

ANIMAL KINGDOM



Basis of Classification

- There are fundamental features common to various individuals in relation to the arrangement of cells, body symmetry nature of coelom, patterns of digestive, circulatory or reproductive systems. These features are used as the basis of classification of animals.

Levels of Organisation

- All the members of Animalia are multicellular, but some of them do not exhibit the same pattern of organisation of cells. Example: the cells in sponges are arranged as loose cell aggregates i.e., they exhibit cellular level of organisation.
- The cells performing the same function, in coelenterates, are arranged into tissues, hence is called tissue level of organisation.
- Organs level is the higher level of organisation, exhibited by members of Platyhelminthes and other higher phyla where tissues are grouped together to form organs.
- The pattern in which organs associate to form functional systems and each system is concerned with a specific physiological function is called organ system level of organisation.
- The digestive system in Platyhelminthes has only a single opening to the outside of the body that serves as both mouth and anus and hence is called incomplete. A complete digestive system has two opening, mouth and anus.
- **The circulatory system may be of two types:**
 - (i) Open type in which blood is pumped out of the heart and the cells and tissues are directly bathed in it and
 - (ii) Closed type in which the blood is circulated through a series of vessels of varying diameter, e.g., arteries, veins and capillaries.

Symmetry

- Animals can be categorised on the basis of their symmetry.
- Sponges are mostly asymmetrical, i.e., any plane that passes through the centre does not divide them into two equal halves.
- When any plane passing through the central axis of the body divides the organism into two equal halves, it is called radial symmetry. Example: Coelenterates, ctenophores and echinoderms.

- When the body of an organism can be divided into identical left and right halves in only one plane, it is called lateral symmetry. Example: annelids, arthropods etc.

Diploblastic and Triploblastic Organisation

- Diploblastic animals are those in which the cells are arranged in two embryonic layers, an external ectoderm and an internal endoderm. Example: Coelenterates. An undifferentiated layer, mesoglea, is present in between the ectoderm and the endoderm.
- Triploblastic animals are those in which the developing embryo has a third germinal layer, **mesoderm**, in between the ectoderm and endoderm. Example: platyhelminthes.

Coelom

- Coelom is the body cavity, which is lined by mesoderm.
- Animals possessing coelom are called coelomates. Example: annelids, molluscs, arthropods, hemichordates and chordates.
- Animals in which the body cavity is not lined by mesoderm but it is present as scattered pouches in between the ectoderm and endoderm are called pseudocoelomates. Example: aschelminthes, Such a body cavity is called pseudocoelom.
- Animals in which the body cavity is absent are called acoelomates. Example: platyhelminthes.

Segmentation

- The pattern in which the body of animal is externally and internally divided into segments with a serial repetition of at least some organs, is called metameric segmentation. Example: earthworm.
- This phenomenon is known as metamerism.

