia, Salpa and Doliolum
(D) **Cartilaginous fishes** - *Betta* and *Labeo*
(1) A and B (2) A, B and C
(3) B and C (4) A, B and D

8. What would happen if some fresh water protozoans are placed in distilled water ?
(1) The contractile Vacuole will work faster
(2) The contractile vacuole will work slower
(3) The contractile vacuole shows no change
(4) The contractile vacuole disappears

9. Match the column :-

(a)	Dentalium	(i)	Brittle star
(b)	Ophiura	(ii)	Cuttle fish
(C)	Antedon	(iii)	Sea Urchin
(d)	Echinus	(iv)	Tusk shell
(e)	Sepia	(v)	Sea lily

(1) a-(iv). b-(i), c-(iv). d-(ii), e-(iii)
(2) a-(iv), b-(i), c-(v), d-(iii). e-(ii)
(3) a-(i), b-(iv), c-(v), d-(iii). e-(ii)
(4) a-(iv), b-(i), c-(iii), d-(v). e-(ii)

10. True coelom and metameric segmentation in the body is first observed in which of the following phylum :-
(1) Platyhelminthes (2) Aschelminthes
(3) Annelida (4) Arthropoda

11. Read the following statements (a to e) carefully :-
(a) Triploblastic
(b) Bilateral symmetric
(c) Organ system organisation
(d) Pseudocoelomate
(e) Metameric segmentation
Which of the above statement(s) is/are **correct** for phylum **Aschelminthyes** ?
(1) a and b only (2) a. b. c and e
(3) a, b, c and d (4) a, b. c. d and e

12. Which of the following coelenterate exist in both forms polyp and medusa and exhibit metagenesis :
(1) *Hydra* (2) *Adamsia*
(3) *Obelia* (4) *Gorgonia*

13. Which of the following animal is radially symmetrical but has a bilaterally symmetrical larva :
(1) *Ascaris* (Round worm)
(2) *Nereis* (Ring worm)
(3) *Pila* (Apple snail)
(4) *Asterias* (Star fish)

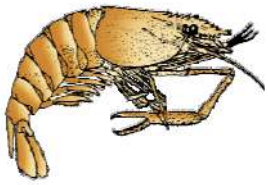
14. Mark the **incorrectly** matched pair :
(1) ***Petromyzon*** – Body devoid of scales and paired fins
(2) ***Scoliodon*** – Operculum present but air bladder is absent
(3) ***Exocoetus*** – Heart two chamered with Single circulation
(4) ***Rana*** – Cold blooded with 10 pairs of cranial nerves and mesonephric kidneys

15. Match **list 'A'** and **list 'B' correctly** and find your answer from the code given below :-

	List -A (Animal)		**List - B (Common name)**
(i)	*Physalia*	(A)	Brain coral
(ii)	*Pennatula*	(B)	Sea fan
(iii)	*Gorgonia*	(C)	Sea pen
(iv)	*Meandrina*	(D)	Portuguese man of

Code:
(1) (i)-A, (ii)-B, (iii)-C, (iv)-D
(2) (i)-D, (ii)-C, (iiil-B, (iv)-A
(3) (i)-C, (iil-D, (iii)-B, (iv)-A
(4) (i)-D, (iil-C, (iii)-A, (iv)-B

16. Mark the **incorrect** statement regarding the animal given in the adjacent figure :



(1) Respiration occurs by gills
(2) Excretion occurs by green glands
(3) It is an example of living fossil
(4) Jointed legs for swimming

