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Vol. 1 for NEET 2025

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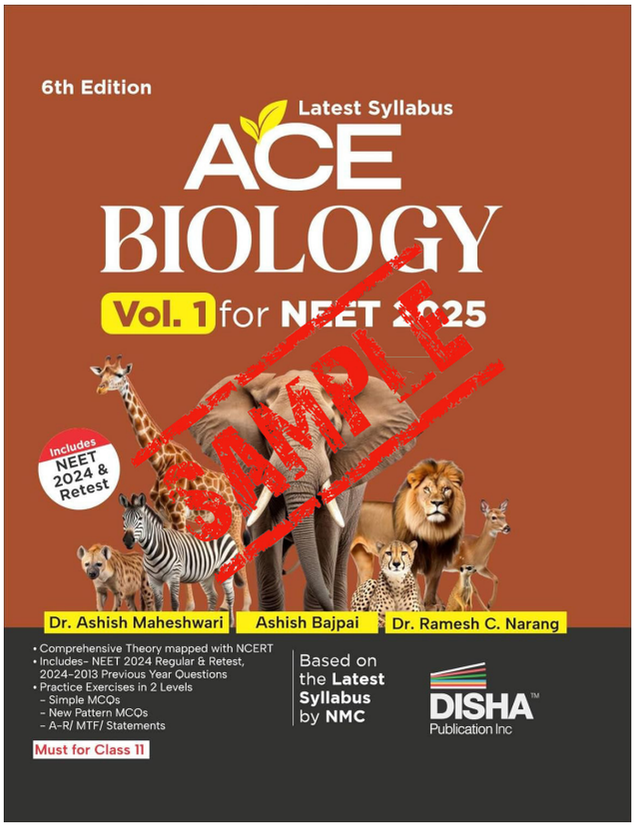

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4

Zoology

Animal Kingdom

Chapter At A Glance

- Basis of Classification
- Classification of Animals

BASIS OF CLASSIFICATION

There are fundamental differences in the various individuals of animal kingdom. These differences can be in the arrangement of cells, level of organization, body wall, type of symmetry, body plan and type of coelom etc. These differences form the basis of classification.

Grade or level of organization

There are four levels of Organisation in animals.

1. Cellular level of organization-This occurs in porifers where the individual function is performed by a particular cell. Here the cells are loosely arranged. The Choanocytes, for example, by flagella, create the water current for filter feeding and the Scleroblasts form the spicules.

2. Tissue or cell- tissue level of organization- It has developed in Cnidaria and Ctenophora. Here the specific tissues like nervous and gonadal, have been developed.

3. Organ or tissue organ level of organisation- It is found in flatworms (Platyhelminthes) where various forms of tissues have been organized to form organs like excretory organs and Brain. (Do remember, Hydra, a cnidarian, has nervous tissue but does not have brain)

4. System / organ system level of organization- From Aschelminths to chordata, all have organ system grade of organization. They have developed various systems like digestive, reproductive, respiratory, and circulatory etc,. up to various degree of complexity.

Body wall

In metazoans the body develops from two or three germ layers, i.e., ectoderm and endoderm, or the ectoderm, mesoderm and endoderm.

In animal kingdom there are two types of body wall:

1. Diploblastlc Body Wall- e.g., Cnidarians and Ctenophores Here the body of the organism develops from two germ layers, i.e., ectoderm and endoderm.The two layers are cemented together by jelly -like mesoglea.Remember, mesoglea is a non-cellular layer.

2. Trlploblastic Body Wall– e.g., Platyhelminthes to Chordates The body of, such animals develop from all three germ layers, i.e., ectoderm, mesoderm and endoderm. Unlike mesoglea, the mesoderm is a cellular layer,

Symmetry

In lower forms, like porifers (sponges) the body is asymmetrical. If their body is cut through the centre into two halves, these halves cannot be identical. However, in higher forms there is a specific symmetry in the body of the animals.

There are 2-major type of symmetry in higher animals

1. Radial symmetry -e.g., Cnidarians, Ctenophores and Echinoderms

In Cnidarians, for example, the body is cylindrical and if cut into two halvesthrough the centre of the axis, the resulted two parts will be identical. However, the right and left, or the dorsal and ventral side in such symmetry are not differentiated.

The radial symmetry is advantages to sessile (attached animals) as they can feed from all directions.

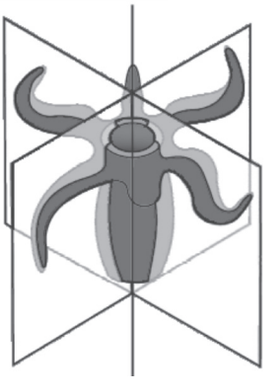


Fig.: Radial symmetry

2. Bilateral symmetry -e.g., Platyhelminthes to Molluscs and Hemichordates to chordates

The body of such animals can be differentiated into right and left halves, because they show lateral symmetry. The body can be cut into longitudinally into two halves. However, there is no similarity in dorsal and ventral side or the anterior and posterior sides.

A modified type of radial symmetry, called **Biradial symmetry**, is present in anthozoans (cnidaria), where opposite sides are identical but the adjacent sides are not.

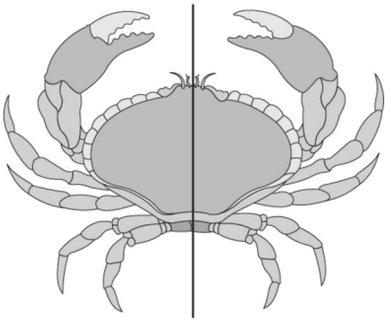


Fig.: Bilateral symmetry

Body plan

There are 3-types of body plans, mainly depending upon the presence or absence, or the complexity, of the gut.

1. Cell aggregate Body plan- e.g., Porifers

The gut is not differentiated and the ingestion is wholly intracellular. The whole body consists of a group of well differentiated cells.

2. Blind sac Body Plan– e.g., Cnidarians, Ctenophores and Platyhelminthes

The gut cavity has a singleopening, called 'mouth'. The anal opening is absent. The alimentary is, therefore, a blind sac. The undigested waste in such cases is also removed through the same, so called, mouth opening.

3. Tube-within-Tube Body plan e.g., Aschelminths to Chordates

Here the gut is complete, tubular and more complex with separate mouth and anal opening

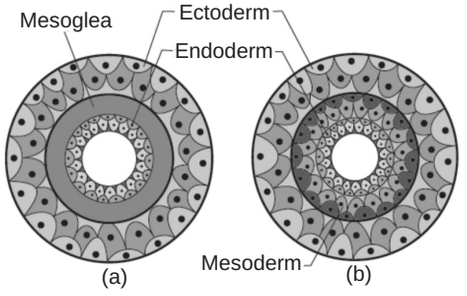


Fig.: Showing germinal layers (a) Diploblastic (b) Triploblastic

Coelom

It is a body cavity present between the body wall and the gut. Based on bodycavity, the animals can be differentiated into three categories.

1. Acoelomate- e.g.,Porifers, Cnidarians, Ctenophores and Platyhelminthes

Insuch animals, either the gut is not differentiatedorifit isdifferentiated (e.g.Gastrovascular cavityof Cnidarians or the incomplete gut of Platyhelminthes) then, there is no cavity between body wall and the gut. ln Platyhelminthes, thespace between ectoderm and endoderm is filled with mesodermal tissue.

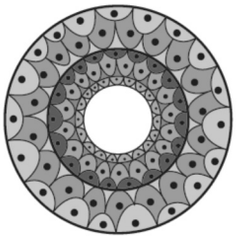


Fig.: Acoelomate

2. Pseudocoelomate- e.g.,Aschelminths (Nematodes)

In this group the body cavity lies between body wall and the gut, but it is not lined by mesoderm on both the sides. It is therefore, called Pseudocoelom. In such cases the mesoderm may be present as scattered pouches. representing**persistent blastocoel.** The gut cavity in such animals is not muscular (mesodermal layer absent around the gut) and the organs, therefore, lie loose (mesenteries absent). The peristalsis, due to*lack of muscular layer,* does not occur in pseudocoelomates.

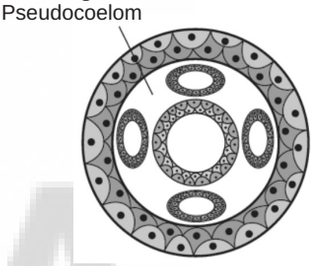


Fig.: Pseudocoelomate

3. Eucoelomates- e.g., Annelids to Chordates

The eucoelomate animals have 'true coelom', i.e., a body cavity lined withmesoderm on both the sides. Here the muscular lining allows the organs *to* move independently. The organs in true coelom arc held in place by mesenteries. On the basis of origin, the true coelom is of **2-types**.

(i) Schizocoel– e.g., Annelids, Arthropods and Molluscs
Such coelom develops by the splitting of mesodermal segments.

(ii) Enterocoel– e.g., Echinoderms, Hemichordates and Chordates

This type of coelom develops bypouching oroutpocketing of the archenteron (cavityof gastrula).

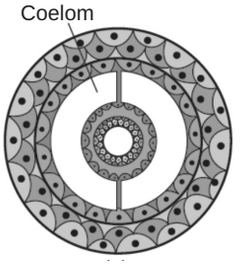


Fig.: Coelomate

Body Segmentation

Porifers, Cnidarians, Ctenophore, Platyhelminthes and Aschelminths do not have truly -segmented body. The true body segmentation first appeared in phylum Annelida. Such segmentation is called metameric segmentation, and the phenomenon of such segmentation is called **Metamerism**. Remember, the molluscs, are not metamerically segmented.

Notochord

The notochord forms the important basis of classification in the animal kingdom. The animals that do not have notochord are called Non- chordates, whereas the animals that have notochord at any stage of the life cycle, are called, Chordates. The chordates include **Protochordates** to **Vertebrates**. In case of vertebrates, the notochord is modified into **vertebral column.**

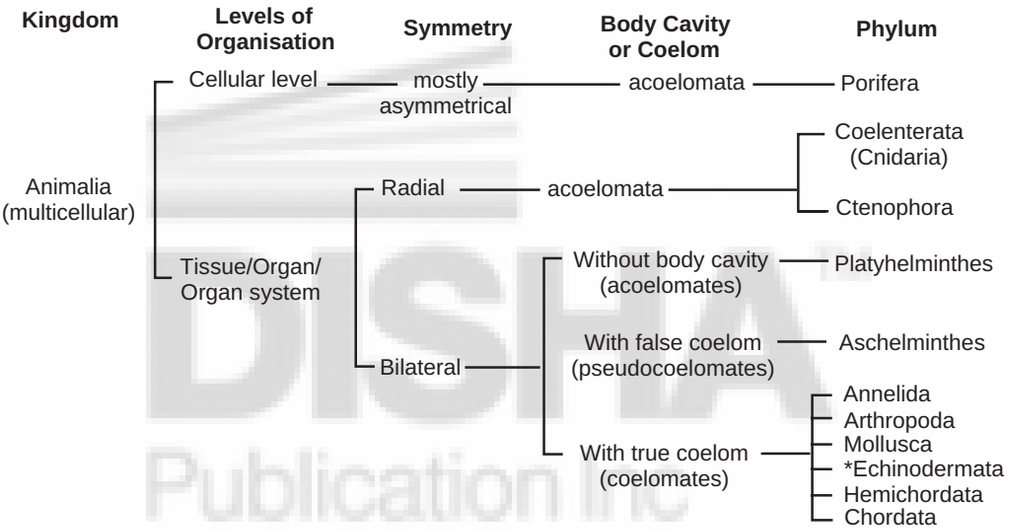
The notochord is derived from **mesoderm** and lies below spinal cord/ neural cord of the body of the chordates.

CLASSIFICATION OF ANIMALS

On the basis of above fundamental points, the Animal Kingdom can be divided into two major groups:

1. Animals with the **cellular level** of organization,
2. Animals with **tissue/ organ / organ system**, level of organization.

The 1st group includes only one Phylum, i.e., Porifera;whereas the 2nd group includes **radially symmetrical animals**of **Cnidaria** and **Ctenophora**, and **bilaterally symmetrical animals**, belonging to **Platyhelminthes**(Acoelomate), **Aschelminthes** (Pseudocoelomate) and **Annelids** to **Chordates** (True coelomate). The inclusion of Echinodermata in Bilateria can be justified as the developmental stages (larvae) of Echinoderms are all bilaterally symmetrical. Please note that adults of Echinoderms are all radially symmetrical.



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

Fig.: Broad classification of Kingdom Animalia based on common fundamental features

Phylum-Porifera

- Pore bearing animals
- 2-types of pores, **Ostia-** incurrent pores, **Osculum-** excurrent pore; Ostia act as mouths and osculum as anus. A sponge thus has many 'mouths' but one 'anal' opening
- Porifers are multicellular animals. They are most primitive metazoans.
- They are commonly called **sponges.**
- All sponges are aquatic- mostly marine, and free living(not parasites)
- All are **Sessile** (attached to substratum) i.e., the *locomotory structures are absent in adults*. The characteristic cells of sponges are **'Cboanocytes**or **Collar cells'.**
- Sponges have **Cellular grade of organization**.
- Amongst metazoans, the Porifers have Maximum regeneration power.
- Body plan is **Cell aggregate type**
- Most of the porifers are**asymmetrical**
- Skeleton consists of **spicules** or **spongin fibres**.
- **Body wall diploblastic**, with ectoderm and endoderm. The **mesoderm is absent**. Mesoglea, a non- cellular and jelly type, is however, present between ectoderm and endoderm. Similar mesoglea is present in Cnidarians.
- Mesoglea- non-cellular and jelly like
- Body cavity - **Spongocoel** or Para gastric cavity
- Coelom absent- all sponges are **acoelomate.**

- **Canal system,** for the transportation of water,is the characteristic feature of all porifers
- Respiration - aerobic and through general body surface
- Excretion - Ammonotelic and excretion through general body surface
- Nutrition - all filter- feeders, Digestion - intracellular

(The animals which create water current with ciliary or flagellar beating and pick-up the food particles from it, are called, **filterfeeders**).

