

DAY THREE

Animal Kingdom

Learning & Revision for the Day

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|-----------------------------|------------------------|------------------------|
| ♦ Classification of Animals | ♦ Phylum–Aschelminthes | ♦ Phylum–Echinodermata |
| ♦ Phylum–Porifera | ♦ Phylum–Annelida | ♦ Phylum–Hemichordata |
| ♦ Phylum–Coelenterata | ♦ Phylum–Arthropoda | ♦ Phylum–Chordata |
| ♦ Phylum–Platyhelminthes | ♦ Phylum–Mollusca | |

Animals are believed to have been evolved from ancestral protists by the process of division of labour among the cells. The classification of animals is based on organisation of the body, coelom, symmetry, habitat, germ layers, etc.

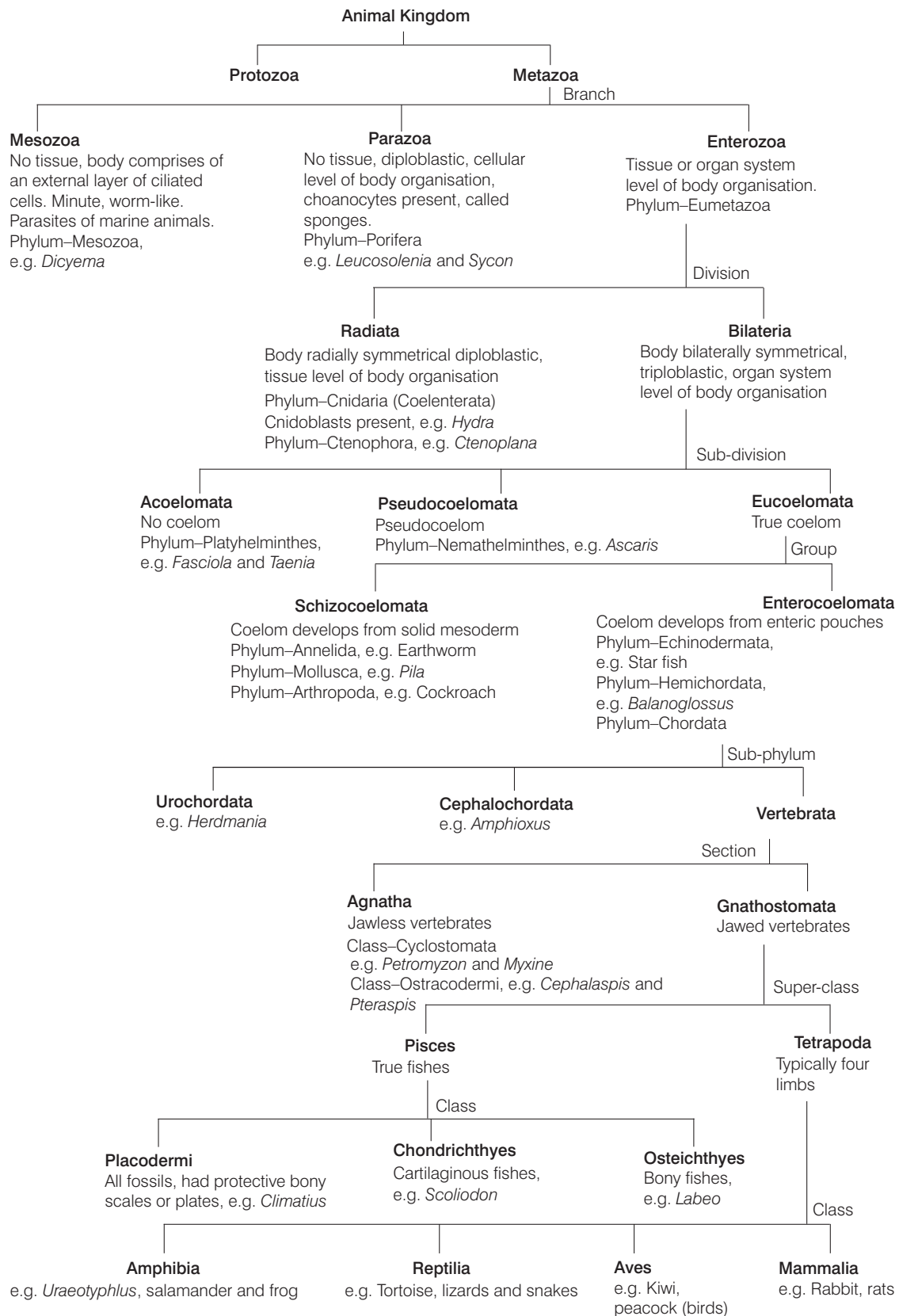
Coelom refers to a large fluid-filled space lying between outer body wall and inner digestive tube.