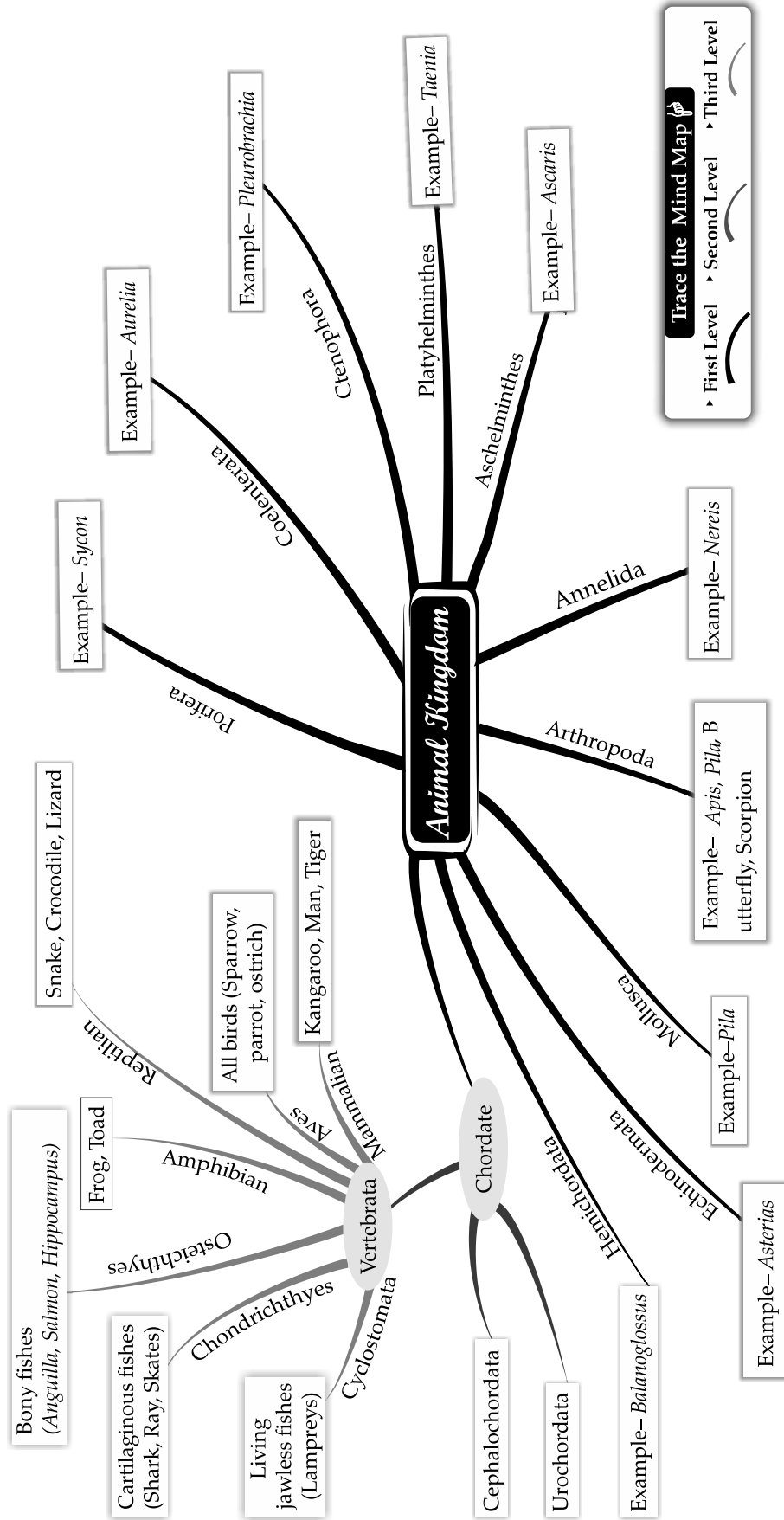
Notochord

- Notochord is a mesodermally derived rod like structure formed on the dorsal side during embryonic development in some animals.
- Animals with notochord are called chordates and those animals which do not form this structure are called non-chordates. Example: porifera to echinoderms.



Classification of Animals

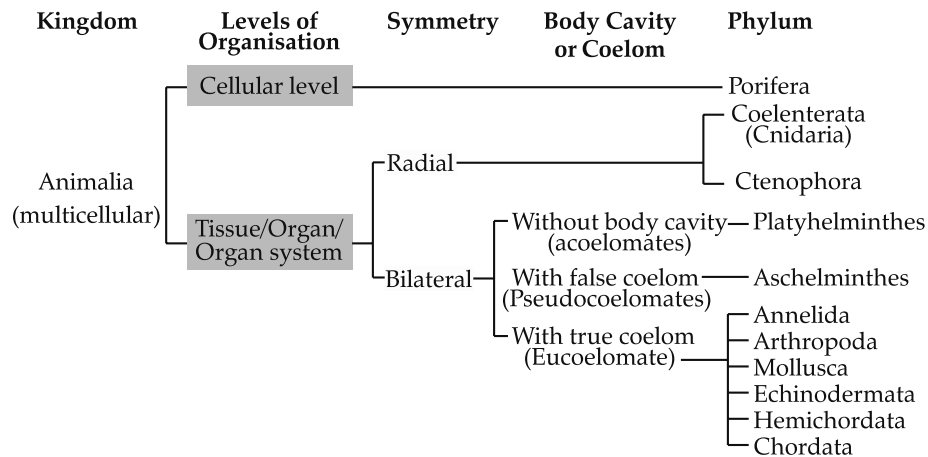
- Animals are classified on the basis of arrangement of cells, body symmetry, nature of coelom, patterns of digestive, circulatory or reproductive systems.



Trace the Mind Map

► First Level ► Second Level ► Third Level

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Phylum Porifera

- Members of this phylum are commonly known as sponges.
- Most of them are marine and **asymmetrical** animals.
- They are primitive multicellular animals with cellular level of organisation.
- Body wall is two layered – outer dermal layer called **pinacoderm** and inner gastral layer called **choanoderm**.



Mnemonics

Concept: Phylums of Animal Kingdom

Mnemonics: A CHAMP PACE

Interpretation: Aschelminthes, Coelenterata, Hemichordata, Annelida, Mollusca, Platyhelminthes, Porifera, Arthropoda, Ctenophora, Echinodermata.