17. Select the group of organism given below those have **diploblastic members** only:

(1) *Ctenoplana, Taenia, Fasciola*

(2) *Pleurobrachia, Physalia, Meandrina*

(3) *Wuchereria, Culex, Limulus*

(4) *Aedes, Ascaris, Hydra*

18. The symmetry found in an animal which can be divided into identical left and right halves in only one plane is :-

(1) Spherical

(2) Bilateral

(3) Radial

(4) Asymmetry

19. Select the pseudocoelomates from the list of organisms given below :-

(1) *Ascaris, Fasciola, Taenia*

(2) *Culex, Locusta, Limulus*

(3) *Wuchereria, Ascaris. Ancylostoma*

(4) *Nereis, Hirudinaria. Wuchereria*

20. Which of the following pairs of animals comprise **'Comb jellies'**?

(1) *Balanoglossus* and *Saccoglossus*

(2) *Pleurobranchia* and *Ctenoplana*

(3) Sea anemone and sea pen

(4) Sea lily and brittle star

21. Which one of the following pairs of animals comprise **'Cartilaginous fishes'**?

(1) *Labeo* and *Catla*

(2) *Pterophyllum* and *Scoliodon*

(3) *Pristis* and *Carcharodon*

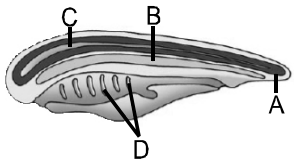
(4) *Petromyzon* and *Myxlne*

22. Which of the following fishes is also known as **"Great white shark"** ?

(1) *Pristis* (2) *Trygon*

(3) *Clarias* (4) *Carcharodon*

23. A schematic representation of a chordate's embryo is shown in the below figure.



The structures maked A, B, C and D are respectively :-

(1) Notochord, Nerve cord, Intestine and gill slits

(2) Postanal part, Gillslits, Nerve cord and Notochord

(3) Postanal part, nerve cord, Notochord and Gill

(4) Post anal part, Notochord, Nervecord and Gill slits.

24. In which one of the following protochordates Notochord present only in the tail of larva ?

(1) *Ascidia* (2) *Balanoglossus*

(3) *Myxine* (4) *Branchiostoma*

25. Match the **column-I** with the **column-II** and find out the **correct** answer :-

Column - I		**Column - II**	
(A)	Spongocoel	(i)	Arthropoda
(B)	Dorso-ventrally flattened body	(ii)	Cnidaria
(C)	Coelenteron cavity	(iii)	Porifera
(D)	Chitinous exoskeleton	(iv)	Platyhelminthes

(1) A-iii, B-iv, C-i, D-ii

(2) A-iv, B-iii, C-ii, D-i

(3) A-iii, B-iv, C-ii, D-i

(4) A-ii, B-iv, C-iii, D-i

26. Which of the following is a matching pair?
(1) *Ophiura* - Sea lily
(2) *Octopus* - Cuttle fish
(3) *Torpedo* - Electric ray
(4) *Aptenodytes* - Ostrich

27. Which one is **not** the character of **Osteichthyes**?
(1) Terminal mouth
(2) Gills with operculum
(3) Body covered by placoid scales
(4) Air bladder regulate buoyancy.

28. Which one of the following pairs is **not correcly** matched ?
(1) *Chaetopleura* - Chiton
(2) *Ascaris* - Round worm
(3) *Wuchereria* - Filaria worm
(4) *Octopus* – Cuttle fish

29. The greatest evolutionary change that enabled the land vertebrates to be completely free from water, was the development of :-
(1) Four appendages
(2) Lungs
(3) Cleidoic eggs
(4) Four chambered heart

30. Identify the following figure **correctly** with its characters & phylum :

[A] 

[B] 

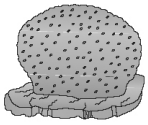
[C] 

[D] 

	Fig.	Animal	Characters	Phylum
(1)	A	*Sycon*	Sensory cells	Porifera
(2)	B	*Aurelia*	Cnidocytes	Ctenophora
(3)	C	*Pleurobrachia*	Bioluminiscence	Ctenophora
(4)	D	*Hirudinaria*	Acoelomate	Platyhelminthes

31. How many in the given examples of animals are **Coelentrates :**
Physalia, Obelia, Plannaria, Pennatula, Gorgonia, Pleurobrachia, Meandrina and Nereis.
(1) Three (2) Four
(3) Five (4) Six

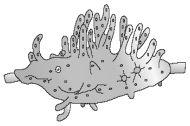
32. Identify the following four animals (A, B, C and D) given below. Which one of these is **not correctly** identified in the option given along with its correct taxonomic group and their common name ?



(A)

(B)

(C)



(D)

Options :

	Figure	Name of animal	Taxonomic group	Common Name
(1)	B	*Adamsia*	Ctenophor	Star coral
(2)	D	*Spongilla*	Porifera	Fresh waterspon
(3)	C	*Aurelia*	Coelentera	Jelly fish
(4)	A	*Euspongi*	Porifera	Bath

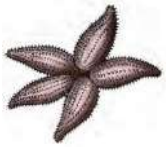
33. How many organism are related with Echinodermata phylum :
Star fish, Sea-urchin, Sea-lily, Sea-hare, Sea-cucumber, Brittle star, Sea-fan, Sea-pen
(1) 4 (2) 5
(3) 6 (4) 7

34. The evidence for the origin of birds from reptiles is the presence in them of :
(1) Feathers (2) Scales
(3) Claws (4) Hairs

35. In which one of the following groups all animals are **hermaphrodite** :
(1) Pleurobranchia, Ascaris, Pheretima
(2) *Pleurobranchia, Homo sapiens, Leech*
(3) Tapeworm, Toad, Starfish
(4) *Pleurobranchia*, Leech, Tapeworm