- Blood and Nervous tissue are absent
- Reproduction- Asexual and sexual both. Mostly bisexual or Hermaphrodite. Asexual reproduction by **budding** or by **gemmule** formation '(in fresh water forms).
- In sexual reproduction the development is **indirect**, i.e., having Larval stages.

Examples:

Leucosolenia(simplest sponge), ***Scypha*** (***Sycon***), ***Euplectella*** (Venus flower basket), ***Euspongia***(common bath sponge)- Spicules absent but spongin fibres present, ***Spongilla*** (common fresh water sponge), ***Ephydatia*** is also a fresh water sponge. The fresh water sponges also produce **Gemmules** for asexual mode of reproduction.

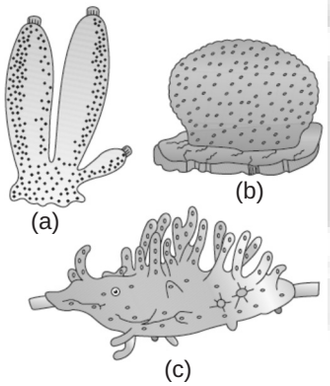


Fig.: Examples of Porifera : (a) *Sycon* (b) *Euspongia* (c) *Spongilla*

Phylum-Cnidaria (Coelenterata)

- All cnidarians are Aquatic- mostly marine. Some sessile (attached) while others are free swimming.
- **Radially symmetrical**
- Sessile or free-swimming in nature
- **Cell- tissue level of organization**
- **Body plan- Blind-sac type,** having single opening, acting as 'mouth' and 'anus'.
- **Locomotory structures- Tentacles**
- **Body wall- Diploblastic** (Ectoderm and endoderm with jelly- like mesoglea)
- Body cavity - **Coelenteron** or Gastrovascular cavity
- Coelom absent **-Acoelomate**
- Characteristic cells are **Cnidoblasts or Nematoblasts,** commonly called **Stinging cells. Cnidoblasts** are used for offence (capturing prey), defense and anchorage.

Fig.: Diagrammatic view of Cnidoblast

- Cnidarians are Solitary or colonial forms. Colony can be monomorphic, dimorphic(2- forms, *Polyp* and *Medusa*), or polymorphic
- Polyp forms of some cnidarians (anthozoans) secrete exoskeleton of Calcium carbonate, to form**Corals**
- Respiration- aerobic, through general body surface
- Excretion- through general body surface, excretory product- NH3 (Ammonotelic)
- Digestion- *partly extracellular* (incoelenteron, which is called *Gastrovascular cavity)* and *partly intracellular* (in nutritive cells). Undigested food material is removed through mouth/anus.
- Nervous tissue developed for the first time- in the form of network of neurons. The **brain is absent.**
- Most of the cnidariansoccur in 2- bodyforms, i.e., Polyp form, e.g., Hydra, Adamsia,
- and Medusa form (e.g., Aurelia- Jelly-fish). Some cnidarians, like'Obelia', have both the forms and show **Alternation of Generation**, called **Metagenesis.**(Do not confuse it with *metamorphosis*)
- The **Polyp form** is tubular in shape. It is mainly feeding form and can be sessile or free swimming. It can be unisexual (Dioecious) or bisexual (Monoecious).
- The **Medusa form** is umbrella- shaped and is mainly reproductive form. It is dioecious and reproduces sexually only.
- Cnidarians reproduce asexually or sexually, orby both means. Asexual reproduction occurs by budding. In sexual reproduction, the development is either direct or indirect (with larva). There are 2- forms of larvae, **Planula** and **Ephyra**, the later in jelly fishes.

Check Point

1. **What are locomotory structures in the following protozoans:**
   Trypanosoma, Babesia, Paramecium, Opalina, Euglena, Leishmania
2. **Name the diseases caused by -**
   Entamoeba histolytica, Leishmania donavani, Plasmodium, Trypanosoma gambience

Examples of cnidarians:

Hydra, ***Aurelia*** (Jelly fish), ***Obelia***, ***Adamsia*** (Sea anemone), ***Pinnatula*** (Sea pen), ***Gorgonia*** (Sea fan), ***Physalia*** (Portuguese man of war), ***Meandrina*** (Brain coral).

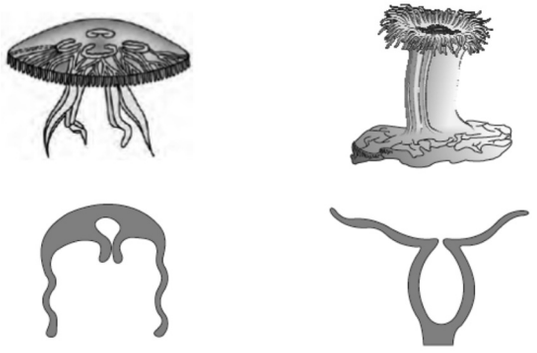


Fig.: Examples of Coelenterata indicating outline of their body form : (a) *Aurelia* (Medusa) (b) *Adamsia* (Polyp)

Phylum-Ctenophora

- **Acoelomate** animals with **Tissue grade** of organization
- Body plan- Blind sac type
- Ctenophores, due to their shapes, are commonly called as **Sea wall nuts** or **Sea Goose berries**. They are colorful and jelly- fish like or medusa forms of cnidarians.
- The characteristic feature of ctenophores is the presence of **Comb plates**. The are 8 in number and help in locomotion. The comb plates, being ciliated are also called as **Ciliary plates,** or **Paddle plates** (for movement). Due to the presence of comb plates, the ctenophores are commonly called as **COMB JELLIES**.
- Another characteristic feature of ctenophores is the presence of **Bioluminescence**, a property of light emitting by living forms.
- They are **exclusively marine**, pelagic (free swimming) and solitary forms.
- They all are **radially symmetrical**.
- Body is unsegmented and the body wall is **Diploblastic**.
- The Cnidoblasts are absent but Lasso cells are present for capturing the prey.
- Because of free swimming habit, body contains**Statocyst**, a balancing structure.
- As in cnidarians, the digestionis, both extracellular and intracellular
- Skeletal, respiratory, excretory and circulatory systems are absent.
- Brain is absent, but a diffuse network of neurons is present.
- All are bisexual (Dioecious), Reproduction is only sexual type. Unlike cnidarians, the asexual mode of reproduction is absent. Fertilization is external or internal.
- Ctenophores, like cnidarians, have great power ofregeneration.
- Development is indirect (larva present), The alternation of generation (**Metagenesis**) is absent in ctenophores.

Examplesof ctenophores:
Ctenoplana*, *Beroe*, *Pleurobrachia

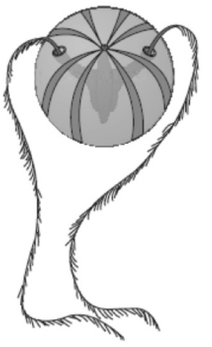


Fig.: Example of Ctenophora (*Pleurobrachia*)

Phylum-Platyhelminthes

- Aquaticorterrestrial
- Free-livingorparasite
- Dorsoventrally-flattenedanimals.Commonly called **Flatworms.**
- Tissue - **Organ level** of body organization
- **Cepbalization** appeared for the first time
- **Bilaterally symmetrical**
- **Acoelomate**
- Body wall is **Triploblastic** (Body develops from 3-germ layers)
- **Blind sac body plan -** Mouth present but anal opening absent
- The characteristic cells in flat worms are **FLAME CELLS** (also known as Protonephridia or Solenocytes) which help in osmoregulation and excretion.
- Alimentary canal in complete and branched.Digestion extracellular. Parasitic forms have hooks or suckers.
- Mostly endoparasite, found in the body of other animals, including humans.
- Generally, Osmotrophs - getting nourishment through *general body surface*.
- Respiration - aerobic in free living forms butan aerobic in parasitic forms
- Locomotion by suckers or ciliated skin
- Nervous tissue well developed . *Brainpresent*
- Blood or Blood vascular system absent
- Mostly bisexual/hermaphrodite or **monoecious** (e.g, *Planaria,*Tapeworm and Liverfluke). Blood fluke is however, unisexual or **dioecious**.
- Reproduction - asexual (by **transverse fission),** or sexual. Fertilization self or cross, but internal. (Remember, Planaria possess high regeneration power).
- Development generally indirect through many larval stages.

Examples of Platyhelminthes:
Planaria (freeliving form), ***Taenia*** (Tapeworm) ***Fasciola hepatica*** (liver fluke)

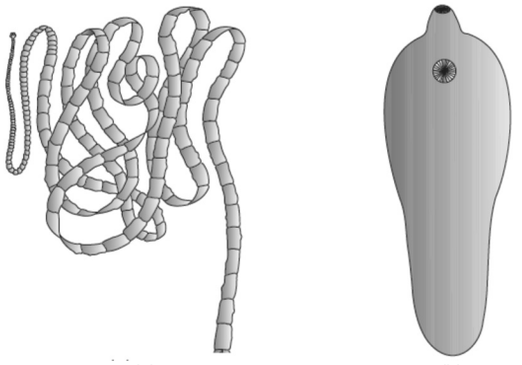


Fig.: Examples of Platyhelminthes : (a) Tape worm (b) Liver fluke

Phylum-Aschelminthes

- Aschelminthes are cylindrical in body shape, hence, called **roundworms** or thread worms. They are also **True worms**. (Remember, Tapeworm and earthworm are not true worms).
- They are **unsegmented**, **triploblastic** and **bilaterally symmetrical**
- They are free living (e.g.,*Rhabditis*)- can be aquatic or terrestrial; or parasites (in animals as well as plants).
- The characteristic feature of roundworms is **PSEUDOCOELOMATE** condition (Pseudocoelom is a persistent blastocoel)
- Body plan is **TUBE WITHIN TUBE** (Alimentary canal, unlike Platyhelminthes, is complete with mouth, muscular pharynx and the anal opening)
- Excretory pore is separate for the removal of excretory matter from the body cavity.
- Since, the number of cells in Aschelminthes body remains constant, the growth in the body occurs by increase in the size/volume of the cells, and not by multiplication of cells. Such growth is call **Auxetic growth**.
- Asexual reproduction and regeneration both, absent
- Unisexual (**Dioeceous**). Sexual dimorphism prominent. Females generally longer than males.
- Fertilization internal. Development is direct or indirect.

Examples of Aschelminthes:
Ascaris (Round worm)- It is endoparasite in small intestine of human, particularly children.
Ancylostoma duodenale (Hook worm) - It is monogenetic parasite of small intestine.
Wuchereria bancrofti (**Filaria worm**)- It is a digenetic parasite (having 2- hosts, i.e., Human and *Culex* mosquito), and causes Filariasis or **Elephantiasis.**
Other examples of Aschelminthes are Pin worm and Guinea worm.

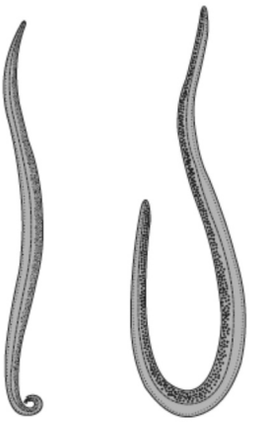


Fig.: Example of Aschelminthes: Roundworm

Phylum-Annelida

- Annelids are *free living* (*aquatic*- fresh water form or marine form, or *terrestrial*), or *parasites*
- Body organization- is of **Organ system level**. Body is segmented. Segments are ring -shaped (annulus), hence, called Annelids.
- Characteristic feature of annelids is **True segmentation** (**METAMERISM**). Segments (true) called metameres. (Remember, *Metamerism, besides Annelida, is also present in Phylum Arthropoda and Phylum Chordata*)
- Annelids are **Triploblastic** and **bilaterally symmetrical**.
- Locomotory structures - **Setae** and **Parapodia.** Body possesses both circular and longitudinal muscles for locomotion.
- Body plan - **Tube Within Tube**
- They are true coelomate (**Eucoelomate**). The type of coelom is **Schizocoel**.
- Alimentary canal well differentiated with mouth and anal opening
- Excretory structures are **Nephridia**
- Blood vascular system has developed for the first time. Blood pigment is dissolved in plasma. The RBCs are absent. The blood vascular system is CLOSED TYPE. [Out of 4-major types ofrespiratory (blood) pigments, i.e., Haemoglobin, Haemoerythrin, Chlorocruonin and Haemocyanin, the first three are present in Annelida]. **Haemocyanin** is absent in annelids but is present in molluscs and arthropods.
- Nervous system includes CNS (Central Nervous System), P (Peripheral) NS and A (Autonomous) NS. Ventral nerve cord is *ganglionated* and *paired*.
- Unisexual or bisexual forms. Reproduction sexual only. Fertilization external or internal. Development direct or indirect. If indirect the larva is **Trochophore**.

Examples of Annelids:

Pheretima (Earthworm)- It is terrestrial and **monoecious** (bisexual);

Hirudinaria(Leech)- It is aquatic but **monoecious**;

Nereis (sand worm)- It is aquatic but**dioecious**(unisexual).