- Flat cells called **pinacocytes** are present in the pinacoderm and specialised flagellated cells called **collar cells** or **choanocytes** are present in the choanoderm.
- They possess a large cavity called spongocoel, which opens to outside through a pore called **osculum**. Choanocytes line the spongocoel.
- They have a water canal system. Water enters through minute pores called **ostia** in the spongocoel and from the spongocoel goes out through the osculum. The canal system helps in gathering of food, respiratory exchange and removal of waste.
- The body is supported by a skeleton made up of spicules or spongin fibres.
- Digestion is intracellular.
- They are hermaphrodite i.e., male and female sex organs are present on the same individual.
- They reproduce by asexual and sexual reproduction. Asexual reproduction takes place through fragmentation and sexual by formation of gametes. Fertilisation is internal.
- Development is indirect and involves a larval stage which is morphologically distinct from the adult.

- Examples: *Sycon* (Scypha), *Spongilla* (fresh water sponge) and *Euspongia* (bath sponge).

Phylum- Coelenterata (Cnidaria)

- They are aquatic, mostly marine, sessile or free-swimming animals.
- They possess radial symmetry.
- They exhibit tissue level of organisation.
- They are diploblastic.
- They possess special cells called **cnidoblasts** or **cnidocytes** on the tentacles and the body. These cells help in anchorage, defence and capturing of prey.
- They have a central gastro-vascular cavity with a single opening called **hypostome**. Digestion is extracellular and intracellular.
- Some of the coelenterates like corals possess a skeleton composed of calcium carbonate.
- Coelenterates show two basic body forms – polyp and medusa.
 - Polyp form:** It is the sessile and cylindrical form which is observed in *Hydra* and *Adamsia*.
 - Medusa form:** It is the umbrella-shaped and free-swimming form which is observed in *Aurelia* or jelly fish.
- Some coelenterates e.g., *Obelia* exist in both forms. These coelenterates exhibit phenomenon of alternation of generation (metagenesis). Polyp form reproduces asexually to produce medusae and medusa form reproduces sexually to produce polyps.
- Common examples of coelenterates are *Physalia* (Portuguese man-of-war), *Adamsia* (Sea anemone), *Pennatula* (Sea-pen), *Gorgonia* (Sea-fan) and *Meandrina* (Brain coral).

Phylum – Ctenophora

- Members of this phylum are commonly known as **sea walnuts** or **comb jellies**.
- They are exclusively marine and possess radial symmetry.
- They are diploblastic organisms with tissue level of organisation.
- Their body bears eight external rows of ciliated comb plates which help in locomotion.
- They exhibit the phenomenon of bioluminescence (the property of a living organism to emit light).
- Digestion is both extracellular and intracellular.

- ▶ They are hermaphrodite. They reproduce only by sexual means. Fertilisation is external and development is indirect.
- ▶ Common examples of ctenophores are *Pleurobrachia* and *Ctenoplana*.

Phylum – Platyhelminthes

- ▶ The members belonging to this phylum have dorso-ventrally flattened body. Because of this they are also called as **flatworms**.
- ▶ They possess bilateral symmetry.
- ▶ They are triploblastic and acoelomate animals with organ level of organisation.
- ▶ Most of them are endoparasites. They possess hooks and suckers to attach and absorb digested food from the host.
- ▶ Specialised cells called **flame cells** are present in them. These cells help in osmoregulation and excretion.
- ▶ They are hermaphrodite.
- ▶ Fertilisation is internal and development is through many larval stages.
- ▶ Common examples of flat worms are *Taenia* (Tapeworm) and *Fasciola* (Liver fluke).

Phylum – Aschelminthes

- ▶ As their body is circular in cross-section, they are also known as round worm.
- ▶ They are found in variety of habitats. For example, some of them are aquatic, some are terrestrial and some are parasitic in plants and animals.
- ▶ They have organ-system level of body organisation.
- ▶ They possess bilateral symmetry.
- ▶ They are triploblastic and pseudocoelomate animals.
- ▶ They possess complete digestive system with well developed muscular pharynx.
- ▶ They have an excretory tube which removes body wastes from the body cavity through the excretory pore.
- ▶ They are dioecious, i.e., males and females are distinct. Usually, females are longer than males.
- ▶ Fertilisation is internal and development may be direct or indirect.
- ▶ Some examples of aschelminthes are *Ascaris* (Round Worm), *Wuchereria* (Filarial worm) and *Ancylostoma* (Hookworm).