36. Which of the following parasites have no alimentary canal and absorb nutrients from host directly through their body surface :-
(1) *Fasciola* (Liver fluke)
(2) *Ancylostoma* (Hook worm)
(3) *Ascaris* (Round worm)
(4) *Taenia* (Tape worm)

37. Mark the **incorrect** statement regarding following animals and their characterstics :-
(1) ***Nereis*** $\rightarrow$ Dioecious and parapodia for swimming
(2) ***Limulus*** $\rightarrow$ Living fossil and respiration by book gills
(3) ***Echinus*** $\rightarrow$ Endoskeleton of calcareous ossicles and water vascular system
(4) ***Balanoglossus*** $\rightarrow$ Internal fertilisation and direct development

38. Which of the following animal has **lateral** or **paired** pharyngeal gill slits for respiration ?
(1) 
(2) 
(3) 
(4) 

39. Mark the option with **wrong** taxonomic group :-
(1) **Osteichthyes** - *Exocoetus, Pristis, Catla*
(2) **Urochordata** - *Salpa, Ascidia, Doliolum*
(3) **Mollusca** - *Dentallium, Chaetopleura, Pincatada*
(4) **Aschelminthes** - *Ascaris, Ancylostoma, Wuchereria*

40. Mark the option with **incorrect** statement regarding the animal shown in adjacent figure

(1) Fully ossified endoskeleton and non pneumatic many bones
(2) Homeothermic and Feathers present all over the body
(3) Air sacs connected to lungs supplement respiration
(4) External fertilisation and viviparous

41. Water vascular system of echinoderm's helps in?

(1) Locomotion

(2) Capture and transport of food

(3) Respiration

(4) All of these

42. Choose **incorrect** statement regarding cyclostomata ?

(1) Members are ectoparasite on some fishes

(2) Circular mouth with jaws present

(3) Body is devoid of scales

(4) Vertebral column is cartilagenous

43. Match the following ?

(i)	*Pteropus*	a	Angle fish
(ii)	*Aptenodytes*	b	Krait
(iii)	*Bangarus*	c	Flying fox
(iv)	*Pterophyllum*	d	Penguin
		e	Fighting fish

(1) (i)- b, (ii) - c, (iii) - d, (iv) - a

(2) (i)- a, (ii) - b, (iii) - c, (iv) - d

(3) (i)- c, (ii) - d, (iii) - b, (iv) - a

(4) (i)- c, (ii) - b, (iii) - d, (iv) – a

Answer Key

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ans.	4	4	4	3	3	3	3	1	2	3	3	3	4	2	2	3	2	2	3	2	3	4	4	1	3
Que.	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**							
Ans.	3	3	4	3	3	3	1	2	2	4	4	4	3	1	4	4	2	3							

Exercise – III (Previous year Question)

[AIPMT-2007]

1. Which one of the following is a matching pair of a body feature and the animal possessing it ?

(1) Ventral heart - Scorpion

(2) Post-anal tail - *Octopus*

(3) Ventral central nervous system - Leech

(4) Pharyngeal gill slits absent in embryo - *Chamaeleon*

2. What is true about Nereis, Scorpion, Cockroach and Silver fish ?

(1) They all belong to the same phylum

(2) They all have paired jointed appendages

(3) They all possess dorsal or lateral heart

(4) None of them is aquatic

3. Which one of the following pairs is mismatched ?

(1) *Bombyx mori* – Silk

(2) *Pila globosa* – Pearl

(3) *Apis indica* – Honey

(4) *Laccifer lacca* - Lac

4. Which of the following pairs are **correctly** matched ?

	Animals	**Morphological features**
(A)	Crocodile	4-chambered heart
(B)	Sea Urchin	Parapodia
(C)	*Obelia*	Metagenesis
(D)	Lemur	Thecodont teeth

(1) Only A and B (2) A, C and D

(3) B, C and D (4) Only A and D

5. What is common between parrot, platypus and - kangaroo ?

(1) Ovoparity

(2) Homoiothermy

(3) Toothless jaws

(4) Functional post-anal tail

[AIPMT-2008]

6. Which one of the following is not a characteristic of phylum Annelida ?

(1) Closed circulatory system

(2) Segmentation

(3) Pseudocoelom

(4) Ventral nerve cord

7. Which one of the following phyla is **correctly** matched with its two general characteristics ?

(1) **Arthropoda:** Body divided into head, thorax and abdomen and respiration by tracheae

(2) **Chordata :** Notochord at some stage and separate anal and urinary openings to the outside

(3) **Echinodermata:** Pentamerous radial symmetry and mostly internal fertilization

(4) **Mollusca:** Normally oviparous and development through a trochophore or veliger larva

8. Ascaris is characterized by :-

(1) Absence of true coelom but presence of metamerism

(2) Presence of neither true coelom nor metamerism

(3) Presence of true coelom but absence of metamerism

(4) Presence of true coelom and metamerism

9. Which one of the following groups of the three animals each is **correctly** matched with their one characteristic morphological feature ?