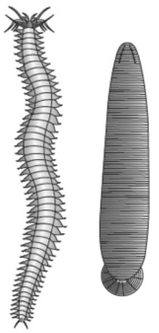


Fig.: Examples of Annelida : (a) *Nereis*; (b) *Hirudinaria*

Phylum-Arthropoda

- *Arthros*-**jointed**,*podos* - **legs**, i.e., animals with jointed legs or appendages
- It is the **largest phylum of the animal kingdom**, covering more than70 % of the animals
- Arthropods are Aquatic, terrestrial, or aerial (the only non-chordates which can be aerial).
- Like annelids, all arthropods have **organ system level** of body organization.
- They are **bilaterally symmetrical, triploblastic** and **true coelomate** animals
- Body is covered with Exoskeleton of **Chitin** (Remember, *Chitin is a polysaccharide*, not a protein)
- Periodic removal of exoskeleton is called **Ecdysis** or **Moulting** - which is essential for growth.
- In most of the arthropods, the body is differentiated into Head, Thorax and Abdomen.
- As in Annelids, the body in arthropods is also **Metamerically segmented**
- **Circulatory system**is **Open type** (*Capillaries absent, Haemocoel present*). Blood pigment present or **absent** (insects). If present it is Hemocyanin (having **Cu** instead of **Fe**)
- Respiratory structures are **Gills**, **Book lungs** and **Tracheal tubes**
- Excretory structures are **Green glands** (**Antennal glands**) in *Palaemon*, **Coxal glands**in Spider and Scorpion, and **Malpighiantubules**in insects.
- Nervous system is very well developed. **Eyes** are simple or **Compound.** The sensory structures also include **Statocyst** (for balancing) and **Antenna**.
- Arthropods are Unisexual (Dioecious) with well-marked sexual dimorphism. Fertilization internal. They are **Oviparous** or egg laying. Development is direct or indirect.

Examples of Arthropods:

Peripatus- a living connecting link between annelids and arthropods;

Limulus- a *living fossil*, commonly called King crab or Horse shoe crab;

Prawn (***Palaemon***), Crab, Scorpion, Spider.

Economically important insects-

Honey bee (***Apis***), Silk worm (***Bombyx***), Lac insect (***Laccifer***), Termites (white ants),Locusts- gregarious pests of crops.

Mosquitoes/ Vectors (***Anopheles***, ***CulexandAedes***);

Other important insects-

Silver fish (***Lepisma***), Dragon and Damsel flies, Butterflies, House flies etc.

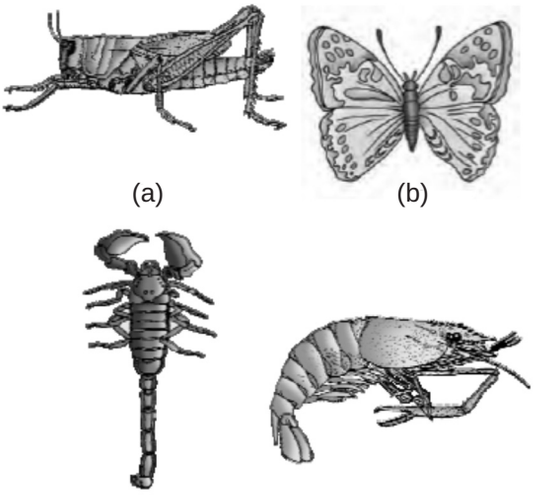


Fig.: Examples of Arthropoda :
(a) Locust; (b) Butterfly; (c) Scorpion; (d) Prawn

Check Point

1. **What are respiratory and excretory structures in the followings -**
   (i) Crab
   (ii) Mosquito
   (iii) Nereis
   (iv) Spider
   (v) Starfish
   (vi) Liver fluke
   (vii) Pila
   (viii) Ascaris

Phylum-Mollusca

- *Molluscus* - **soft bodied** (animals)
- Mollusca is the **2nd largest phylum of animal kingdom**.
- Aquatic (fresh water or marine) or terrestrial forms
- **Triploblastic**, **bilaterally symmetrical** and **true coelomates** (Coelom - Schizocoel)

- **Body unsegmented** and differentiated into Head, visceral hump and muscular foot
- Body organization is of **Organ system level.**
- The Visceral hump is covered with a fleshy flap called **Mantle** or Pallium. The presence of **MANTLE** is the characteristic feature of molluscs. It also forms a covering over gills.
- Most of the molluscs have skeleton of shells or plates of the $CaCO_3$
- Excretion occurs by modified Nephridia.
- Respiration by gills or ctenidia in aquatic forms and by pulmonary sac interrestrial forms.
- Buccal cavity in all molluscs, *except in bivalves*, contains a file-like, rasping organ for feeding, called **RADULA**.
- **Circulatory systemis Openor Closedtype**, Blood pigment is **Haemocyanin.** Heart in molluscs is **Myogenic (**not Neurogenic, as in arthropods**).**
- Locomotory structure is **foot** (or the **arms** - modified from foot)
- Nervous system- annelidan type
- Most of the forms are dioecious and oviparous. The development is mostly indirect.

Examples of molluscs:

Pila (apple snail) - a fresh water snail with coiled shell.
Unio - a bivalve mollusc.
Pinctada (pearl oyster),
Octopus (devil fish) – 8 arms but without shell.
Sepia (cuttlefish)- with 10 arms and internal shell plate, called cuttle bone.
Loligo (squid)- It is the largest and the most intelligent invertebrate, 10 armed.
(*Octopus, Sepia and Loligo* - all secrete blue black ink for defending from predators. *Sepia*and *Loligo* also show jet propulsion movement**).**
Aplysia (sea hare)- a soft bodied mollusc, *without shell*.
Dentalium (Elephant-tusk shell),
Chaetopleura (Chiton)- with 8 shell plates.

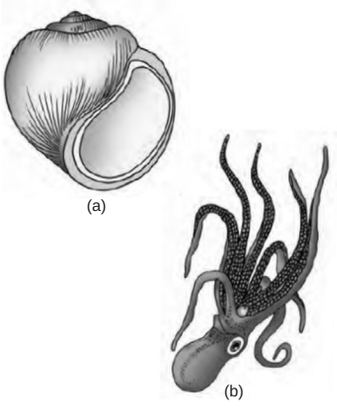


Fig.: Examples of Mollusca : (a) *Pila*; (b) *Octopus*

Phylum-Echinodermata

- *Echino*- spines, *derma*- skin - Spiny- skinned animals
- **Exclusively marine**
- *Endoskeleton mesodermal*- consisting of ossicles and spicules
- **Symmetry in adults - Radial**, generally pentamerous; **larvae-bilaterally symmetrical**.
- **Body unsegmented**
- **Organ system level** of organization.
- **Triploblastic** and **True coelomate**(*Coelom- Enterocoel*-a chordate character)
- Digestive system complete. Mouth is generally present on the ventral side, and anus on the dorsal side, of the body
- Locomotory structures- **Tube feet**
- **Excretory system** is *absent*. Excretion occurs by wandering amoebocytes
- Blood vascular system- called Haemal system, is reduced and **Open type**
- **The characteristic feature of echinoderms** is the presence of **Water vascular system** or **Ambulacral system,** that *helps in locomotion, food capturing and transportation*. The opening of this system is called *Madreporite.*
- **Respiration** - by gills or branchiae, tube feet and respiratory tree. The ambulacral system also helps in respiration.
- **Cephalization** (differentiation of Head from the body) **absent** and brain is not differentiated.
- Individuals are Dioecious but **sexual dimorphism absent (**The males and females cannot be externally differentiated**).**
- Reproduction is sexual type. *Fertilization external in water*. Development indirect with free- swimming larvae. Do remember that **Larvae in echinoderms are bilaterally symmetrical**

Example of Echinoderms:

Asterias (star fish or sea star, with pentamerous symmetry)
Echinus (Sea urchin) – locomotion by *movable spines*, Jaw apparatus is called **Aristotle Lantern**
Antedon(Sea lily or feather star) – mostly sessile with dorsal mouth, and water vascular system lacking.
Ophiura (brittle star)- shows **autotomy** (self-mutilation) of arms
Cucumaria and ***Holothuria*** (Sea cucumber) – show autotomy of visceral organs, (Wall lizard has autotomy of tail)

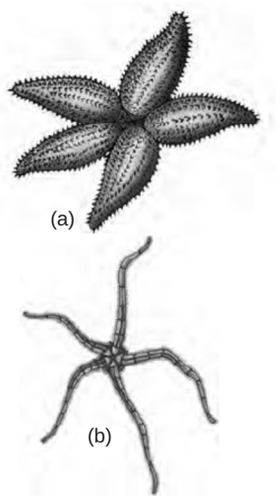


Fig.: Examples of Echinodermata **:** (a) *Asterias*; (b) *Ophiura*

Phylum-Hemichordata

- Hemichordata was previously considered as a **subphylum** of phylum Chordata, but now, it has been shifted to non-Chordata, under an independent **Phylum**. The structure previously thought to be a **notochord,** is now known as **Buccal diverticulum** or **Stomochord**. This is an *ectodermal structure*.
- (*Do remember* that **Notochord in Chordates, is a mesodermal structure**)
- Hemichordata is considered as a **connecting link** between Non-Chordata and Chordata
- They are bilaterally symmetrical, triploblastic and true coelomate animals.
- Hemichordates have organ system level of organization.
- This phylum consists a small group of worm- like animals.
- The body is cylindrical and is differentiated, from anterior to posterior side, into **Proboscis, Collar and Trunk.**
- Nervous system is **dorsal** and **tubular** - *a chordate character*
- **Pharyngeal gill- slits are present** - also *a chordate character*
- **Circulatory system** is **Open type**.
- Excretory organ is **Proboscis gland**.
- Respiration occurs through **Gills**.
- Sexes are separate (**dioecious**) and Fertilization is external.
- Development indirect. Larva - **Tornaria**.

Examples of Hemichordata:
Balanoglossus (Acorn worm or Tongue worm)
Saccoglossus

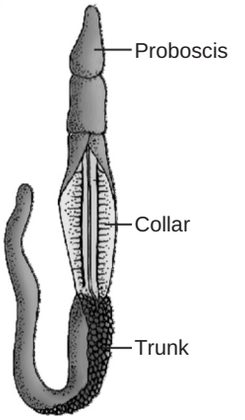


Fig.: *Balanoglossus*

Phyum-Chordata

3- fundamental characters of Chordates are

- Presence of **notochord** at some stage of lifecycle
- Presence of **dorsal,tubular (hollow) nervous system**
- Presence of **pharyngeal gill slits** at some stage of life cycle

Other chordate characters include:

- Ventral heart
- Presence of Endostyle or Thyroid gland
- Development of Eyes from nervous epithelium (not skin epithelium)
- Tail- post anal (present after anal opening)

General characters of Chordates:

1. Organ system level of body organization
2. Bilaterally symmetrical and triploblastic
3. True coelomate

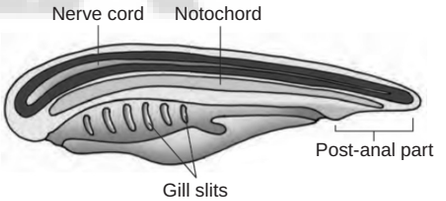


Fig.: Chordata characteristics

4. Closed circulatory system

Comparison between Non- Chordata and Chordata

S. N.	Non-Chordates	Chordates
1.	Notochord is absent	Notochord is present
2.	Nervous system is ventral, solid and paired	Nervous system is dorsal, tubular and single
3.	Gill slits are lacking	Pharynx is perforated with gill slits

4.	Heart, if present, is dorsal	Heart is ventral in position
5.	Post- anal tail is absent	Post anal tail is present

Phylum Chordata is divided into **3- subphyla**

1. Cephalochordata
2. Urochordata or Tunicata
3. Vertebrata or Craniata

Cephalochordates and Urochordates are called as **Protochordates** or **Acraniates,** whereas the Vertebrates are called **Craniates (having Cranium or brain box)**

Subphylum Cephalochordata

- Notochord extends from head to tail and is present throughout life.
- All are marine
- Excretion by protonephridia (having Solenocytes)
- Pharyngeal gill slits present in adults
- Development mostly direct

e.g., *Branchiostoma* (Ampbioxus orLancelet)

Amphioxus represents all the 3-fundamental chordate characters in adult-stage.

Subphylum Urochordata Or Tunicata

- Outer covering of Tunicin- a type of cellulose.
- AJI are marine
- Notochord is present in tail region, only during larval stages
- Blood vascular system - Open type
- Many forms sessile
- Asexual reproduction by budding in many forms
- Some forms show Neoteny (Retention oflarval characters inadults) and Alternation of generation
- e.g., *Herdmania* (sea squirt), *Ascidia*, Salpa and *Doliolum*

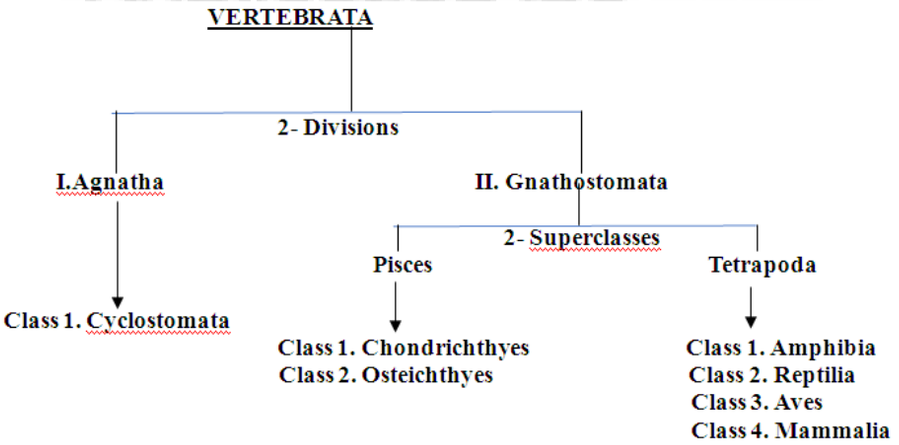
Fig.: *Ascidia*

Subphylum Vertebrata Or Craniata

- Notochord is present in embryonic stages, and is replaced by vertebral column in adults. Hence, *all vertebrates are chordates, but all chordates are not vertebrates.*
- Brain box or Cranium is present.
- Hepatic portal system is present
- Paired Fins or appendages/ limbs present
- Heart 2, 3 or 4 chambered
- Excretion occurs by kidney

VERTEBRATA is further divided into 2- Divisions

I. **Agnatha** II. **Gnathostomata**



I. Agnatha (Jawless vertebrates):

They are represented by a single class- **Cyclostomata**

Class Cyclostomata

- Cyclostomes are marine and *Ectoparasite on fishes*
- They have elongated body with **jaw- less, circular mouth** (*Cyclo*- circular, *Stoma*- mouth), which justifies the name of the class. Mouth is sucking type.
- The cranium and vertebral column are **cartilaginous**.