Phylum – Annelida

- ▶ They may be aquatic (marine and freshwater) or terrestrial; free-living, and sometimes parasitic.
- ▶ They have organ-system level of body organisation.
- ▶ They have bilateral symmetry.
- ▶ They are triploblastic and coelomate animals.
- ▶ Their body surface is distinctly marked out into segments or metameres.
- ▶ They possess longitudinal and circular muscles which help in locomotion.
- ▶ Aquatic annelids like *Nereis* possess lateral appendages called **parapodia** which help in swimming.
- ▶ They possess closed circulatory system.
- ▶ Nephridia (sing. nephridium) help in osmoregulation and excretion.

- ▶ Neural system consists of paired ganglia connected by lateral nerves to a double ventral nerve cord.
- ▶ Some of them such as *Nereis* is dioecious, while some such as earthworms and leeches are monoecious.
- ▶ They reproduce by sexual means.
- ▶ Common examples of annelids are *Nereis*, *Pheretima* (Earthworm) and *Hirudinaria* (Blood sucking leech).

Phylum Arthropoda

- ▶ This is the **largest phylum** of kingdom animalia which includes insects.
- ▶ More than two-third of all named species on earth are arthropods.
- ▶ They have organ-system level of organisation.
- ▶ They have bilateral symmetry.
- ▶ They are triploblastic, segmented and coelomate animals.
- ▶ Their body is covered by chitinous exoskeleton.
- ▶ The body is divisible into three parts – head, thorax and abdomen.
- ▶ They have jointed appendages.
- ▶ They have gills, book gills, book lungs or tracheal system as respiratory organ.
- ▶ They have open circulatory system.
- ▶ They possess sensory organs like antennae and eyes.
- ▶ They have malpighian tubules as excretory organ.
- ▶ Most of them are dioecious and oviparous.
- ▶ Fertilisation is usually internal. Development may be direct or indirect.
- ▶ Some of the arthropods such as *Apis* (Honey bee), *Bombyx* (Silkworm), *Laccifer* (Lac insect) are economically important insects while some other insects like *Anopheles*, *Culex* and *Aedes* (Mosquitoes) are vectors and some insects like *Locusta* (Locust) are pest. *Limulus* (King crab) is a living fossil.

Phylum – Mollusca

- ▶ This is the second largest phylum of kingdom Animalia.
- ▶ Molluscs are terrestrial or aquatic (marine or freshwater) organisms.
- ▶ They have an organ-system level of organisation.
- ▶ Their body is bilaterally symmetrical.
- ▶ They are triploblastic and coelomate animals.
- ▶ They have soft and unsegmented body covered by a calcareous shell.
- ▶ Their body is differentiated into head, muscular foot and visceral hump. A soft and spongy layer of skin forms a mantle over the visceral hump. The space between the hump and the mantle is called the mantle cavity.
- ▶ The anterior region of the head bears sensory tentacles. The mouth contains a rasping organ for feeding, called radula.
- ▶ In terrestrial forms, respiration takes place through lungs and in aquatic forms, respiration takes place through feather-like gills which are present in the mantle cavity.

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- Molluscs are usually dioecious and oviparous with indirect development.
- Common examples of molluscs are *Pila* (Apple snail), *Pinctada* (Pearl oyster), *Sepia* (Cuttlefish), *Loligo* (Squid), *Octopus* (Devil fish), *Aplysia* (Sea-hare), *Dentalium* (Tusk shell) and *Chaetopleura* (Chiton).

Phylum – Echinodermata

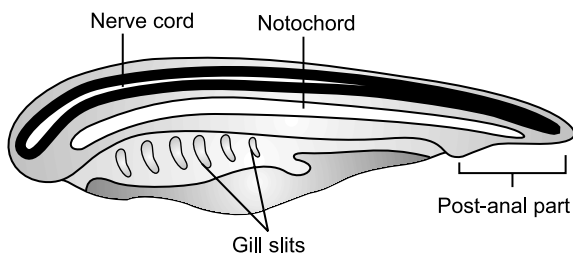
- The echinoderms are marine organisms which have an endoskeleton of calcareous ossicles.
- They have organ-system level of organisation.
- The echinoderms, in larval stage, are bilaterally symmetrical but adults are radially symmetrical.
- They are triploblastic and coelomate animals.
- The digestive system is complete. The mouth is situated on the lower (ventral) side and anus is present on the upper (dorsal) side.
- Their unique characteristic is presence of water vascular system. This system helps in locomotion, capture and transport of food and respiration.
- Echinoderms lack excretory system.
- They reproduce by sexual means. Sexes are separate.
- Fertilisation is usually external and development is indirect with free-swimming larva.
- Common echinoderms are *Asterias* (Star fish), *Echinus* (Sea urchin), *Antedon* (Sea lily), *Cucumaria* (Sea cucumber) and *Ophiura* (Brittle star).