	Animals	**Morphological features**
(1)	Liver fluke, Sea anemone, Sea cucumber	Bilateral symmetry
(2)	Centipede, Prawn, Sea archin	Joined appendages
(3)	Scorpion, Spider, Cockroach	Ventral solid central nervous system
(4)	Cockroach, Locust, *Taenia*	Metameric segmentation

10. Which one of the following groups of animals is bilaterally symmetrical and triploblastic ?

(1) Sponges

(2) Coelenterates (Cnidarians)

(3) Aschelminthes (round worms)

(4) Ctenophores

[AIPMT-2009]

11. Peripetus is a connecting link between :-

(1) Coelenterata and Porifera

(2) Ctenophora and Platyhelminthis

(3) Mollusca and Echinodermata

(4) Annelida and Arthropoda

12. Which one of the following pairs of animals are 'jawless fishes' ?

(1) Guppies and hag fishes

(2) Lampreys and eels

(3) Mackerals and Rohu

(4) Lampreys and hag fishes

[AIPMT (Pre)-2010]

13. One example of animals having a single opening to the outside that serves both as mouth as well as anus is :-

(1) *Fasciola* (2) *Octopus*

(3) *Asterias* (4) *Herdmania*

14. Which one of the following statement about all the four of *Spongilla*, Leech, Dolphin and Penguin is correct ?

(1) All are bilaterally symmetrical

(2) Penguin is homoiothermic while the remaining three are poikilothermic

(3) Leech is a fresh water form while all others are marine

(4) *Spongilla* has special collared cells called choanocytes, not found in the remaining three.

15. Which one of the following animals are triploblastic ?

(1) Corals (2) Round worms

(3) Sponges (4) Ctenophores

16. Which one of the following statement about certain given animals is correct ?

(1) Flat worms (Platyhelminthes) are coelomates

(2) Round worms (Aschelminthes) are pseudocoelomates

(3) Molluscs are acoelomates

(4) Insects are pseudocoelomates

[AIPMT (Main)-2010]

17. Crocodile and Penguin are similar to Whale and Dogfish in which one of the following features ?

(1) Lay eggs and guard them till they hatch.

(2) Possess bony skeleton

(3) Have gill slits at some stage

(4) Possess a solid single stranded central nervous system.

[AIPMT (Pre)-2011]

18. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception ?

(1) **Reptilia:** possess 3-chambered heart with one incompletely divided ventricle

(2) **Chordata :** possess a mouth provided with an upper and a lower jaw

(3) **Chondrichthyes :** possess cartilaginous endoskeleton

(4) **Mammalia :** give birth to young ones

19. Which one of the following animals is correctly matched with its particular named taxonomic category ?

(1) Tiger - tigris, the species

(2) Cuttlefish - Mollusca, a class

(3) Humans - Primata, the family

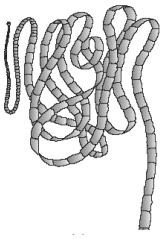
(4) Housefly - Musca, an order

20. In which one of the following the genus name, its two character and its class/phylum are correctly matched ?

	Genus Name	Two characters	Class / Phylum
(1)	*Ascaris*	(a) Body (b) segmented Males and	Annelida
(2)	*Salamendra*	(a) A tympanum represents (b) ear	Amphibia
(3)	*Pteropus*	(a) Skin (b) prossesses	Mammalia
(4)	*Aurelia*	(a) Cnidoblasts (b) Organ level of organization	Coelenterata

[AIPMT (Main)-2011]

21. The figure shows four animals (a), (b), (c) and (d). Select the correct answer with respect to a common characteristics of two of these animals.

(a) 

(b 

(c) 

(d) 

(1) (c) and (d) have a true coelom

(2) (a) and (d) respire mainly through body wall

(3) (b) and (c) show radial symmetry

(4) (a) and (b) have cnidoblasts for self defence.

[AIPMT (Pre)-2012]

22. In which one of the following, the genus name, its two characters and its phylum are not **correctly** matched, whereas the remaining three are **correct** ?

	Genus Name	Two characters	Class/ Phylum
(1)	*Sycon*	(a) Pore bearing (b) Canal system	Porifera
(2)	*Periplaneta*	(a) Jointed (b) appendages Chitinuous exoskeleton	Arthropoda
(3)	*Pila*	(a) Body segmented (b) Mouth with Radula	Mollusca
(4)	*Asterias*	(a) Spiny skinned (b) Water vascular system	Echinodermata

[AIPMT (Main)-2012]

23. Which one of the following organisms is scientifically correctly named, correctly printed according to the International Rules of Nomenclature and correctly described ?