- Unlike fish, *they do not have paired fins* and *body scales*.
- Respiration occurs through gills,generally 6- 15 pairs, which open through gill slits,
- Circulatory system is closed type.
- Cyclostomes, e.g., Petromyzon, migrate to fresh water for spawning and the larva, after metamorphosis, return to ocean.

Examples of Cyclostomes:

***Petromyzon* (Lamprey)-** It is dioecious and shows indirect development. Larva is **Ammocoete**.

Fig.: A jawless vertebrate - *Petromyzon*

***Myxine* (Hag fish)-** It is monoecious and shows direct development.

II. Gnathostomata (Jawed vertebrates)

They are into 2- super classes, i.e., **Pisces** and **Tetrapod**

A. Superclass Pisces:

- They have fins and *do not have Pentadactyle* (Five- fingered) *plan.*
- All are aquatic
- Includes 2- classes, **Chondrichthyes** and **Osteichthyes**

B. Superclass Tetrapoda;

- Members have paired (Pentadactyl- 5- fingered) limbs
- They are aquatic, terrestrial, or aerial.
- Includes 4-classes, **Amphibia, Reptilia, Aves** and **Mammalia**

A. Superclass Pisces

- Includes **Jawed fishes**
- Study of fishes is called **Ichthyology**
- They are Aquatic, mostly marine with **Streamlined body**.
- **Poikilothermic or cold blooded** (lack the capacity to regulate body temperature)
- Locomotion by **fins. Fins** are **of 2- types**, paired and unpaired The *Paired fins*, also called as *lateral fins* include- **Pectoral** and **Pelvic fins**, whereas the unpaired or median fins include *dorsal fin, caudal fin, ventral fin and anal fin* etc.
- Exoskeleton of fishes consists of ecto-mesodermal scales,
- Respiration by **gills** *(5-7* pairs)
- Excretion by mesonephros or Opistho nephros kidney
- Blood vascular system·- **closed type**,with single circulation. Heart **2- chambered** with **deoxygenated blood only** (**VENOUS HEART**).
- Cranial nerves **10- pairs**. Only internal ear present (*for balancing only*). Eye lids absent.

  Lateral line organ having neuromast cellspresent for detecting water vibrations (*Rheoreceptor*)
- Skull monocondylic (one occipital condyle in cranium). Centrum (of vertebrae) amphicoelous. Ribs present.
- Dioecious (Unisexual). Fertilization mostly external in water. Development direct.

Class Chondrichthyes

- Commonly called **Cartilaginous fishes** (Endoskeleton – Cartilaginous)
- All aquatic, mostly marine, and predaceous/ predators
- **Notochord persists throughout life**
- **Mouth is ventral** (not terminal) in position
- The gill slits are 5 – pairs and separate without gill cover (**Operculum absent)**
- Body scales are **placoid (**plate- like**)**and are backwardly directed.
- Jaws are powerful with strong teeth which are modified placoid scales
- Tail is **heterocercal** (with unequal lobes)
- **Air bladder is absent,** hence, swim constantly to avoid sinking.
- Snout region has special thermoreceptors, called *Ampullae of Lorenzini*
- Dioecious. The pelvic fins in males have **Claspers** for transferring sperms into female body
- Can be Oviparous- with 'mermaid purse', Ovoviviparous or viviparous.
- The peculiar, external distinctive features of cartilaginous fishes are- **Mouth ventral, Heterocercal tail and absence of Operculum**

Examples of cartilaginous fishes: includes Sharks and Rays.

***Scoliodon*-** commonly called **Dog fish** because of **high smelling power.** It is **viviparous**.

Pristis (Saw fish) – snout toothed

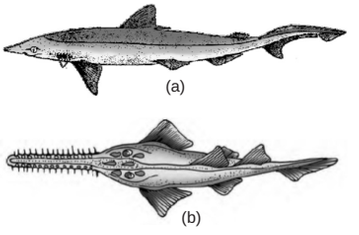


Fig.: Example of Cartilaginous fishes: (a) *Scoliodon*; (b) *Pristis*

***Torpedo* (Electric ray)** – possesses electric organs.

***Trygon* (Sting ray) -** possesses poison sting

Class Osteichthyes

- Commonly called **Bony fishes** (Endoskeleton – Bony)

- They are marine as well as fresh water forms
- **Mouth is terminal**.
- Gills are 4- pairs and covered by an **operculum.**
- Instead of placoid, the skin is covered with Ctenoid (teeth-like) or Cycloid (circular) scales
- Tail is **Homocercal**, with equal lobes
- **Air bladder** or Swim bladder provides buoyancy, and also acts a accessory respiratory organ.
- Sexes separate and fertilization is external
- Mostly oviparous with direct development
- The external distinctive feature of bony fishes are: **Terminal mouth, Homocercal tailand presence of operculum**

Examples of bony fishes:

Marine forms:

Latimeria (Coelacanth fish)- fleshy lobed fins, considered a connecting link between fishes and amphibians.

Exocoetus **(**Flying fish**)-** pectoral fins modified into wing like structure.

Hippocampus (Sea horse)

Anabas (climbing perch)

Fresh water forms:

Clarias **(**Magur**),** ***Catla*** **(**Katla**) and** ***Labeo*** **(**Rohu**)**

Aquarium fishes:

Betta **(Fighting fish),** ***Pterophyllum*** **(**Angel fish**)**

Gambusia (Minnow**)-** feeds on mosquito larvae and used inbiological control.

Lung fishes: They have cartilaginous endoskeleton. Notochord persists throughout life. Have gills and lungs both **Only 3 – genera** of these fishes in the world. ***Protopterus***- African, ***Lepidosiren*** – American and ***Neoceratodus***- Australian.

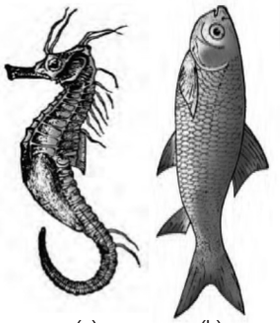


Fig.: Examples of Bony fishes : (a) *Hippocampus*; (b) *Catla*

B. Superclass Tetrapoda

Class Amphibia

- It is the smallest class of vertebrates
- Name amphibia, *Amphi* (dual) and *Bios*- life, means they have 2- modes of life, i.e., Aquatic and Terrestrial. However, some forms are Terrestrial and other purely Aquatic.
- The body is differentiated into **Head** and **Trunk.** Some forms have**Tail** also (The '**neck**' is absent in all amphibians).
- Amphibians are Cold blooded or **Poikilothermic**
- They are tetrapod, with 2- pairs of limbs.
- They undergo *aestivation* (summer sleep) or *hibernation* (winter sleep)
- Their skin is moist but, unlike fish, they do not have scales.
- Digestive tract, Urinary tract and Reproductive tracks, all open into **Cloaca.**
- Kidney- **Mesonepbros**type (amphibians are mostly ureotelic)
- **Respiration- Cutaneous** (through Skin), **Branchial**(through gills) or **Pulmonary** (through Lungs)
- **Heart** - 3-chambered (2- atria, 1- ventricle) with sinus venosus; BVS is closed type. Both renal and hepatic **portal systems** well developed
- Exoskeleton lacking in most of the forms
- Eyes have eye lids and ear starts from **tympanum**
- **Dioecious** (Unisexual). Fertilization is external.
- Oviparous, with indirect development (**Tadpole larva** present)

Examples of Amphibians:

Rana (Frog), ***Bufo*** (Toad), ***Hyla*** (Tree frog), ***Salamandra*** (Salamander), ***Ichthyophis*** (*Ichthyo*- fish, *Ophis*- snake)-a limbless amphibian. (The common frog is ***Rana tigrina***). (Remember, **Salamander** can be externally differentiated from wall lizard, as the former has neither neck nor the body scales)

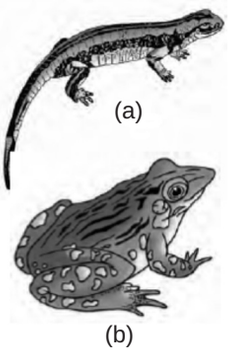


Fig.: Examples of Amphibia: (a) *Salamandra*; (b) *Rana*

Class Reptilia

- Study of reptiles is called **Herpetology**
- Study of lizards is called **Saurology**
- Study of snakesis called **Ophidology**or**Serpentology**
- Reptiles are **Poikilothermic** or cold- blooded
- True land or terrestrial vertebrates with creeping mode of locomotion (*reptum*- to creep or crawl)

- Skin is dry with epidermal **scales** or scutes.
- Respiration **pulmonary** (through Lungs)
- Kidney metanephros, as in birds and mammals
- Heart 3 or incompletely 4-chambered (Completely **4-chambered** in **Crocodiles** and Alligators).
- As in amphibians the digestive, excretory and reproductive tracks open through Cloaca.
- Cranial nerves 12- pairs, Lizards have external, middle -and internal ear, but not pinna. The snakes have only internal ear.
- **Dioecious**. Fertilization internal, **oviparous** having **Cleidoic** (shelled or box like) **eggs**
- Extra embryonic membranes develop during embryonic stage. Larvae absent; hence, the development is direct.
- Lizards and snakes shed their skin as skin- cast.

Examples of reptiles:

Hemidactylus (Wall lizard), ***Calotes*** (Garden lizard) ***Chameleon*** (Tree lizard- 'Girgit'), ***Draco*** (Flying lizard), ***Varanus*** (Monitor lizard), ***Helioderma*** (Gila monster)- *Poisonous lizard*, ***Phrynosoma*** (Horned toad), ***Sphenodon*** (Tuatara) – A living fossil that has with 3rd (Pineal) eye functional in young stages. ***Testudo*** (Tortoise), ***Chelone*** (Turtle), ***Crocodilus*** (Crocodile), ***Alligator*** (Alligator).

Poisonous snakes- ***Naja*** (Cobra), ***Vipera*** (Viper) **and** ***Bangarus*** (Krait)

Non-poisonous snakes- ***Python***, ***Eryx johni*** **(**Sand boa**)**

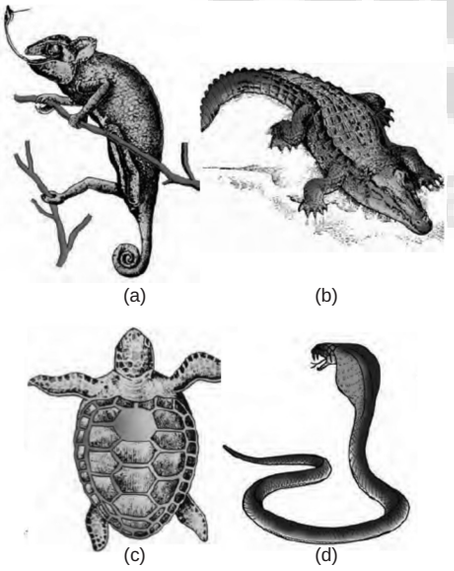


Fig.: Reptiles: (a) *Chameleon*; (b) *Crocodilus*; (c) *Chelone;* (d) *Naja*

Class Aves

- Study of birds is called **Ornithology**
- Bird man of India- Dr. Salim Ali (a famous ornithologist)
- Birds are **Homeothermic** / Endothermic / Warm- blooded
- Body temperature is the highest amongst vertebrates (40-45°C)
- **Exoskeleton**- ectodermal and consists of Beak, Feathers and Claws
- Fore -limbs modified into **wings**- so **bipedal**
- **Characteristic feature of birds**is the presence of **Feathers (**Remember, the wings are present in insects and bat also**)**
- Hind limbs have scales and are modified for walking, griping tree branches, swimming etc.
- **Body streamlined** (faces least air resistance during flight)
- Stomach not differentiated but two additional chambers, the **crop** and **gizzard**have developed in alimentary canal.
- Respiration is**Pulmonary** (through **Lungs**). Lungs are inelastic and are supplemented with **Air- sacs.** The **Residual air** is absent
- Sound box is called **Syrinx** and is present at the base of trachea.
- Kidney is metanephros. *Urinary bladder is absent.* **Uricotelic**
- Heart - **4 chambered**. Richest blood amongst vertebrates (with maximum RBC per mm^3).
- Eyes are telescopic with **Pecten**, attached tochoroid. Middle ear with single ear ossicle. Nictitating membrane present in eyes
- Skin is generally dry but **oil gland**s (*Uropygeal glands*/ **Preen glands**) are present at the base of the tail region- forfeather dressing
- The Gut, excretory duct and reproductive duct, all, openoutside through common **cloaca**
- Bones are **spongy and pneumatic**(with air cavities). The Marrow canal is absent
- Dioecious with internal fertilization, and oviparous (**Cleidoic** or box- like eggs)
- Extra-embryonic membranes - Amnion, Chorion and Allantois present (group **Amniota**). **Allantois** acts as a urinary bladder in the embryo.
- Development is direct (without larval stages)

Examples of birds:

Archeopteryx lithographica – a fossil and connecting link between reptiles and birds.