Phylum – Hemichordata

- It was earlier considered as a sub-phylum under phylum Chordata. But now it is considered as a separate phylum under non-chordata.
- This phylum incorporates worm-like marine animals with organ-system level of organisation.
- Hemichordates are bilaterally symmetrical, triploblastic and coelomate animals.
- Their body is cylindrical and differentiated into an anterior proboscis, a collar and a long trunk.
- They have open circulatory system.
- They respire through gills.
- Proboscis gland is their excretory organ.
- Sexes are separate. Fertilisation is external and development is indirect.
- Common hemichordates are *Balanoglossus* and *Saccoglossus*.

Phylum-Chordata

- Animals belonging to phylum Chordata are fundamentally characterised by the presence of a notochord, a dorsal hollow nerve cord and paired pharyngeal gill slits.



Chordata characteristics

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

Table: Comparison of chordates and non-chordates.

S.No.	Chordates	Non-chordates
(i)	Notochord present.	Notochord absent.
(ii)	Central nervous system is dorsal, hollow and single.	Central nervous system is ventral, solid and double.
(iii)	Pharynx perforated by gill slits.	Gill slits are absent.
(iv)	Heart is ventral.	Heart is dorsal (if present).
(v)	A post-anal part (tail) is present.	Post-anal tail is absent.

➤ Phylum chordata is divided into three subphyla:

- Urochordata:** In urochordates, notochord is present only in larval tail. Their examples are *Ascidia*, *Salpa* and *Doliolum*.
- Cephalochordata:** In cephalochordates, notochord extends from head to tail region and is persistent throughout their life. Examples of cephalochordates is *Branchiostoma*.
- Vertebrata:** The members of this sub-phylum possess notochord during the embryonic period. In adults, this notochord is replaced by a cartilaginous or bony vertebral column.
 - Subphyla Urochordata and Cephalochordata are often referred to as protochordate.
 - They have a ventral muscular heart with two, three or four chambers.
 - They have kidneys for excretion and osmoregulation.
 - They have paired appendages either in the form of fins or in the form of limbs.
 - Subphylum vertebrata is divided into two Divisions: Agnatha and Gnathostomata.

Divisions : Agnatha (The jawless vertebrates).

Class – Cyclostomata

- All the members of class cyclostomata are marine and ectoparasites on some fishes.
- They possess an elongated body containing 6-15 pairs of gill slits for respiration.
- They have a sucking and circular mouth without jaws.
- They lack scales and paired fins.
- Their cranium and vertebral column are cartilaginous.
- They have closed circulatory system.
- They are marine creatures but for spawning they migrate to freshwater. Thereafter, they die within a few days.
- Their larvae, after metamorphosis, return to the ocean.

- Some common members of class cyclostomata are *Petromyzon* (Lamprey) and *Myxine* (Hagfish).

Divisions : Gnathostomata (The jawed vertebrates)

Gnathostomata is divided into two super classes : Pisces and Tetrapod.

Super Class I: Pisces (bear fins)

Class 1 – Chondrichthyes

- They are marine animals.
- Their body is streamlined and endoskeleton is cartilaginous.
- Their mouth is located on the ventral side.
- Notochord is persistent throughout life.
- Gill slits are separate and not covered by operculum.
- They contain minute placoid scales. Because of their presence, the skin is tough.
- Their teeth are modified placoid scales which are backwardly directed. Their jaws are very powerful. These animals are predaceous.
- They lack air bladder and hence to avoid sinking they have to swim constantly.
- Their heart is two-chambered (one auricle and one ventricle).
- Some of cartilaginous fishes e.g., *Torpedo* have electric organs and some of them e.g., *Trygon* possess poison sting.
- They do not have capacity to regulate their body temperature. Such type of animals are called cold-blooded animals or poikilothermous animals.
- Sexes are separate. In males, pelvic fins bear claspers.
- They show internal fertilisation and many of them are viviparous.
- Some examples of chondrichthyes are *Scoliodon* (Dog fish), *Pristis* (Saw fish) and *Carcharodon* (Great white shark) and *Trygon* (Sting ray).