(1) ***Felis tigris* -** The Indian tiger, well protected in Gir forests.

(2) ***E coli* -** Full name Entamoeba coli, a commonly occuring bacterium in human intestine.

(3) ***Musca domestica* -** The common house lizard, a reptile.

(4) ***Plasmodium falciparum* -** A protozoan pathogen causing the most serious type of malaria.

24. Which one of the following categories of animals, is correctly described with no single exception in it ?

(1) All sponges are marine and have collared cells.

(2) All mammals are viviparous and possess diaphragm for breathing

(3) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal)

(4) All bony fishes have four pairs of gills and an operculum on each side.

25. Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them ?

(1) ***Ascaris* and *Ancylostoma*** – Metameric segmentation

(2) **Sea horse and Flying fish** - Cold blooded (poikilothermal)

(3) ***Pteropus* and *Ornithorhyncus*** - Viviparity

(4) **Garden lizard and Crocodile** – Three chambered heart

[AIIMS-2012]

26. The most poisonous fish is :

(1) Clown fish (2) Eel

(3) Tiga fish (4) Stone fish

27. Find out the correct Matching ?

(1) **Ostrich, peacock, *Peteromyzon*** – Vertebrate Exception – Peteromyzon

(2) ***Ascaris*, Leech, Earthworm** - Eucoelomate Exception-Ascaris

(3) ***Scoliodon, Pristis, Exocoetus*** - Osteichthyes exception- Exocoetus

(4) ***Bufo, Rana, Chelone*** - Reptilia Exception Chelone

[NEET UG-2013]

28. One of the representatives of Phylum Arthropoda is :

(1) Flying fish (2) Cuttle fish

(3) Silver fish (4) Puffer fish

29. Which group of animals belong to the same phylum ?

(1) Sponge, Sea anemone, Starfish

(2) Malarial parasite, *Amoeba*, Mosquito

(3) Earthworm, Pinworm, Tapeworm

(4) Prawn, Scorpion, Locusta

30. Infection of Ascaris usually occurs by :

(1) Mosquito bite

(2) Drinking water containing eggs of Ascaris

(3) Eating imperfectly cooked pork.

(4) Tse-tse fly

31. Which of the following are correctly matched with respect to their taxonomic classification ?

(1) Spiny anteater, sea urchin, sea cucumber - Echinodermata

(2) Flying fish, cuttlefish, silverfish - Pisces

(3) Centipede, millipede, spider, scorpion - Insecta

(4) House fly. butterfly, tsetsefly, silverfish - Insecta

32. Match the name of the animal (column I), with one characteristics (column II), and the phylum/class (column III) to which it belongs :

	Column I	**Column II**	**Column III**
(1)	*Adamsia*	radially symmetrical	Porifera
(2)	*Petromyzon*	ectoparasite	Cyclostomata
(3)	*Ichthyophis*	terrestrial	Reptilia
(4)	*Limulus*	Body covered by chitinous	Pisces

[AIIMS-2013]

33. Which of the following pairs of organisms, possess stinging cells (nematocytes) ?

(1) Sea fan and Sea pen

(2) Cobra and Scorpion

(3) Cockroach and Mosquito

(4) Wasp and Honey bee

[AIPMT-2014]

34. Which one of the following living organisms completely lacks a cell wall ?

(1) Cyanobacteria

(2) Sea – fan (*Gorgonia*)

(3) Saccharomyces

(4) Blue-green algae

35. Select the Taxon mentioned that represents both marine and fresh water species :

(1) Echinoderms (2) Ctenophora

(3) Cephalochordata (4) Cnidaria

36. Planaria possess high capacity of :

(1) Metamorphosis

(2) Regeneration

(3) Alternation of generation

(4) Bioluminescence

37. A marine cartilaginous fish that can produce electric current is :

(1) *Pristis*

(2) *Torpedo*

(3) *Trygon*

(4) *Scoliodon*

[AIIMS-2014]

38. Find out the correct option regarding following organisms; *Fasciola; Ascaris; Nereis: Periplaneta* :

(1) Except *Fasciola*, rest all have a complete digestive system

(2) *Ascaris* and *Nereis* have internal fertilisation

(3) Except *Ascaris* all others show metamerism

(4) *Periplaneta* has compound eyes rest others have simple eyes

39. Which of the following is **correct** match ?

(1) **Human and Frog** -Nucleated RBC

(2) **Ascaris and Liver fluke** -Internal Fertilisation

(3) **Earthworm and cockroach** -sexual dimorphism

(4) **Nereis and Hydra** - Segmented body

[AIPMT-2015]