Pigeon (***Columba***), Crow (***Corvus***), Parrot (***Psittacula***), Peacock (***Pavocristatus***)- National bird of India,Vulture (***Neophron***), Koel/Coccoo (***Eudynamis***) – a brood- parasite of crow's nest, and its males have melodious sound.

Penguin (***Aptenodytes***)- bird of Antarctica (South pole), Ostrich (***Struthio***)- a flightless bird of **Africa, Kiwi-**a flightless bird of **New Zealand**.

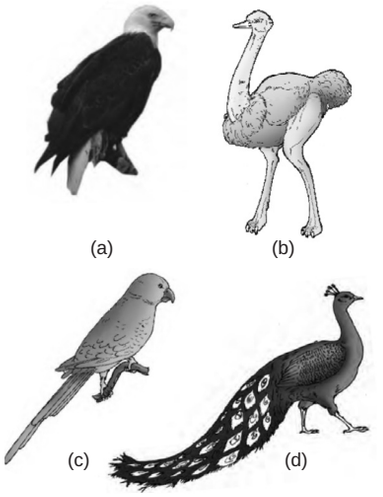


Fig.: Some birds : (a) *Neophron*; (b) *Struthio*; (c) *Psittacula*; (d) *Pavo*

Class Mammalia

- Mammals are characterized by the presence of **Mammary glands** to nourish the young ones.
- They are **Homeothermic**/ endothermic or warm blooded
- Occur in variety of habitat. Mode of life- *Terrestrial, Aquatic* or *Aerial*
- Exoskeleton includes **Hairs**, Homs, Hoofs, Claws, Nailsand Scales etc.
- **Muscular diaphragm**is present between thorax and abdomen
- **Cheek bone** or **Zygomatic arch**is present
- Besides Mammary glands, the **Sweat glands** and **Sebaceous glands** are also present
- Kidney is metanephros type. The main excretory product is**Urea**
- Teethof various types, like **the codont, monophyodont** or **diphyodont** and Homodont or **heterodont** type
- Respiration **pulmonary** only
- Heart 4- chambered. Circulatory system closed type.
- Cranial nerves 12-pairs.
- Most of the forms have **Pinna** as external ear.
- **Amniotes,** having extra embryonic membranes - **Amnion, Chorion** and **Allanto is** during embryonic development**.**
- Dioecious, with internal fertilization and direct development. Mostly **viviparous,** Placenta is present for nourishment of foetus.

Examples of mammals:

Oviparous (egg laying) **mammal (*Prototherians*)**- Duck-billed platypus(***Ornithorhynchus***)

Viviparous mammals: (*Marsupials* and *Eutherians*)- Kangaroo- (***Macropus***)- a marsupial/ metatherian, Flying fox (***Pteropus***); Monkey (***Macaca***), Dog (***Canis***), Cat (***Felis***), Rat (***Rattus***), Horse (***Equus cabalus***), Camel (***Camelus***), Elephant (***Elephas***), Dolphin (***Delphinus***)- *National Aquatic animal of India*,Opossum (***Didelphis***)-a marsupial, Blue whale (***Balaenoptera***)- the largest mammal,Tiger (***Panthera tigris***)- *National animal of India*, Lion (***Panthera leo***), Bat (***Pteropus***)- a flying mammal,

Monkeys, **Apes**- Chimpanzee, Gorilla, Gibbon and Orangutan; and **Human (*Homo sapiens*).**

(Please note that **Prototherians**or egg laying mammals, do not have Pinna, Uterus and Teeth in adults).

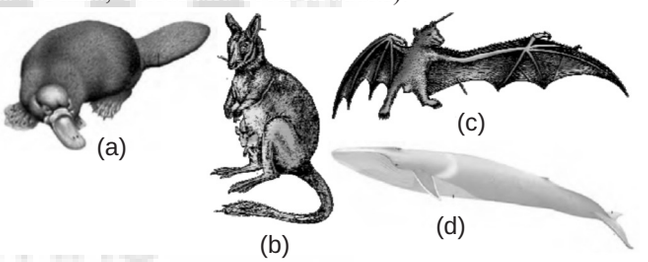


Fig.: Some mammals : (a) *Ornithorhynchus*; (b) *Macropus*; (c) *Pteropus*; (d) *Balaenoptera*

EXERCISE - 1 NCERT BASED QUESTIONS

1. The members of following phylum represent cellular level of organization
   (a) Cnidaria (b) Porifera
   (c) Protozoa (d) Both (a) and (b)
2. Mark the incorrect statement for the phyla, Platyhelminthes to Echinodermata.
   (a) All groups represent organ/organ – system level of organization
   (b) All are triploblastic
   (c) All are bilaterally symmetrical
   (d) None of these
3. When any plane passing through the central axis of the body divides the organism into two identical halves, the organism is called
   (a) Radially symmetrical
   (b) Bilaterally symmetrical
   (c) Asymmetrical
   (d) Metamerically segmented
4. In Platyhelminthes
   (a) The embryonic layers, ectoderm and endoderm, are separated by mesoglea
   (b) The body is asymmentrical
   (c) There is tissue level of organization
   (d) The body cavity is absent
5. The organisms belonging to following phylum are (true) coelomate
   (a) Arthropoda (b) Aschelminthes
   (c) Ctenophora (d) Platyhelminthes
6. Which of the following is a fresh water sponge?
   (a) *Sycon* (b) *Euspongia*
   (c) *Spongilla* (d) *Pleurobrachia*
7. Comb jellies belong to
   (a) Porifera (b) Cnidaria
   (c) Ctenophora (d) Corals
8. The members of the following phylum are mostly marine and asymmetrical
   (a) Ctenophora (b) Coelenterata
   (c) Porifera (d) Echinodermata
9. *Antedon* is commonly called :-
   (a) Sea lily (b) Brittle star
   (c) Sea-star (d) Sea-cucumber
10. Which of the following is commonly called 'Pearl oyster'
   (a) *Limulus*
   (b) *Pinctada*
   (c) *Dentalium*
   (d) *Chaetoplenura*
11. Following organism is triploblastic, bilaterally symmetrical and marine, and respires through gills
   (a) *Echinus* (b) *Hirudinaria*
   (c) *Balanoglossus* (d) *Physalia*
12. The phenomenon of metagenesis occur in
   (a) *Taenia* (b) *Aurelia*
   (c) *Obelia* (d) *Musca*
13. Which of the following organism is correctly matched with its common name ?
   (a) *Aurelia* -comb jelly
   (b) *Adamsia* -sea anemone
   (c) *Ancylostoma* - pin worm
   (d) *Aplysia* - sea mouse
14. The members of following phylum are exclusively marine, radially symmetrical and diploblastic
   (a) Porifera (b) Echinodermata
   (c) Ctenophora (d) Hemichordata
15. Choose the correct statement:
   (a) All Pisces have gills covered by an operculum
   (b) All mammals are viviparous
   (c) All cyclostomes do not possess jaws and paired fins
   (d) All reptiles have 3- chambered heart
16. Which statement regarding *Nereis* is wrong ?
   (a) It has nephridium for excretion
   (b) It is metamerically segmented
   (c) It is monoecious
   (d) It has parapodia for swimming
17. Which one of the following characteristics is not shared by birds and mammals?
   (a) Warm blooded nature
   (b) Ossified endoskeleton
   (c) Breathing using lungs
   (d) Viviparity
18. Which set has the two members of the same phylum ?
   (a) Cuttle fish and jelly fish
   (b) Tape worm and earthworm
   (c) Dog fish and dolphin
   (d) Sea mouse and sea lion
19. Following is an oviparous mammal
   (a) *Delphinus* (b) *Ornithorhynchus*
   (c) *Macropus* (d) *Elephas*
20. Which of the following feature of bony fish is missing in cartilaginous fishes
   (a) Operculum (b) Placoid scales
   (c) Poekilothermic (d) Paired fins

21. Mark the correct match of the animal and its common name
(a) Trygon – dog fish
(b) Ascidia – lancelet
(c) Pterophyllum – flying fish
(d) Myxine – hagfish

22. Which of the following is a limbless amphibian
(a) *Salamander* (b) *Ichthyophis*
(c) *Pristis* (d) *Cucumaria*

23. *Chelone* is commonly known as
(a) Garden lizard (b) Tortoise
(c) Flying lizard (d) Turtle

24. Which of the following is the exclusive feature of the birds
(a) 4 – chambered heart
(b) Homoeothermic
(c) Fore limbs modified into wings
(d) Presence of feathers

25. Sea horse is
(a) A marine mammal (b) A marine fish
(c) Hippopotamus (d) Antelope

26. Sharks do not have
(a) Teeth (b) Claspers
(c) Air bladder (d) Ventral mouth

27. Which of the following animal is cold blooded and has 4 - chambered heart
(a) Salamander
(b) *Ornithorhynchus*
(c) Crocodile
(d) *Calotes*

28. The following group is not a subphylum of Chordata
(a) Urochordata (b) Tetrapoda
(c) Cephalochordata (d) Vertebrata

29. *Salpa* and *Doliolum* belong to
(a) Cephalochordata (b) Hemichordata
(c) Tunicata (d) Cyclostomata

30. Lamprey is not a fish since it does not have
(a) Closed blood vascular system
(b) Fins
(c) Body scales
(d) Cranium and vertebral column

31. Following chordate is not a vertebrate
(a) *Branchiostoma* (b) Petromyzon
(c) Salamander (d) *Bufo*

32. The scientific name of Ostrich is
(a) *Neophron* (b) *Aptenodytes*
(c) *Pavo* (d) *Struthio*

33. Acoelomates is characteristic of:
(a) Mollusca
(b) Platyhelminthes
(c) Aschelminthes
(d) Coelenterates

34. The cyclostomes are
(a) Marine and non migratory
(b) Fresh water form and non migratory
(c) Marine and migrate to fresh water for spawning
(d) Fresh water form and migrate to sea for spawning

35. Which of the follwing is not a chordate character
(a) Presence of paired pharyngeal gill slits
(b) Ventral heart
(c) Solid and ventral nerve cord
(d) Presence of post anal tail

36. Which of the following organism is a pseudocoelomate?
(a) Hook worm (b) Tape worm
(c) Earthworm (d) Tongue worm

37. Which of the following group does not represent a class?
(a) Amphibia (b) Cyclostomata
(c) Pisces (d) Aves

38. This class of animals are all ectoparasites on some fishes:
(a) Amphibia (b) Osteichthyes
(c) Reptilia (d) Cyclostomata

39. All the members of the following phylum/phyla have closed blood vascular system:
(a) Annelida
(b) Platyhelminthes
(c) Arthropoda
(d) Both (a) and (b)

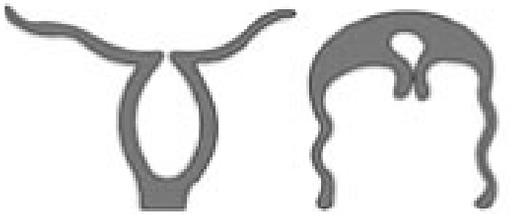
40. Which of the following is a mismatch pair:
(a) Scales- Reptilia
(b) Comb plates- Mollusca
(c) Choanocytes- Porifera
(d) Parapodia- Annelida

41. A jawless fish which lays eggs in fresh water and whose ammocoete larvae after metamorphosis return to the ocean is:
(a) *Myxine* (b) *Neomyxine*
(c) *Petromyzon* (d) *Eptatretus*

42. Metagenesis refers to:
(a) Alternation of generation between asexual and sexual phases of an organism
(b) Occurrence of a drastic change in form during post-embryonic development
(c) Presence of a segmented body and parthenogenetic mode of reproduction
(d) Presence of different morphic forms

43. The structure present in all adult vertebrates is
(a) notochord
(b) dorsal tubular nerve cord
(c) pharyngeal gill slits
(d) All of these

44. The adjoining cartoons represent 2- forms of:
(a) Ctenophores (b) Platyhelminthes
(c) Cnidarians (d) Echinoderms



45. Which triploblastic animal does not have coelom?
(a) *Planaria* (b) *Hydra*
(c) *Sycon* (d) *Pheretima*

46. Following organism does not have organ- system level of organization:
(a) Squid (b) Liver fluke
(c) Silver fish (d) Leech

47. The proboscis gland is the excretory organ in:
(a) *Taenia* (b) Blood worm
(c) *Balanoglossus* (d) *Ascidia*

48. The animal shown in the adjoining picture is commonly known as:
(a) Garden lizard (b) Tree lizard
(c) Poisonous lizard (d) Wall lizard

49. Besides Annelida and Arthropoda metamerism is found in
(a) Cestoda (b) Acanthocephala
(c) Chordata (d) Mollusca

50. In contrast to Annelids the Platyhelminths show:
(a) Absence of body cavity
(b) Bilaterial symmetry
(c) Radial symmetry
(d) Presence of pseudocoel

51. Flame cells are excretory organ of
(a) *Planaria* (b) *Hydra*
(c) *Hydrilla* (d) Cockroach

52. Which one of following feature is possessed by phylum Arthropoda?
(a) jointed appendages (b) antennae
(c) chitinous exoskeleton (d) All of the above