The organisms may be acoelous (Porifera, Coelenterata and Platyhelminthes), pseudocoelous (Aschelminthes and Nematoda) or eucoelous (Annelida, Echinodermata and Chordata).

Classification of Animals

- The aim of animal systematics is to arrange animals into groups that reflect evolutionary relationship.
- The group that originated from a single ancestral species and include all of its descendants, such a group is called a **monophyletic group**, in which animal characters indicate relatedness.
- Members of **polyphyletic groups** are originated from different ancestors. Since, each group should have a single ancestor, a polyphyletic group reflects insufficient knowledge of the group.
- A paraphyletic group includes some, but not all members of lineage.
- Animal kingdom is divided into two sub kingdoms, i.e. Protozoa and Metazoa.
 - (i) **Protozoa** are defined as single-celled eukaryotic organisms that feed heterotrophically and exhibit diverse motility mechanisms.
 - (ii) **Metazoa** are multicellular eukaryotes, which are further divided into three branches, i.e. Mesozoa, Parazoa and Eumetazoa.

Animal kingdom is broadly classified as follows



Non-chordates can be classified into following phylum

Phylum–Porifera

Salient features of phylum-Porifera are as follows

- It consists of primitive multicellular animals with cellular grade of organisation.
- Free-living, mostly marine either solitary or colonial.
- Body is asymmetrical, lacks tissues or organs but possesses large number of incurrent pores called **ostia** leading into a spongocoel through a system of canals.
- Spongocoel opens out side by one or two large excurrent pores called **oscula**. Canals and spongocoel are lined by flagellated cells called choanocytes or collar cells.
- Sensory and nerve cells are absent in sponges. Body wall with two layers, i.e., diploblastic (pinacoderm and choanoderm) of loosely arranged cell and a mesenchyme is present between them.
- Body has an endoskeleton made up of spicules, composed of calcareous or siliceous spicules or spongin fibres.
- Digestion is intracellular and holozoic. Respiration and excretion occur by simple diffusion. Reproduction is by asexual (external or internal buds) or sexual methods. Gemmules are the mass of archaeocytes.

Common Characteristics of Classes of Phylum–Porifera

Characteristic	Class– Calcarea	Class– Hexactinellida	Class– Demospongiae
Habitat	Marine	Marine	Marine or freshwater
Spicules	Made up of calcium carbonate	Made up of silica	Made up of spongin fibres or absent
Example	<i>Sycon</i> and <i>Leucosolenia</i>	<i>Euplectella</i> (venus flower basket), <i>Hyalonema</i> (glassrope sponge)	<i>Spongilla</i> (freshwater sponge) and <i>Euspongia</i> (bath sponge), <i>Cliona</i> (boring sponge)

Leucosolenia

- Body is cylindrical and radially symmetrical.
- Porocytes are special cells for passage of incoming water.
- Outer layer of cells is called pinacoderm made of pinacocytes.
- A mesenchyme is found in between the two layers containing free amoebocytes and skeletal elements. Different types of amoebocytes are as follows
 - **Archaeocytes** Undifferentiated totipotent cells.
 - **Chromocytes** With pigment granules.
 - **Thesocytes** With reserve food granules.
 - **Myocytes** Contractile, spindle-shaped cells.
 - **Trophocytes** Supply nutrients to developing cells.
 - **Gland cells** Secrete slimy substance.
 - **Sex cells** Develop from archaeocytes only during breeding season.

- Choanocytes or collar cells possess a central flagellum and beating of flagella help to maintain water current and ingest the food particles.
- *Leucosolenia* has asconoid type of canal system.
- Nutrition is holozoic and digestion is intracellular. Food vacuole is transferred to amoebocytes and digestion is completed there.
- The chief nitrogenous waste of the sponge is ammonia.
- *Leucosolenia* reproduces asexually by external budding and sexually by syngamy.
- No special gonads, sperms and ova are developed from archaeocytes.
- Fertilisation is internal. Cleavage is equal and holoblastic. Parenchymula larva swims freely and get attached to substratum.

NOTE Study of sponges is called parazoology.

Proterospongia is a connecting link between Protozoa and Porifera.