40. Which of the following animal is not viviparous ?

(1) Elephant

(2) Platypus

(3) Whale

(4) Flying fox (Bat)

41. Which of the following represents the correct combination without any exception ?

	Characteristics	Class
(1)	Mouth ventral, gills without operculum; skin with placoid scales; persistent notochord	Chondrichthyes
(2)	Sucking and circular mouth: jaws absent, integument without scales, paired fins	Cyclostomata
(3)	Body covered with feathers; skin moist and glandular; fore-limbs modified into wings	Aves
(4)	Mammary gland; hair on body; pinnae; two pairs of Limbs	Mammalia

42. The active form of Entamoeba histolytica feeds upon :

(1) Mucosa and submucosa of colon only

(2) Food in intestine

(3) Blood only

(4) Erythrocytes; mucosa and submucosa of colon

43. Which of the following endoparasites of humans does show viviparity ?

(1) *Enterobius vermicularis*

(2) *Trichinella spiralis*

(3) *Ascaris lumbricoides*

(4) *Ancylostoma duodenale*

[Re-AIPMT-2015]

44. Metagenesis refers to :

(1) Presence of a segmented body and parthenogenetic mode of eproduction

(2) Presence of different morphic forms

(3) Alternation of generation between asexual and sexual phases of an organism

(4) Occurrence of a drastic change in form during post -embryonic development

45. Which one of the following animals has two separate circulatory pathways ?

(1) Shark (2) Frog

(3) Lizard (4) Whale

46. Body having meshwork of cells, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum :

(1) Protozoa (2) Coelenterata

(3) Porifera (4) Mollusca

47. A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is :

(1) *Petromyzon* (2) *Eptetretus*

(3) *Myxine* (4) *Neomyxine*

[NEET-2016]

48. Which of the following features is not present in the Phylum-Arthropoda ?

(1) Chitinous exoskeleton

(2) Metameric segmentation

(3) Parapodia

(4) Jointed appendages

49. Which of the following characteristic features always holds true for the **corresponding group** of animals ?

(1)	Cartilaginous endoskeleton	Chondrichthyes
(2)	Viviparous	Mammalia
(3)	Possess a mouth with an upper and a lower jaw	Chordata
(4)	3- chambered heart with one incompletely divided ventricle	Reptilia

50. Which one of the following characteristics is not shared by birds and mammals ?
(1) Ossified endoskeleton
(2) Breathing using lungs
(3) Viviparity
(4) Warm blooded nature

[NEET-2017]

51. An important characteristic that Hemichordates share with Chordates is :
(1) absence of notochord
(2) ventral tubular nerve chord
(3) pharynx with gill slits
(4) pharynx without gill slits

52. Which among these is the correct combination of aquatic mammals ?
(1) Seals, Dolphins, Sharks
(2) Dolphins, Seals, *Trygon*
(3) Whales, Dolphins, Seals
(4) *Trygon*, Whales, Seals

53. In case of porifernas, the spongocoel is lined with flagellated cells called :
(1) Ostia
(2) Osculum
(3) Choanycytes
(4) Mesenchymal cells

[AIIMS 2017]

54. Which of the following is correct option ?
(1) Frog - External fertilisation
(2) *Scoliodon* - External fertilisation
(3) *Exocoetus* - Internal fertilisation
(4) *Ophiura* - Internal fertilisation

55. Find out the correct match :
(1) *Chelone, Chameleon, Calotes* – Epidermal scales
(2) *Ornithorhynchus, Panthera leo, Macropus* - Oviparous
(3) *Exocoetus, Pavo, Psittacula, Columba* - Forelimbs are modified into wings
(4) Scoliodon, Pristis, Pterophyllum - Placoid scales

56. External fertilization is found in :
(1) *Hemidactylus* (2) *Trygon*
(3) *Catla* (4) *Scoliodon*

57. Select the group of animals in which jointed appandages are found ?
(1) *Limulus, Apis* and *Laccifer*
(2) *Limulus, Neries* and *Laccifer*
(3) Locust, Flae and Snail
(4) *Apis, Laccifer* and Unio

58. Select the correct match pair and choose the correct option ?
(1) Snail → in mouth → Radulla → Rasping organ
(2) Sea Urchin → in mouth → Aristotle lattern's → Secretory organ
(3) *Ascaris* → On lips → Phasmids → Sensory organ
(4) Cockroach → In buccal cavity → Mandibles → Chewing the food