53. Symmetry in cnidaria is
(a) radial (b) bilateral
(c) pentamarous (d) spherical

54. Excretory organs in *Taenia* are
(a) flame cells (b) nephridia
(c) nephrons (d) kidneys

55. Body cavity lined by mesoderm is called
(a) coelenteron (b) pseudocoel
(c) coelom (d) blastocoel

56. Feeding in sponges takes place through
(a) choanocytes (b) nurse cells
(c) ostia (d) osculum

57. Sea fan belongs to
(a) echinodermata (b) crinoidea
(c) mollusca (d) coelentrata

58. *Sea anemone* belongs to the phylum
(a) porifera (b) echinodermata
(c) coelenterata (d) protista

59. Notochord occurs all through the length of body and throughout life in
(a) Hemichordata (b) Urochordata
(c) Cephalochordata (d) Vertebrata

60. An egg laying mammal is
(a) Kangaroo (b) Platypus
(c) Koala (d) Whale

61. In which one of the following sets of animals do all the four give birth to young ones?
(a) Platypus, Penguin, Bat, Hippopotamus
(b) Shrew, Bat, Cat, Kiwi
(c) Kangaroo, Flying Fox, Dolphin, Dog
(d) Lion, Bat, Whale, Ostrich

62. Which one of the following is a matching set of a phylum and its three examples ?
(a) Platyhelminthes-*Planaria, Schistosoma, Enterobius*
(b) Mollusca - *Loligo, Pila, Octopus*
(c) Porifera - *Spongilla, Euplectella, Pennatula*
(d) Cnidaria - *Bonellia, Physalia, Aurelia*

63. Changes that allow the conversion of larva into adult is called
(a) metagenesis (b) alternation
(c) metamorphosis (d) metastasis

64. In which of the following animals, respiration occurs without any respiratory organ?
(a) frog (b) fish
(c) cockroach (d) earthworm

65. Pseudocoelom occurs in
(a) *Ascaris* (b) *Taenia solium*
(c) *Fasciola hepatica* (d) Planaria

66. All triploblastic animal have primarily
(a) bilateral symmetrical
(b) true coelom
(c) reproduction with sexual dimorphism
(d) regeneration power

67. Which is exclusively marine phylum?
(a) porifera (b) polychaeta
(c) echinodermata (d) mollusca

68. Most appropriate word for protozoans is
(a) cellular (b) unicellular
(c) acellular (d) multicellular

69. Bioluminescence is exhibited by
(a) *Chlorella* (b) *Hirudinaria*
(c) *Chlamydomonas* (d) *Ctenoplana*

70. Which of the following is a pseudocoelomate animal?
(a) *Aurelia* (b) Planaria
(c) *Nereis* (d) *Wuchereria*

71. What is common between parrot, platypus and kangaroo?
(a) Ovoparity (b) Homoiothermy
(c) Toothless jaws (d) Functional Post-anal tail

72. In contrast to annelids the platyhelminthes show
(a) radial symmetry (b) presence of pseudocoel
(c) bilateral symmetry (d) absence of body cavity

73. Which one of the following is *NOT* a characteristic of phylum Annelida ?
(a) Ventral nerve cord
(b) Closed circulatory system
(c) Segmentation
(d) Pseudocoelom

74. *Ascaris* is characterized by :
(a) presence of true coelom and metamerism (metamerisation)
(b) absence of true coelom but presence of metamerism
(c) presence of neither true coelom nor metamerism
(d) presence of true coelom but absence of metamerism

75. Which one of the following statements is totally wrong about the occurrence of notochord, while the other three are correct?
(a) It is present only in larval tail in Ascidians
(b) It is replaced by a vertebral column in adult frog
(c) It is absent throughout life in humans from the very beginning
(d) It is present throughout life in *Amphioxus*

76. Functionwise, just as there are nephridia in an earthworm, so are
(a) parotid glands in toad
(b) statocysts in prawn
(c) flame cells in liver fluke
(d) myotomes in fish

77. Which one of the following groups of animals is bilaterally symmetrical *and* triploblastic ?
(a) Sponges
(b) Coelenterates (Cnidarians)
(c) Aschelminthes (round worms)
(d) Ctenophores

78. Which one of the following pairs of animals comprises 'jawless fishes' ?
(a) Guppies and hag fishes
(b) Lampreys and eels
(c) Mackerals and Rohu
(d) Lampreys and hag fishes

79. Which of the following is correctly matched?
(a) Human -Renal portal system
(b) Earthworm - Closed circulatory system
(c) Cockroach - Nephridia
(d) None of the above

80. Which one of the following kinds of animals are *triploblastic*?
(a) Corals (b) Flat worms
(c) Sponges (d) Ctenophores

81. Which one of the following statements about certain given animals is ***correct*** ?
(a) Flat worms (Platyhelminthes) are coelomates
(b) Round worms (Aschelminthes) are pseudocoelomates.
(c) Molluses are acoelomates
(d) Insects are pseudocoelomates

82. One example of animals having a single opening to the outside that serves both as mouth as well as anus is :
(a) *Fasciola* (b) *Octopus*
(c) *Asterias* (d) *Ascidia*

83. Which one of the following statements about all the four of *Spongilla*, Leech, Dolphin and Penguin is *correct* ?
(a) All are bilaterally symmetrical
(b) Penguin is homoiothermic while the remaining three are poikilothermic
(c) Leech is a fresh water form while all others are marine
(d) *Spongilla* has special collared cells called choanocytes, not found in the remaining three.

84. Phylum mollusca can be distinguished from other invertebrates by the presence of
(a) Bilateral symmetry and exoskeleton
(b) A mantle and gills
(c) Shell and non-segmented body
(d) A mantle and non-segmented body

85. Air bladder is present in
(a) Chondricthyes (b) Star fishes
(c) Osteichthyes (d) Amphibians

86. Which one of the following statements is **not** correct?
(a) All echinoderms are viviparous.
(b) Roundworm has no circulatory system.
(c) In bony fishes, swim bladder is usually present.
(d) In cartilaginous fishes, fertilization is internal.

87. Which of the following have notochord throughout life?
(a) Birds (b) Fish
(c) Snake (d) Amphioxus

88. Which one of the following animal phyla does not possess a coelom ?
(a) Platyhelminthes
(b) Annelida
(c) Mollusca
(d) Echinodermata

89. Which one of the following statements is totally wrong about the occurrence of notochord while the other three are correct
(a) It is absent throughout life in humans from the very beginning
(b) It is present throughout life in Amphioxus
(c) It is present only in larval tail in Ascidians
(d) It is replaced by a vertebral column in adult frog

90. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?
(a) Mammalia : give birth to young ones
(b) Reptilia : possess 3-chambered heart with one incompletely divided ventricle
(c) Chordata : possess a mouth provided with an upper and a lower jaw
(d) Chondrichthyes : possess cartilaginous endoskeleton

91. The canal system is a characteristic feature of
(a) echinoderms (b) helminthes
(c) coelenterates (d) sponges

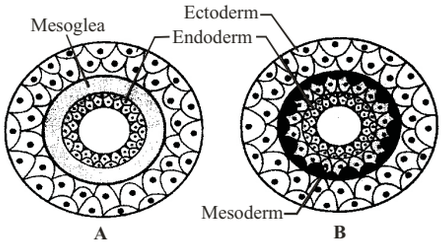
92. Which are exclusively viviparous ?
(a) Bony fishes (b) Cartilagenous fishes
(c) Sharks (d) Whales

93. Name the character of phylum Aschelminthes which differentiates it from all other phyla of kingdom Animalia:
(a) Parasitic mode (b) Round in shape
(c) Pseudocoelomate (d) Bilateral symmetry

94. Chondrichthyes is characterised by
(a) placoid scale
(b) placoid scale and ventral mouth
(c) ventral mouth
(d) ctenoid scale and ventral mouth

95. A marine cartilaginous fish that can produce electric current is:
(a) *Pristis* (b) *Torpedo*
(c) *Trygon* (d) *Scoliodon*

96.



The above diagram shows the germs layer. The animals having structures shown in the figures A and B are respectively called
(a) Diploblastic, Triploblastic
(b) Triploblastic, Diploblastic
(c) Diploblastic, Diploblastic
(d) Triploblastic, Triploblastic

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

	Animals		*Morphological feature*
(a)	Cockroach, Locust, *Taenia*	-	Metameric segmentation
(b)	Liver fluke, Sea anemone, Sea cucumber	-	Bilateral symmetry
(c)	Centipede, Prawn, Sea urchin	-	Jointed appendages
(d)	Scorpion, Prawn, Cockroach	-	Organ system level of organisation

NEW PATTERN QUESTION

98. Match item in column I with those given in column II

	Column I		**Column II**
A.	limbless reptile	I.	lamprey
B.	jawless vertebrate	II.	salamander
C.	amphibian	III.	snake
D.	cartilaginous fish	IV.	shark

(a) A–I; B–II; C–III; D–IV
(b) A–II; B–I; C–III; D–IV
(c) A–III; B–I; C–II; D–IV
(d) A–IV; B–II; C–III; D–I

99. Match the following and select the correct option.

	List-I		**List-II**
A.	Cyclostomes	I.	Hemichordata
B.	Aves	II.	Urochordata
C.	Tunicates	III.	Agantha
D.	*Balanoglossus*	IV.	Pisces
		V.	Tetrapod

(a) A – III; B – V; C – II; D – I
(b) A – III; B – I; C – V; D – II
(c) A – I; B – II; C – III; D – IV
(d) A – II; B – III; C – IV; D – I

100. Match the features given in column I with their examples given in column II and choose the correct match from the option given below.

	Column-I (Features)		**Column-II (Examples)**
A.	Pseudocoelomates	I.	*Hydra, Adamsia*
B.	Diploblastic	II.	*Ctenoplana, Aurelia*
C.	Cellular level of organization	III.	*Ascaris, Wuchereria*
D.	Radial symmetry	IV.	*Sycon, Spongilla*

(a) A – I; B – II; C – IV; D – III
(b) A – III; B – I; C – IV; D – II
(c) A – II; B – I; C – III; D – II
(d) A – III; B – II; C – IV; D – I

101. Match the characteristic feature/terms given in column I with the phylum to which they belong given in column II and choose the correct option.

	Column-I (Characteristic feature/term)		Column-II (Phylum)
A.	Choanocytes	I.	Platyhelminthes
B.	Cnidoblasts	II.	Ctenophora
C.	Flame cells	III.	Porifera
D.	Comb plates	IV.	Coelenterata

(a) A – II; B – I; C – IV; D – III
(b) A – II; B – IV; C – I; D – II
(c) A – IV; B – I; C – III; D – II
(d) A – III; B – IV; C – I; D – II

102. Match the terms/feature given in column I with their examples given in column II and select the correct match from the option given below.

	Column-I (Term/Feature)		Column-II (Examples)
A.	High regeneration capacity	I.	*Hirudinaria*
B.	Vector	II.	*Planaria*
C.	Oviparous with indirect development	III.	*Sepia*
D.	Metameres	IV.	*Aedes*

(a) A – I; B – II; C – III; D – IV
(b) A – III; B – I; C – II; D – IV
(c) A – III; B – II; C – IV; D – II
(d) A – II; B – IV; C – III; D – I

DIRECTION (103-104): *Read the statements carefully and answer the question on the basis of following options.*
(a) Both Statement I and Statement II are incorrect
(b) Statement I is correct but Statement II is incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct

103. **Statement I:** The digestive system in platyhelminthes has only a single opening and serves as both mouth and anus.
Statement II: Organ level of organisation is exhibited by members of platyhelminthes.

104. **Statement I :** Cephalochordata bears notochord all along the body throughout life.
Statements II : Urochordate bears vertebral column only in tail region throughout the life.

105. Given below are four statements regarding Aschelminthes
A. They are bilaterally symmetrical and triploblastic
B. They are dioecious
C. Fertilisation is external
D. They are acoelomate
Mark the option that has both the correct statements
(a) A, B (b) A, C
(c) B, C (d) B, D

106. Scientific names of which two fish are correctly matched:
A. Fighting fish- *Pterophyllum*
B. Magur- *Clarias*
C. Sea horse- *Hippocampus*
D. Flying fish- *Draco*
(a) A & B (b) B & C
(c) C & D (d) A & C

107. The following are the features associated with cnidaria
A. radial symmetry
B. presence of gastrovascular cavity
C. animals are in either of the two forms-polyp and medusa or both
D. alternation of generations in their history
Which of the above are true?
(a) all (b) only A, B and D
(c) only A, B (d) only B & C

108. Which of the following statements is/are not true?
A. in urochordata, notochord is present in larval tail.
B. in cephalochordata, notochord extends from head to tail region.
C. *Branchiostoma* belongs to hemichordata
D. only one class of living members, class Cyclostomata represents the super class agnatha
(a) A, B, D only (b) C, D, A only
(c) C only (d) A, D only

109. Which of the following statements are true/false?
A. in *Torpedo* the electric organs are capable of generating strong electric shock to paralyze the prey
B. bony fishes have ctenoid scales
C. amphibian skin is moist and has thick scales
D. birds are poikilothermous animals
E. the most unique mammalian characteristic is the presence of milk producing mammary glands by which the yound ones are nourished
(a) A, B and C are true; D, E are false
(b) A, B and E are true; C and D are false
(c) A, D and E are true; B and C are flase
(d) A, B and D are flase; C and E are true

110. Flame cells of flatworms help in:
A. Osmoregulation
B. Digestion
C. Reproduction
D. Excretion
E. Bioluminiscence
Choose the correct option:
(a) Only B is correct
(b) Only A and D are correct
(c) Only C is correct
(d) Only A and E are correct

111. Read the statements regarding echinoderms and choose the correct option:
A. All are marine with organ system level of organization
B. Adults are bilaterally symmetrical
C. They are dioecious
D. Fertilization is internal and indirect development is observed
E. Triploblastic and acoelomate animals
(a) A and C are correct
(b) E alone is correct
(c) A, C and E are correct
(d) A and E are correct