Class 2 – Osteichthyes

- This class includes those marine and freshwater fishes which have bony endoskeleton.
- Their body is streamlined and mouth is terminal.
- They possess four pairs of gills which are covered by an operculum on each side.
- Skin is covered with cycloid/ctenoid scales.
- They possess air bladder which regulates buoyancy.
- They have two-chambered (one auricle and one ventricle) heart.
- They are cold-blooded animals.
- Sexes are separate.
- Fertilisation is usually external and most of them are oviparous.
- Development is direct.
- Common examples of marine bony fishes are *Exocoetus* (Flying fish), *Hippocampus* (Sea horse) while *Labeo* (Rohu), *Catla* (Katla), *Clarias* (Magur) are examples of freshwater bony fishes. Some of them such as *Betta* (Fighting fish), and *Pterophyllum* (Angel fish) are aquarium fishes.

Super class 2. Tetrapoda (bear two pairs of limbs).

Class 1. – Amphibia

- Amphibians can live in aquatic as well as terrestrial habitats.
- Their body is differentiated into head and trunk. Some amphibians also possess tail.
- Their skin is moist and lack scales.
- They have two pairs of limbs.
- The eyes have eyelids and tympanum represents the ear.
- Respiration takes place by gills, lungs and through skin.
- They possess three-chambered heart. Out of the three chambers, two are auricles and third one is ventricle.
- They are cold-blooded animals.
- Sexes are separate. They are oviparous.
- Fertilisation is external and development is direct or indirect.
- Some common amphibians are *Bufo* (Toad), *Rana* (Frog), *Hyla* (Tree frog), *Salamandra* (Salamander) and *Ichthyophis* (Limbless amphibia).

Class 2. – Reptilia

- Members of this class are mostly terrestrial animals and have creeping or crawling mode of locomotion.
- Their body is covered with dry and cornified skin, epidermal scales or scutes.
- They lack external ear openings. Tympanum represents ear.
- Most of them possess two pairs of limbs while some do not have limbs.
- Except the crocodiles, all reptiles have three-chambered heart. (Crocodiles have four-chambered heart).
- They are cold blooded animals.
- Sexes are separate.
- They are oviparous.
- Fertilisation is internal and development is direct.
- Some common reptiles are *Chelone* (Turtle), *Testudo* (Tortoise), *Chameleon* (Tree lizard), *Calotes* (Garden lizard), *Crocodilus* (Crocodile), *Alligator* (Alligator), *Hemidactylus* (Wall lizard) and poisonous snakes like *Naja* (Cobra), *Bangarus* (Krait), *Vipera* (Viper).

Class 3. – Aves

- This class includes all the birds which have ability to fly (except flightless birds like ostrich).
- They are characterised by the presence of feathers.
- They possess a beak.
- Their forelimbs are modified into wings and the hind limbs are modified for walking, swimming or clasping the tree branches.
- Their skin is dry and lacks glands but at the base of the tail, oil gland is present.
- They have fully ossified (bony) endoskeleton. The long bones are hollow with air cavities (pneumatic).

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- ▶ In birds, there are additional chambers in digestive tract called the crop and gizzard.
 - ▶ Heart is four – chambered.
 - ▶ They are able to maintain a constant body temperature. Such type of animals are called warm-blooded or homoiothermous animals.
 - ▶ They respire through lungs.
 - ▶ Sexes are separate and fertilisation is internal.
 - ▶ They are oviparous and development is direct.
 - ▶ Common members of this class are *Corvus* (Crow), *Columba* (Pigeon), *Psittacula* (Parrot), *Struthio* (Ostrich), *Pavo* (Peacock), *Aptenodytes* (Penguin) and *Neophron* (Vulture).
- Class 4. – Mammalia**
- ▶ They are found in a variety of habitats like polar ice caps, deserts, mountains, forests, grasslands and dark caves. Some of them are also adapted to fly or live in water.
 - ▶ They have milk producing mammary glands to nourish their young ones.
- ▶ They possess two pairs of limbs which are adapted for walking, running, climbing, burrowing, swimming or flying.
 - ▶ They possess hair on the skin.
 - ▶ External ears or pinnae are present.
 - ▶ They possess different types of teeth in the jaw.
 - ▶ The heart is four-chambered.
 - ▶ They are homoiothermous.
 - ▶ They respire through lungs.
 - ▶ Sexes are separate and fertilisation is internal.
 - ▶ They are viviparous with few exceptions and development is direct.
 - ▶ Common mammals are *Macropus* (Kangaroo), *Pteropus* (Flying fox), *Camelus* (Camel), *Macaca* (Monkey), *Rattus* (Rat), *Canis* (Dog), *Felis* (Cat), *Elephas* (Elephant), *Equus* (Horse), *Delphinus* (Common dolphin), *Balaenoptera* (Blue whale), *Panthera tigris* (Tiger), *Panthera leo* (Lion). Exceptionally *Ornithorhynchus* (Platypus) is an oviparous mammal.