59. Which of the following option is correct regarding animal kingdom ?

	Phylum	Symmetry	Example	Characteristic property
(1)	Colenterata	Bilateral	*Hydra*	Aquatic, Marine
(2)	Annelida	Bilateral	*Ancylostama*	Hooks and Suckers present
(3)	Platyhelminimes	Bilateral	*Planaria*	High regeneration capacity
(4)	Mollusca	Radial	*Pinctada*	Aquatic

60. Which of the following have internal fertilization ?

(1) Sea urchin (2) Platypus

(3) Frog (4) *Labeo*

61. Which of the following is correctly matched with its characters ?

	Animal	Phylum	Character
(1)	*Planaria*	Platyhelminthes	Regeneration
(2)	*Pleurobrachia*	Cnidaria	Combplate
(3)	*Adamsia*	Annelida	Cnidoblast
(4)	*Pheretima*	Aschelminthes	Flame cell

[NEET-2018]

62. Ciliates differ from all other protozoans in

(1) Having two types of nuclei

(2) Using flagella for locomotion

(3) Using pseudopodia for capturing prey

(4) Having a contractile vacuole for removing excess water

63. **Identify** the vertebrate group of animals characterized by crop and gizzard in its digestive system :

(1) Osteichthyes (2) Amphibia

(3) Aves (4) Reptilia

64. Which one of these animals is **not** a homeotherm ?

(1) *Psittacula* (2) *Macropus*

(3) *Camelus* (4) *Chelone*

65. Which of the following animals does **not** udergo metamorphosis ?

(1) Starfish (2) Earthworm

(3) Moth (4) Tunicate

[NEET-2019]

66. Match the following organisms with their respective characteristics :

(a) *Pila* (i) Flame cells

(b) *Bombyx* (ii) Comb plates

(c) *Pleurobrachia* (iii) Radula

(d) *Taenia* (iv) Malpighian tubules

Select the correct option from the following:

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(iii)	(i)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(iii)	(iv)	(ii)	(i)

67. Consider following features :

(a) Organ system level of organisaiton

(b) Bilateral symmetry

(c) True coelomates with segmentation of body

Select the **correct** option of animal groups which possess all the above characteristics.

(1) Arthropoda, Mollusca and Chordata

(2) Annelida, Mollusca and Chordata

(3) Annelida, Arthropoda and Chordata

(4) Annelida, Arthropoda and Mollusca

[NEET(UG)-2019 (Odisha)]

68. Match the following genera with their respective phylum:

(a) Ophiura	(i) Mollusca
(b) Physalia	(ii) Platyhelminthes
(c) Pinctada	(iii) Echinodermata
(d) Planaria	(iv) Coelenterata

Select the correct option:

(1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)

(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

(4) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

69. Which of the following animals are true coelomates with bilateral symmetry ?

(1) Adult Echinoderms

(2) Aschelminthes

(3) Platyhelminthes

(4) Annelids

[NEET(UG)-2020]

70. Match the following columns and select the correct option.

Column-I	**Column-II**
(a) 6-15 pairs of gill slits	(i) Trygon
(b) Heterocercal Caudal fin	(ii) Cyclostomes
(c) Air Bladder	(iii) Chondrichthyes
(d) Poison sting	(iv) Osteichthyes

(1) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(4) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

71. Bilaterally symmetrical and acoelomate animals are exemplified by:

(1) Annelida

(2) Ctenophora

(3) Platyhelminthes

(4) Aschelminthes

72. Which of the following statements are true for the phylum-Chordata?

(a) In Urochordata notochord extends from head to tail and its is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (b) and (c) (2) (d) and (c)

(3) (c) and (a) (4) (a) and (b)

73. Match the following columns and select the **correct** option.

Column-I	**Column-II**
(a) Gregarious, pest	(i) Asterias
(b) Adult with radial symmetry and larva with bilateral symmetry	(ii) Scorpion
(c) Book lungs	(iii) Ctenoplana
(d) Bioluminescence	(iv) Locusta

(1) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

(2) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(4) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

[NEET(UG)-2020]

74. Which of the following options does correctly represent the characteristic features of phylum Annelida?

(1) Triploblastic, unsegmented body and bilaterally symmetrical.

(2) Triploblastic, segmented body and bilaterally symmetrical.

(3) Triploblastic, flattened body and acoelomate condition.

(4) Diploblastic, mostly marine and radially symmetrical.