Phylum–Coelenterata

Salient features of this phylum are as follows

- It is composed of radially symmetrical, diploblastic multicellular animals with a tissue grade of organisation.
- The members of this phylum are freshwater or marine, solitary or colonial forms, which may be free-swimming or sedentary.
- Body has a mouth at the oral end, which leads into a spacious cavity called gastrovascular cavity or coelenteron.
- The presence of long, hollow structures called **tentacles** used for locomotion and food capturing.
- The epidermis consists of epitheliomuscular cells (provide musculature), cnidoblasts, interstitial cells (totipotent cells), nerve cells and sensory cells.
- The presence of peculiar type of cells, called **cnidoblasts**, **nematocysts** or stinging cells, in the ectoderm, especially in the tentacles, is used for offence and defence.
- Digestion is both intracellular and extracellular.
- Respiration and excretion by simple diffusion.
- The network of nerves spreads all over the body.
- Many forms exhibit polymorphism. Different types of individuals are present in a colony for different functions. These individuals are called **zooids**.
- Reproduction is either asexual (by external budding) or sexual (formation of gametes).
- Metagenesis is the alternation of two phases, i.e. polypoid and medusoid phases, e.g. in life cycle of *Obelia*.

Characteristics of Classes of Phylum–Coelenterata

Characteristic	Class–Hydrozoa	Class–Scyphozoa	Class–Anthozoa
Habitat	Freshwater or marine	Marine	Marine
Body form	Polypoid or medusoid	Medusoid	Polypoid
Example	<i>Hydra</i> , <i>Obelia</i> , <i>Physalia</i> (Portuguese man of war)	<i>Aurelia</i> and <i>Cassoprea</i> (jelly fishes)	Sea anemone corals, <i>Fungia</i> , <i>Gorgonia</i> (seafan)

Hydra

- It was discovered by **Trembley** in 1744. **Linnaeus** (1758) gave the name *Hydra*.
- It is diploblastic and radially symmetrical.
- Separate coelom is absent in *Hydra*, so can be called **acoelomate**.
- It has tissue grade of organisation with division of labour.
- Body cavity of *Hydra* is called **coelenteron** or gastrovascular cavity.
- Nematocyst plays an important role in locomotion, food capture, for offence and defence.
- It is carnivorous. Digestion in *Hydra* is first extracellular and then intracellular.
- It has no anus. It has nerve cells but no nerves.
- Reproduction is both asexual and sexual.
- No free larval stage (only a planula-like stage) occurs and during development, there is no moulting or ecdysis.

NOTE Phylum–Ctenophora includes exclusively marine animals which swim with the help of cilia. They are radially symmetrical and diploblastic animals, e.g. *Ctenoplana*.

Phylum–Platyhelminthes

General characteristics of this phylum are as follows

- It is bilaterally symmetrical, true multicellular animals with organ grade of organisation. Free-living (aquatic or terrestrial) but mostly parasitic (ecto or endoparasites). Body is dorsoventrally compressed and leaf-like.
- Body is triploblastic and they have blind sac body plan.
- A body cavity is absent and the space between body wall and alimentary canal is filled with mesenchyme (connective tissue).
- Digestive system is incomplete and anus is absent. Respiration occurs by simple diffusion.
- Excretion occurs with the help of specialised cells called flame cells or solenocytes.

- Nervous system is ladder-like consisting of a brain and a pair of longitudinal nerves connected by many transverse nerves.
- They have high capacity of regeneration due to the presence of neoblast cells. These cells are scattered all over the body.
- Reproduction is usually by sexual methods. Majority of the forms are bisexual. Development is direct or indirect.

Characteristics of Classes of Phylum–Platyhelminthes

Characteristic	Class–Turbellaria	Class–Trematoda	Class–Cestoda
Habit and habitat	Free-living, aquatic	Ecto or endoparasites	Endoparasites
Digestive system	Present	Present	Absent
Example	<i>Planaria</i> (flatworm)	<i>Fasciola</i> (liver fluke) and <i>Schistosoma</i> (blood fluke)	<i>Taenia solium</i> (tapeworm)

Fasciola hepatica

- It is also called liver fluke as it inhabit liver and bile ducts of different vertebrates like cattle, goat, rabbit, pig, dog and human.
- It is an endoparasite and completes its life history in two hosts.
- The vertebrate sheep acts as its primary host and mostly gastropod snail *Limnaea trunculata*, as intermediate host.
- The broad anterior portion of animal bears a distinct triangular projection called the head lobe or oral cone. This structure bears mouth at its anterior tip, which is some what surrounded by the muscular oral sucker.
- On the ventral side, at some distance from oral sucker, one more sucker is present called ventral sucker or posterior sucker of acetabulum.
- Both the suckers are the structures containing radial muscles.
- Alimentary canal is incomplete as there is single opening for ingestion and egestion. It is called blind sac body plan.
- In between the acetabulum and the oral sucker (i.e. mid ventrally), an opening is present called gonopore or genital opening. This opening is nearer to the acetabulum as compared to oral sucker.
- During breeding season, a temporary opening called **opening of Laurer's canal** is seen on the dorsal surface, a little upwards to the middle of body.
- Due to its parasitic mode of life, liver fluke is practically anaerobic or anoxybiotic in nature.
- The animal is **hermaphrodite** or **monoecious** and male as well as female genital ducts open into a common chamber called genital atrium.