Salient Features of Different Phyla in the Animal Kingdom

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



Key Words

- ▶ **External fertilisation:** When fertilisation occurs outside the female body, it is called external fertilisation
- ▶ **Internal fertilisation:** When fertilisation occurs inside the female body, it is called internal fertilisation.
- ▶ **Direct development:** In this, the young ones resemble the adults in all respects except colour, size.
- ▶ **Indirect development:** In this, the young ones do not resemble the adults.



NCERT CORNER

Q. 1. What are the difficulties that you would face in classification of animals, if common fundamental features are not taken into account?

[NCERT Ex. Q. 1, Page 53]

Ans. For the classification of living organisms, common fundamental characteristics are considered. This common fundamental features helps in grouping animals in certain categories or sub-categories. If we consider specific characteristics, then each organism will be placed in a separate group and the entire objective of classification would not be achieved. Sometimes, classification of animals, plays an important role in comparing different organisms and judging their individual evolutionary significance. If only one characteristic is considered, then this objective would not be achieved.

Q. 2. If you are given a specimen, what are the steps that you would follow to classify it ?

[NCERT Ex. Q. 2, Page 53]

Ans. To classify the given specimen, firstly we will consider some of its fundamental features in a given manner:

- (i) Arrangement of cell and level of organisation.
- (ii) Body symmetry.
- (iii) Body cavity and nature of coelom.
- (iv) Segmentation.
- (v) Diploblastic and triploblastic organisation.

Q. 3. How useful is the study of the nature of body cavity and coelom in the classification of animals?

[NCERT Ex. Q. 3, Page 53]

Ans. The nature of body cavity and coelom is very important in classification.

- (i) The body cavity which is lined by mesoderm is called coelom and the animal possessing coelom are called coelomates.
- (ii) The animals in which the coelom is absent are called acoelomate animals.
- (iii) In some animals, the body cavity is not lined by mesoderm, instead, the mesoderm is present as scattered pouches in between the ectoderm and endoderm. Such a body cavity is known as pseudocoel and the animals are called pseudocoelomates.

Q. 4. Distinguish between intracellular and extracellular digestion.

[NCERT Ex. Q. 4, Page 53]

Ans. Differences between intracellular and extracellular digestion are:

	Intracellular digestion	Extracellular digestion
(i)	It occurs within the cells.	It occurs outside the cell in a cavity.

(ii)	In this, the digestive enzymes are poured into the food vacuoles, where digestion of food takes place.	In this, the digestive enzymes are poured into the cavity for digestion to take place.
(iii)	e.g., Protozoans and Sponges	e.g., Higher invertebrates and all vertebrates.

Q. 5. What is the difference between direct and indirect development?

[NCERT Ex. Q. 5, Page 53]

Ans. (i) In oviparous animals, the newly hatched young may resemble the adult. Such a development is called direct development.

(ii) In some cases, the young hatched from eggs do not resemble the adult. They lead independent life for some period and finally undergo important changes to become adults. These changes from larvae to adult are called metamorphosis and such a development is called indirect development.

Q. 6. What are the peculiar features that you find in parasitic Platyhelminthes?

[NCERT Ex. Q. 6, Page 53]

Ans. The main features of Platyhelminthes are given below:

- (i) They have dorsoventrally flattened body, hence are called flatworms.
- (ii) Hooks and suckers are present, which absorb nutrients from the host directly through their body surface.
- (iii) Flame cells are present, which helps in osmo-regulation and excretion.
- (iv) Some members like *Planaria* possess high regeneration capacity.
- (v) Example: *Taenia* (Tapeworm), *Fasciola* (liver fluke).

Q. 7. What are the reasons that you can think of for the arthropods to constitute the largest group of the animal kingdom?

[NCERT Ex. Q. 7, Page 53]

Ans. (i) Tough cuticle protects the arthropods against predators and forms jointed exoskeleton for muscles attachment. This has enabled the arthropods to survive on land in almost any environment

- (ii) Bilaterally symmetrical, 'segmented', triploblastic, coelomate animals, found almost everywhere in all habitats.
- (iii) Body enclosed by chitinous cuticle (exoskeleton).
- (iv) They have jointed appendages.
- (v) They have mouth parts of various types.
- (vi) Trachea/book lungs or book gills for respiration.