112. Which of the following statement(s) is/are correct?
(i) Organ systems in different group of animals show various patterns of complexities.
(ii) The digestive system in platyhelminthes has only a single opening to the outside of the body that serve as both mouth and anus, and is hence called complete.
(iii) In open type of circulatory system, the blood is pumped out of the heart and the cells and tissues are directly bathed in it.
(iv) In closed type, the blood is circulated through a series of vessels of varying diameters (arteries, veins and capillaries).
(v) Sponges bear tissue level of organs.
(a) Only (i)
(b) Both (ii) and (v)
(c) Only (i), (iii) and (iv)
(d) All of these

113. Which of the following statement(s) is/are correct regarding phylum aschelminthes?
(i) The body is circular in cross-section hence the name roundworms.
(ii) Alimentary canal is complete with a well-developed muscular pharynx.
(iii) Sexes are separate (dioecious), i.e., males and females are distinct.
(iv) Nephridia help in osmoregulation and excretion.
(a) (i) and (ii) (b) (iii) and (iv)
(c) (i), (ii) and (iii) (d) All of these

114. Which of the following statement(s) is/are correct regarding class *aves*?
(i) The forelimbs are modified into wings and the hindlimbs generally have scales and are modified for walking, swimming or clasping the tree branches.
(ii) Heart is completely four-chambered.
(iii) They are warm- blooded (homoiothermous) animals *i.e.*, they are able to maintain a constant body temperature.
(iv) They are oviparous and development is direct.
(v) Most distinctive feature of aves is presence of water-vascular system.
(a) Both (i) and (iii)
(b) Both (i) and (iv)
(c) (i), (ii) and (iii)
(d) All except (v)

115. Which of the following class is being described by the given statements (i - iv)?
(i) They are found in a variety of habitats- polar ice-caps, deserts, mountains, forests, grasslands and dark caves.
(ii) Most unique mammalian characteristic is the presence of mammary glands by which the young ones are nourished.
(iii) Heart is four-chambered.
(iv) Sexes are separate and fertilization is internal.
(a) Reptilia (b) Aves
(c) Mammalia (d) Amphibia

116. Read the following statements and answer the question.
(i) They are exclusively marine, radially symmetrical, diploblastic organisms with tissue level of organisation.
(ii) Body bears eight external rows of ciliated comb plates, which help in locomotion.
(iii) Digestion is both extracellular and intracellular.
(iv) Reproduction takes place only by sexual means.
Which of the following phylum is being described by above statements?
(a) Platyhelminthes
(b) Arthropoda
(c) Mollusca
(d) Ctenophora

DIRECTION (117-118): *These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.*
(a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(b) (A) is correct but (R) is not correct
(c) (A) is not correct but (R) is correct
(d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

117. **Assertion:** Sponges have body organisation of "cellular level".
Reason: Sponges reproduce asexually by fragmentation and sexually by formation of gametes.

118. **Assertion:** Animals belonging to phylum chordata are fundamentally characterized by presence of notochord.
Reason: They posses a post-anal tail.

EXERCISE - 2 | WINDOW TO COMPETITIVE EXAMS

NEET PAST YEAR QUESTIONS

1. Radial symmetry is NOT found in adults of phylum _____. **2023**

(a) Ctenophora
(b) Hemichordata
(c) Coelenterata
(d) Echinodermata

2. Select the correct statements with reference to chordates.

I. Presence of a mid-dorsal, solid and double nerve cord. **2023**
II. Presence of closed circulatory system.
III. Presence of paired pharyngeal gill slits.
IV. Presence of dorsal heart
V. Triploblastic pseudocoelomate animals.

Choose the correct answer from the options given below:

(a) I, III and IV only
(b) II and III only
(c) II, IV and V only
(d) III, IV and V only

3. The unique mammalian characteristics are: **2023**

(a) hairs, tympanic membrane and mammary glands
(b) hairs, pinna and mammary glands
(c) hairs, pinna and indirect development
(d) pinna, monocondylic skull and mammary glands

4. Select the correct statements : **Ph-II 2023**

(A) Platyhelminthes are triploblastic pseudocoelomate and bilaterally symmetrical organisms.
(B) Ctenophores reproduce only sexually and fertilization is external.
(C) In tapeworm, fertilization is internal but sexes are not separate.
(D) Ctenophores are exclusively marine, diploblastic and bioluminescent organisms.
(E) In sponges, fertilization is external and development is direct.

Choose the correct answer from the options given below:

(a) (A) and (E) only (b) (B) and (D) only
(c) (A), (C) and (D) only (d) (B), (C) and (D) only

5. Match List-I with List-II. **Ph-II 2023**

	List-I		List-II
(A)	Contractile vacuole	(I)	*Asterias*
(B)	Water vascular system	(II)	*Amoeba*
(C)	Canal system	(III)	*Spongilla*
(D)	Flame cells	(IV)	*Taenia*

Choose the correct answer from the options given below

(a) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)
(b) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)
(c) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)
(d) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

6. In which of the following animals, digestive tract has additional chambers like crop and gizzard? **2022**

(a) *Bufo, Balaenoptera, Bangarus*
(b) *Catla, Columba, Crocodilus*
(c) *Pavo, Psittacula, Corvus*
(d) *Corvus, Columba, Chameleon*

7. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**. **2022**

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 :

(a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(b) (A) is correct but (R) is not correct
(c) (A) is not correct but (R) is correct
(d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

8. Which of the following animals has three chambered heart? **Ph-II 2022**

(a) *Pteropus* (b) *Scoliodon*
(c) *Hippocampus* (d) *Chelone*

9. Select the incorrect statements with respect to Cyclostomes. **Ph-II 2022**

(i) They lack scales and paired fins.
(ii) They have circular mouth with jaws.
(iii) They bear 6-15 pairs of gills.
(iv) They migrate to deep sea for spawning.

Choose the most appropriate answer from the options given below :

(a) (i) and (iv) only (b) (i) and (ii) only
(c) (ii) and (iii) only (d) (ii) and (iv) only

10. Match List - I with List - II. **2021**

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)

(a) (iv) (i) (ii) (iii)
(b) (iv) (iii) (i) (ii)
(c) (iii) (iv) (i) (ii)
(d) (iii) (iv) (ii) (i)

11. Match the following: **2021**

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

Choose the correct answer from the options given below.

(A) (B) (C) (D)

(a) (i) (iv) (iii) (ii)
(b) (ii) (iii) (i) (iv)
(c) (iv) (i) (iii) (ii)
(d) (ii) (iii) (iv) (i)

12. Which one of the following organisms bears hollow and pneumatic long bones? **2021**

(a) *Ornithorhynchus* (b) *Neophron*
(c) *Hemidactylus* (d) *Macropus*

13. Read the following statements **2021**

(i) Metagenesis is observed in Helminths.
(ii) Echinoderms are triploblastic and coelomate animals.
(iii) Round worms have organ-system level of body organization.
(iv) Comb plates present in ctenophores help in digestion.
(v) Water vascular system is characteristic of Echinoderms.

Choose the correct answer from the options given below.

(a) (ii), (iii) and (v) are correct
(b) (iii), (iv) and (v) are correct
(c) (i), (ii) and (iii) are correct
(d) (i), (iv) and (v) are correct

14. Match the following columns and select the correct option. **2020**

Column-I	Column-II
(A) Gregarious, polyphagous pest	(i) *Asterias*
(B) Adult with radial symmetry and larva with bilateral symmetry	(ii) *Scorpion*
(C) Book lungs	(iii) *Ctenoplana*
(D) Bioluminescence	(iv) *Locusta*

(A) (B) (C) (D)

(a) (iv) (i) (ii) (iii)
(b) (iii) (ii) (i) (iv)
(c) (ii) (i) (iii) (iv)
(d) (i) (iii) (ii) (iv)

15. Which of the following statements are true for the phylum-Chordata? **2020**

(i) In Urochordata notochord extends from head to tail and it is present throughout their life.
(ii) In Vertebrata notochord is present during the embryonic period only.
(iii) Central nervous system is dorsal and hollow.
(iv) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.

(a) (iii) and (i) (b) (i) and (ii)
(c) (ii) and (iii) (d) (i) and (iii)

16. Match the following columns and select the correct option. **2020**

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*

(A) (B) (C) (D)

(a) (iii) (iv) (i) (ii)
(b) (iv) (ii) (iii) (i)
(c) (i) (iv) (iii) (ii)
(d) (ii) (iii) (iv) (i)

17. Bilaterally symmetrical and acoelomate animals are exemplified by **2020**

(a) Platyhelminthes (b) Aschelminthes
(c) Annelida (d) Ctenophora

18. Which of the following animals are true coelomates with bilateral symmetry? **2019**

(a) Annelids (b) Adult echinoderms
(c) Aschelminthes (d) Platyhelminthes

19. Consider following features: **2019**

(i) Organ system level of organisation
(ii) Bilateral symmetry
(iii) True coelomates with segmentation of body

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

(a) Annelida, Arthropoda and Chordata
(b) Annelida, Arthropoda and Mollusca
(c) Arthropoda, Mollusca and Chordata
(d) Annelida, Mollusca and Chordata

20. Match the following genera with their respective phylum: **2019**

Column-I	Column-II
(A) *Ophiura*	(i) Mollusca
(B) *Physalia*	(ii) Platyhelminthes
(C) *Pinctada*	(iii) Echinodermata
(D) *Planaria*	(iv) Coelenterata

Select the correct option :

(a) (A)-(iii), (B)-(iv), (C)-(ii), (D)-(i)
(b) (A)-(iv), (B)-(i), (C)-(iii), (D)-(ii)
(c) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)
(d) (A)-(i), (B)-(iii), (C)-(iv), (D)-(ii)

21. Match the following organisms with their respective characteristics: **2019**

(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)

(a) (iii) (ii) (i) (iv)
(b) (iii) (iv) (ii) (i)
(c) (ii) (iv) (iii) (i)
(d) (iii) (ii) (iv) (i)

22. Which of the following animals does not undergo metamorphosis? **2018**

(a) Earthworm (b) Tunicate
(c) Starfish (d) Moth

23. An important characteristic that Hemichordates share with Chordates is : **2018**

(a) Ventral tubular nerve cord
(b) Pharynx with gill slits
(c) Pharynx without gill slits
(d) Absence of notochord

24. Which one of these animals is not a homeotherm? **2018**

(a) *Macropus* (b) *Chelone*
(c) *Psittacula* (d) *Camelus*

25. Which among these is the correct combination of aquatic mammals? **2017**

(a) Dolphins, Seals, *Trygon*
(b) Whales, Dolphins, Seals
(c) *Trygon*, Whales, Seals
(d) Seals, Dolphins, Sharks

26. In case of poriferans, the spongocoel is lined with flagellated cells called: **2017**

(a) oscula (b) choanocytes
(c) mesenchymal cells (d) ostia

27. Which of the following characteristic features always holds true for the corresponding group of animals? **2016**

(a) Cartilaginous endoskeleton	*Chondrichthyes*
(b) Viviparous	*Mammalia*
(c) Possess a mouth with an upper and a lower jaw	Chordata
(d) 3 - chambered heart	*Reptilia* with one incompletely divided ventricle

28. Which one of the following characteristics is not shared by birds and mammals? **2016**

(a) Ossified endoskeleton
(b) Breathing using lungs
(c) Viviparity
(d) Warm blooded nature

29. Which of the following featrues is not present in the Phylum - Arthropoda? **2016**

(a) Chitinous exoskeleton
(b) Metameric segmentation
(c) Parapodia
(d) Jointed appendages

30. Which of the following represents the correct combination without any exception? **2015RS**

	Characteristics	Class
(a)	Mouth ventral, gills without operculum; skin with placoid scales; persistent notochord	*Chondrichthyes*
(b)	Sucking and circular mouth; jaws absent, integument without scales; paired appendages	*Cyclostomata*
(c)	Body covered with feathers; skin moist and glandular; fore-limbs form wings; lungs with air sacs	*Aves*
(d)	Mammary gland; hair on body; pinnae; two pairs of Limbs	*Mammalia*

31. Which of the following animals is not viviparous? **2015 RS**

(a) Elephant (b) Platypus
(c) Whale (d) Flying fox (Bat)

32. A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean is: **2015 RS**

(a) *Myxine* (b) *Neomyxine*
(c) *Petromyzon* (d) *Eptatretus*

33. Metagenesis refers to: **2015 RS**

(a) Alteration of generation between asexual and sexual phases of an organisms
(b) Occurrence of a drastic change in form during post-embroyonic development
(c) Presence of a segmented body and parthenogenetic mode of reproduction
(d) Presence of different morphic forms

34. Which of the following characteristics is mainly responsible for diversification of insects on land? **2015 RS**

(a) Bilateral symmetry
(b) Exoskeleton
(c) Eyes
(d) Segmentation

35. Body having meshwork of cell, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum. **2015 RS**
(a) Porifera (b) Mollusca
(c) Protozoa (d) Coelenterate

36. Select the Taxon mentioned that represents both marine and fresh water species: **2014**
(a) Echinoderms
(b) Ctenophora
(c) Cephalochordata
(d) Cnidaria

37. Which one of the following living organisms completely lacks a cell wall? **2014**
(a) Cyanobacteria
(b) Sea – fan(*Gorgonia*)
(c) *Saccharomyces*
(d) Blue–green algae

38. *Planaria* possesses high capacity of:
(a) Metamorphosis **2014**
(b) Regeneration
(c) Alternation of generation
(d) Bioluminescence