75. Match the following group of organisms with their respective distinctive characteristic and select the correct options:

	Organisms		**Characteristics**
(a)	Platyhelminthes	(i)	Cylindrical body with no segmentation
(b)	Echinoderms	(ii)	Warm blooded animals with direct development
(c)	Hemichordates	(iii)	Bilateral symmetry with incomplete digestive system
(d)	Aves	(iv)	Radial symmetry with indirect development

(1) (a)-(iii), (b)-(iv), (c)-(i), (d)-ii

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-i

(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-iii

(4) (a)-(i), (b)-(ii), (c)-(iii), (d)-iv

76. Match the following columns and select the correct option:

Column-I	**Column-II**
(a) *Aptenodytes*	(i) Flying fox
(b) *Pteropus*	(ii) Angle fish
(c) *Pterophyllum*	(iii) Lamprey
(d) *Petromyzon*	(iv) Penguin

(1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-i

(2) (a)-(iii), (b)-(iv), (c)-(i), (d)-ii

(3) (a)-(iv), (b)-(i), (c)-(ii), (d)-iii

(4) (a)-(ii), (b)-(i), (c)-(iv), (d)-iii

77. All vertebrates are chordates but all chordates are not vertebrates, why?

(1) Notochord is replaced by vertebral column in adult of some chordates.

(2) Ventral hollow nerve cord remains throughout life in some chordates.

(3) All chordates possess vertebral column.

(4) All chordates possess notochord throughout their life.

[NEET(UG)-2021]

78. Read the following statements.

(a) Matagenesis is observed in Helminths

(b) Echinoderms are triploblastyic and coelomate animals.

(c) Round worm have organ-system level of body organization

(d) Comb plates present in ctenophores help in digestion.

(e) Water vascular system is characteristic of Echinoderms.

Choose the correct answer from the options given below.

(1) (c), (d) and (e) are correct

(2) (a), (b) and (c) are correct

(3) (a), (d) and (e) are correct

(4) (b), (c) and (e) are correct

79. Match List - I with List - II.

List-I		**List-II**	
(a)	Metamerism	(i)	Coelenterata
(b)	Canal system	(ii)	Ctenophora
(c)	Comb plates	(iii)	Annelida
(d)	Cnidoblasts	(iv)	Porifera

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(i)	(ii)	(iii)

80. Match the following:

List-I		List-II	
(a)	*Physalia*	(i)	Pearl oyster
(b)	*Limulus*	(ii)	Portuguese Man of War
(c)	*Ancylostoma*	(iii)	Living fossil
(d)	*Pinctada*	(iv)	Hookworm

	(a)	(b)	(c)	(d)
(1)	(ii)	(iii)	(i)	(iv)
(2)	(iv)	(i)	(iii)	(ii)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(i)	(iv)	(iii)	(ii)

81. Which one of the following organisms bears hollow and pneumatic long bones?
(1) *Neophron*
(2) *Hemidactylus*
(3) *Macropus*
(4) *rnithorhynchus*

82. Which one of the following belongs to the family Muscidae ?
(1) Fire fly
(2) Grasshopper
(3) Cockroach
(4) House fly

[NEET(UG)-2022]

83. In which of the following animals, digestive tract has additional chambers like crop and gizzard?
(1) *Corvus, Columba, Chameleon*
(2) *Bufo, Balaenoptera, Bangarus*
(3) *Catla, Columba, Crocodilus*
(4) *Pavo, Psittacula, Corvus*

84. In the taxonomic categories which hierarchial arrangement in ascending order is **correct** in case of animals ?
(1) Kingdom, Phylum, Class, Order, Family, Genus, Species
(2) Kingdom, Class, Phylum, Family, Order, Genus, Species
(3) Kingdom, Order, Class, Phylum, Family, Genus, Species
(4) Kingdom, Order, Phylum, Class, Family, Genus, Species

85. Exoskeleton of arthropods is composed of:
(1) Cutin (2) Cellulose
(3) Chitin (4) Glucosamine

86. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) :
All vertebrates are chordates but all chordates are not vertebrates.
Reason (R) :
Notochord is replaced by vertebral column in the adult vertebrates.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**
(3) **(A)** is correct but **(R)** is not correct
(4) **(A)** is not correct but **(R)** is correct

87. Nitrogenous waste is excreted in the form of pellet or paste by :
(1) *Ornithorhynchus*
(2) *Salamandra*
(3) *Hippocampus*
(4) *Pavo*

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	3	3	2	2	2	3	4	2	3	3	4	4	1	4	2	2	3	3	1	2	1	3	4	4	2
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	4	2	3	4	2	4	2	1	2	4	2	2	1	2	2	1	4	2	3	4	3	1	3	1	3
Que.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	3	3	3	1	1	3	1	1	3	2	1	1	3	4	2	4	3	2	4	2	3	1	3	2	1
Que.	76	77	78	79	80	81	82	83	84	85	86	87													
Ans.	3	1	4	3	3	1	4	4	1	3	1	4													