Q. 8. Water vascular system is the characteristic of which group of the following:

- (i) Porifera (ii) Ctenophora (iii) Echinodermata (iv) Chordata

[NCERT Ex. Q. 8, Page 53]

Ans. Option (iv) is correct.

Water vascular system is the characteristic of *Echinodermata*.

ANIMAL KINGDOM

Q. 9. "All vertebrates are chordates but all chordates are not vertebrates". Justify the statement.

[NCERT Ex. Q. 9, Page 53]

Ans. All vertebrates are chordates. This is so because they possess three basic chordates features.

- (i) All chordates possess a notochord.
- (ii) All chordates have a dorsal, hollow nerve cord.
- (iii) All chordates have pharyngeal gill clefts in some stage of their life cycle.

All chordates are not vertebrates: Vertebrates have vertebral column but protochordates and agnatha have notochord that is not replaced by vertebral column.

Q.10. How important is the presence of air bladder in Pisces?

[NCERT Ex. Q. 10, Page 53]

Ans. (i) A gas filled swim bladder or air sac is always present above the alimentary canal which acts as buoyancy regulator. It enables the fish to stay at a particular depth without expending energy in swimming.

(ii) In some bony fishes, the swim bladder is used as lung for breathing air.

Q.11. What are the modifications that are observed in bird that help them fly?

[NCERT Ex. Q. 11, Page 53]

- Ans. (i)** Birds have feathers which help them to fly.
- (ii)** Forelimbs are modified into wings for flight.
 - (iii)** The avian flight muscles are used for flying.
 - (iv)** The long bones are hollow and contain air cavities to reduce weight.
 - (v)** The bones are light.
 - (vi)** Feathers decrease water loss from body.
 - (vii)** High metabolic rate to lift body from ground.
 - (viii)** Urinary bladder is absent. Excreta is passed out at once these features help in reducing the weight of the body.

Q.12. Could the number of eggs or young ones produced by an oviparous and viviparous mother be equal? Why?

[NCERT Ex. Q. 12, Page 53]

Ans. The number of eggs produced by an oviparous mother will be more than the viviparous mother. This is because, in oviparous animals, the development of young one takes place outside the mother's body. As a result, their eggs are more prone to environmental conditions and predators. Therefore, to overcome the loss, more eggs are produced by mothers so that even under harsh environmental conditions, some eggs might be able to survive and produce young ones. On the other hand, a viviparous mother gives rise to fewer number of young ones because there are less chances of their death, as the development of young ones takes place in safe conditions inside the body of the mother.

Q.13. Segmentation in the body is first observed in which of the following:

- (A) Platyhelminthes
- (B) Aschelminthes
- (C) Annelida
- (D) Arthropoda

[NCERT Ex. Q. 13, Page 53]

Ans. Option (iii) is correct.

Segmentation in the body is first observed in Annelida.

Q. 14. Match the following:

(i) Operculum	(a) Ctenophora
(ii) Parapodia	(b) Mollusca
(iii) Scales	(c) Porifera
(iv) Comb plates	(d) Reptilia
(v) Radula	(e) Annelida
(vi) Hairs	(f) Cyclostomata and Chondrichthyes
(vii) Choanocytes	(g) Mammalia
(viii) Gill slits	(h) Osteichthyes

[NCERT Ex. Q. 14, Page 53]

Ans.

(i) Operculum	(h) Osteichthyes
(ii) Parapodia	(e) Annelida
(iii) Scales	(d) Reptilia
(iv) Comb plates	(a) Ctenophora
(v) Radula	(b) Mollusca
(vi) Hairs	(g) Mammalia
(vii) Choanocytes	(c) Porifera
(viii) Gill slits	(f) Cyclostomata and Chondrichthyes

Q.15. Prepare a list of some animals that are found parasitic on human beings.

[NCERT Ex. Q. 15, Page 54]

Ans. Parasitic animals on human beings are:

Parasite	Phylum	In part of human body
<i>Taenia solium</i>	Platyhelminthes	Intestine
<i>Ascaris lumbricoides</i>	Aschelminthes	Small intestine
<i>Fasciola hepatica</i>	Platyhelminthes	Liver and bile ducts
<i>Wuchereria bancrofti</i>	Aschelminthes	Lymphatic and muscular system
<i>Leishmania donovani</i>	Protozoan	Blood
<i>Plasmodium vivax</i>	Protozoan	Blood