39. A marine cartilaginous fish that can produce electric current is: **2014**
(a) *Pristis*
(b) *Torpedo*
(c) *Trygon*
(d) *Scoliodon*

40. The characteristics of class *Reptilia* are: **2013**
(a) Body covered with dry and cornified skin, scales over the body are epidermal, they do not have external ears
(b) Body covered with moist skin which is devoid of scales, the ear is represented by a tympanum, alimentary canal, urinary and reproductive tracts open into a common cloaca
(c) Fresh water animals with bony endoskeleton, air-bladder to regulate buoyancy
(d) Marine animals with cartilaginous endoskeleton, body covered with placoid scales

41. Which one of the following groups of animals reproduces only by sexual means? **2013**
(a) Ctenophora (b) Cnidaria
(c) Porifera (d) Protozoa

42. Which group of animals belong to the same phylum? **2013**
(a) Earthworm , Pinworm, Tapeworm
(b) Prawn, Scorpion, *Locusta*
(c) Sponge, Sea anemone, Starfish
(d) Malarial parasite, *Amoeba*, Mosquito

43. One of the representatives of phylum Arthropoda is: **2013**
(a) Silverfish
(b) Pufferfish
(c) Flying fish
(d) Cuttlefish

44. Which of the following are correctly matched with respect to their taxonomic classification? **2013**
(a) Centipede, millipede, spider, scorpion-Insecta
(b) House fly, butterfly, tse tse fly, silverfish-Insecta
(c) Spiny anteater, sea urchin, sea cucumber-Echinodermata
(d) Flying fish, cuttlefish, silverfish-Pisces

45. Which one of the following animals is correctly matched with its one characteristics and the taxon? **2013**

	Animal	Characteristic	Taxon
(a)	Duckbilled platypus	Oviparous	Mammalian
(b)	Millipede	Ventral nerve cord	Arachnida
(c)	Sea Anemone	Triploblastic	Cnidaria
(d)	Silverfish	Pectoral and Pelvic fins	Chordata

46. Sharks and dogfishes differ from skates and rays by
(a) Their pectoral fins distinctly marked off from cyclindrical bodies **2013**
(b) Gill slits are ventrally placed
(c) Head and trunk are widened considerably
(d) Distinct demarcation between body and tail

47. Match the name of the animal (column I), with one characteristics (column II), and the phylum/class (column III) to which it belongs: **2013**

	Column I	Column II	Column III
(a)	*Ichthyophis*	terrestrial	Reptilia
(b)	*Limulus*	body covered by chitinous exoskeleton	Pisces
(c)	*Adamsia*	radially symmetrical	Porifera
(d)	*Petromyzon*	ectoparasite	Cyclostomata

EXERCISE - 3 | RAISE YOUR LEVEL

1. The members of the following group have exclusively open blood vascular system
   (a) Mollusca (b) Arthropoda
   (c) Both of these (d) Annelida
2. On the basis of following feature the sponges can be differentiated from the coelenterates
   (a) Diploblastic body wall
   (b) Canal system
   (c) Asexual reproduction by budding
   (d) Acoelomate
3. The larvae of Echinoderms are
   (a) Asymmetrical
   (b) Radially symmetrical
   (c) Bilaterally symmetrical
   (d) Both (b) & (c)
4. Platyhelminthes are
   (a) Triploblastic and acoelomate
   (b) Diploblastic and coelomate
   (c) Triploblastic and pseudocoelomate
   (d) Diploblastic and acoelomate
5. Bilateral symmetry, segmentation, coelom and open circulatory system are the characters of
   (a) Arthropoda (b) Mollusca
   (c) Annelida (d) Platyhelmenthes
6. Planaria, *Taenia* and Liver Fluke
   (a) All are coelomate (b) All are found in gut
   (c) All are flat worms (d) Both (b) and (c)
7. Parapodia are locomotory structures in
   (a) Arthropoda (b) Coelenterata
   (c) Echinodermata (d) None of these
8. In which of the following set both the animals belong to the same phylum?
   (a) Octopus and Leech (b) Scoliodon and Whale
   (c) Hag fish and Jelly fish (d) None of these
9. In which group, the notochord is limited to a certain part only :
   (a) Urochordata (b) Cephalochordata
   (c) Hemichordata (d) All of the above
10. Which of the following statement is correct?
   (a) All chordates are vertebrates
   (b) Few chordates are vertebrates
   (c) All vertebrates are chordates
   (d) All chordates are protochordates
11. Both bats and whales are classified as mammals because both
   (a) Have 4 – chambered heart
   (b) Have Pinna
   (c) Give birth to young ones
   (d) Endothermic
12. Which of the following is a vertebrate but not a member of Tetrapoda?
   (a) *Petromyzon* (b) Bat
   (c) Pigeon (d) Amphioxus
13. Which one of the following statements is true as regard to a certain mammal and its feature :
   (a) Bats have feathers
   (b) Platypus is oviparous
   (c) Elephant is ovoviviparous
   (d) Camel has biconcave RBCs
14. Two chief features of mammals which distinguish them from other vertebrates are :
   (a) Hairy skin and oviparity
   (b) Hairy skin and mammary glands
   (c) Mammary glands and teeth
   (d) Pinna and teeth
15. True Coelom is cavity between alimentary canal and body wall enclosed by
   (a) Ectoderm and endoderm
   (b) Mesoderm and ectoderm
   (c) Ectoderm on both sides
   (d) Mesoderm on both sides
16. Which is unrelated
   (a) Sea cucumber (b) Sea lily
   (c) Sea urchin (d) Sea squid
17. Which is an exclusive chordate character
   (a) True coelom (b) Pharyngeal gill slits
   (c) Bilateral symmetry (d) Triploblastic
18. Which is viviparous
   (a) Bony Fish (b) Shark
   (c) Lung Fish (d) Frog
19. Radial symmetry occurs in
   (a) Porifera and Coelenterata
   (b) Coelenterata and Echinodermata
   (c) Coelenterata and Platyhelminthes
   (d) Arthropoda and Mollusca
20. A poisonous snake is
   (a) Viper (b) Cobra
   (c) Krait (d) All of these
21. Which one is not a coelenterate ?
   (a) Sea Fan (b) Jelly fish
   (c) Sea Cucumber (d) Sea Pen
22. Which one is correct
   (a) Flatworms are eucoelomates
   (b) Fishes are radially symmetrical
   (c) Birds are poikilothermic
   (d) Earthworm is metamerically segmented
23. In some animal groups, the body is found divided into compartments with serial repetition of at least some organs. This phenomenon is called
   (a) Segmentation (b) Metamerism
   (c) Metagenesis (d) Metamorphosis

24. Which one of the following statements is incorrect?
(a) Mesoglea is present in between ectoderm and endoderm in *Obelia*
(b) *Asterias* exhibits radial symmetry
(c) *Fasciola* is a pseudocoelomate animal
(d) *Taenia* is a triploblastic animal

25. Body cavity is the cavity present between body wall and gut wall. In some animals the body cavity is not lined by mesoderm instead mesoderm is present as scattered pouches. Such animals are called
(a) Acoelomate (b) Pseudocoelomate
(c) Coelomate (d) Haemocoelomate

NEW PATTERN QUESTION

26. Column I contains zoological names of animals and column II contains their common name. Match the following and choose the correct option.

	Column-I		Column-II
A.	*Physalia*	I.	Sea anemone
B.	*Meandrina*	II.	Brain coral
C.	*Gorgonia*	III.	Sea fan
D.	*Adamsia*	IV.	Portuguese man-of-war

(a) A – III; B – II; C – I; D – IV
(b) A – IV; B – III; C – II; D – I
(c) A – IV; B – II; C – III; D – I
(d) A – II; B – III; C – I; D – IV

27. Column-I contains organisms and column-II contains their excretory structures. Choose the correct match form the options given below.

	Column-I (Organism)		Column-II (Excretory structures)
A.	Honey bee	I.	Nephridia
B.	*Balanoglossus*	II.	Malpighian tubules
C.	Earthworm	III.	Proboscis gland
D.	Flatworm	IV.	Flame cells

(a) A – I; B – III; C – II; D – IV
(b) A – III; B – I; C – II; D – III
(c) A – II; B – I; C – III; D – I
(d) A – II; B – III; C – I; D – IV

28. Match the phylum given in column - I with their example given in column - II and choose the correct option.

	Column-I (Phylum)		Column-II (Examples)
A.	Echinodermata	I.	*Ascidia*, *Doliolum*
B.	Hemichordata	II.	*Asterias*, *Ophiura*
C.	Urochordata	III.	*Branchiostoma*
D.	Cephalochordata	IV.	*Balanoglossus, Saccoglossus*

(a) A – IV; B – II; C – I; D – III
(b) A – II; B – IV; C – I; D – III
(c) A – II; B – IV; C – III; D – I
(d) A – II; B – I; C – IV; D – III

29. Column I contains the characteristics features and column II contains the function/ location. Select the correct match from the option given below.

	Column-I (Characteristic feature)		Column-II (Function/Location)
A.	Water canal system	I.	Sponges
B.	Comb plates	II.	Eight ciliated external rows present in a body of ctenophora.
C.	Nephridia	III.	Helps in osmoregulation and excretion
D.	Jointed appendages	IV.	A body part of arthropoda

(a) A – I; B – II; C – III; D – IV
(b) A – III; B – IV; C – IV; D – II
(c) A – II; B – III; C – I; D – IV
(d) A – III; B – II; C – IV; D – I

DIRECTION (30): *Read the statements carefully and answer the question on the basis of following options.*
(a) Both Statement I and Statement II are incorrect
(b) Statement I is correct but Statement II is incorrect
(c) Statement I is incorrect but Statement II is correct
(d) Both Statement I and Statement II are correct

30. **Statement I:** Parapodia of Nereis are meant for swimming.
Statement II: Nereis is dioecious but earthworms and leeches are monoecious.

31. Which of the following statement(s) is/are correct regarding phylum coelenterata?
(i) They are aquatic, mostly marine, sessile or free-swimming, radially symmetrical animals.
(ii) They have a central gastro-vascular cavity with a single opening called hypostome.
(iii) Digestion is extracellular and intracellular.
(iv) Examples are *Sycon, Spongilla* and *Euspongia*.
(v) They are triploblastic organisms.
(a) (i) and (ii) only
(b) (i) and (v) only
(c) (i), (ii) and (iii) only
(d) All of these

32. Which of the following statements (i – v) are incorrect?
(i) Parapodia are lateral appendages in arthropods used for swimming.
(ii) Radula in molluscs are structures involved in excretion.
(iii) Aschelminthes are dioecious.
(iv) Echinoderm adults show radial symmetry.
(a) (i) and (ii) (b) (i) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

33. Which of the following statements are incorrect?
(i) Circulatory system in arthropods is of closed type.
(ii) Parapodia in annelids helps in swimming.
(iii) Phylum mollusca is the second largest animal phylum.
(iv) Aschelminthes are dioecious.
(a) (i) only (b) (iii) only
(c) (i) and (iii) (d) (iii) and (iv)

34. Select the incorrect feature of mollusca from the given statements.
(i) Terrestrial or aquatic animals having cellular system level of organization.
(ii) Radial symmetrical and acoelomate animals and possesses two germinal layers.
(iii) A file like rasping organ called radula is present.
(iv) Usually dioecious and viviparous animals.
(v) Mollusca is the second largest animal phylum.
(a) (i) and (ii) only (b) (ii) and (v) only
(c) (i), (ii) and (iv) only (d) All the four statements.

35. Which of the following statements are correct?
(i) The pelvic fins of female sharks bear claspers.
(ii) In *Obelia*, polyps produce medusae sexually and medusae form the polyps asexually.
(iii) Flame cells in platyhelminthes help in osmo-regulation and excretion.
(iv) In non-chordates, central nervous system is ventral, solid and double.
(a) (ii) and (iv) (b) (i) and (iii)
(c) (iii) and (iv) (d) (i), (ii) and (iii)

36. Which of the following statement(s) is/are correct for class amphibia?
(i) Body is divisible into head and trunk.
(ii) Respiration is through gills only.
(iii) The heart is two chambered *i.e.* one auricle and one ventricle.
(iv) Fertilization is internal.
(a) Only (i) (b) Only (iv)
(c) (i), (ii) and (iii) only (d) All of these

37. Refer the following animals and identify those which have a fluid filled body cavity with a complete lining derived from mesoderm.
(i) Sycon (ii) Butterfly
(iii) *Nereis* (iv) Sea fan
(v) Scorpion
(a) (i) and (iii) only (b) (ii) and (iv) only
(c) (ii), (iii) and (v) only (d) All of these

DIRECTION (38-44): *These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.*
(a) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(b) (A) is correct but (R) is not correct
(c) (A) is not correct but (R) is correct
(d) Both (A) and (R) are correct and (R) is the correct explanation of (A)

38. **Assertion:** The duck-billed *Platypus* is egg-laying animal and yet is grouped under mammals.
Reason: The skin of mammals is unique in possessing hair.

39. **Assertion:** *Pheretima* and *Nereis* both belong to annelida.
Reason: They have nephridia which helps in locomotion.

40. **Assertion:** *Taenia solium* & *Fasciola* belong to platyhelminthes.
Reason: *Platyhelminthes* is coelomate.

41. **Assertion :** Most of the sponges are radially symmetrical.
Reason : Choanocytes line the spongocoel and the canals.

42. **Assertion :** Cnidarians are diploblastic.
Reason : Cnidarian have mesoglea between ectoderm and endoderm.

43. **Assertion :** All vertebrates are chordates.
Reason : All vertebrates have paired appendages.

44. **Assertion :** Petromyzon does not have jaws.
Reason : Petromyzon migrates to sea for feeding on microbes.