- The male reproductive system consists of two testes, one pair of vas deferens, seminal vesicle and an ejaculatory duct on a **penis**.
- The female reproductive system contains an ovary with its **oviduct**, **vitelline glands** with their ducts and **yolk** reservoir, shell glands, ootype, vitelline duct, uterus and the **female genital pore**.
- The fertilisation is internal and takes place at the distal end of oviduct.
- The life cycle of liver fluke passes through the following developmental stages
Egg → Miracidium → Sporocyst → Redia → Cercaria → Metacercaria → Adult
- The parasite attains sexual maturity and starts laying eggs in about 11-13 weeks after its entry into the body of vertebrate host.
- The symptoms of liver rot (acute fascioliasis) caused by the fluke are more acute in lambs than in sheeps and appear about one month after the infection.

Phylum–Aschelminthes

Salient features of this phylum are as follows

- These animals are mostly parasitic (in animals and plants) and few are free-living forms.
- Body is long, cylindrical, fusiform (pointed at both the ends) and bilateral symmetrical.
- Body wall is composed of cuticle, epidermis and musculature.
- They possess false body pseudocoelom not lined by mesodermal epithelium and is derived from embryonic blastocoel.
- Digestive system is complete and respiration by simple diffusion.
- Nervous system consists of a nerve ring and many longitudinal nerve cords. They reproduce by sexual reproduction.
- Males are usually shorter than females, e.g. *Ascaris* (roundworm, a parasite, facultative aerobic), *Rhabditis* (free-living), *Dracunculus* (guinea worm), *Enterobius* (pinworm), *Trichuris* (whip worm), *Wuchereria* (filarial worm), *Loa loa* (eye worm).

Common characteristics of Classes of Phylum–Aschelminthes

Characteristics	Class–Aphasmidia	Class–Phasmidia
Phasmid	Absent	Present near hind end of body
Amphid	Various types	Present near anterior end
Example	<i>Trichinella</i> (trichina worm)	<i>Ascaris</i> and <i>Wuchereria</i>

Ascaris lumbricoides

- It is also called roundworm and is the most common endoparasite in the small intestine of children.
- Male is smaller than female with curved tail, two pineal setae (copulatory organs) and cloaca.
- The epidermis of *Ascaris* is syncytial.
- The body cavity of *Ascaris* is pseudocoel.
- Excretory system consists of a single excretory cell or renette cell.
- *Ascaris* is monogenetic, only one host is required for the development.
- The larva is called **rhabditiform**.
- *Ascaris* causes the disease ascariasis.

Wuchereria bancrofti

It is also called filarial worm. It causes **elephantiasis**. The disease is characterised by the symptoms like headache, anaemia, fever, lymphatic tumours, swelling in limbs, etc.

Phylum–Annelida

Salient features of this phylum are as follows

- It is free-living, terrestrial or aquatic form animal (freshwater or marine).
- Body is long, cylindrical and metamerically segmented.
- Body wall consists of cuticle, epidermis and musculature.
- Body cavity is a true coelom, lined by mesoderm.
- Coelom is filled with milky, alkaline fluid called coelomic fluid containing different types of corpuscles.
- These corpuscles are of four types– phagocytic, mucocytes, circular nucleated cells and chloragogen cells. Digestive system is complete.
- Respiration is either through skin or through gills.
- Excretion with the help of characteristic **nephridia**. Chloragogen cells or yellow cells of earthworm are analogous to vertebrate liver cells.
- The circulatory system is of closed type.
- Haemoglobin dissolves directly in the plasma.
- Nervous system consists of a nerve ring and a double ventral nerve cord with segmental ganglia.
- Locomotion with the help of setae or parapodia (in aquatic annelids, e.g. *Nereis*).
- Reproduction by sexual methods and development may be direct or indirect.

Common Characteristics of Classes of Phylum–Annelida

Characteristics	Class–Polychaeta	Class–Oligochaeta	Class–Hirudinea	Class–Archiannelida
Habit and habitat	Free-living, marine	Free-living forms found in moist soil	Freshwater forms. Temporary ectoparasites	Marine forms
Locomotory structure	Parapodia	Setae	Absent	Absent
Life cycle	Unisexual with indirect development	Bisexual with direct development	Bisexual with direct development	Bisexual with indirect development
Example	<i>Nereis</i> (ragworm)	<i>Pheretima</i> (Indian earthworm) Megascole, (earthworm of South India)	<i>Hirudinaria</i> (leech)	<i>Polygordius</i>

Earthworm

- *Pheretima posthuma* is brown or clay-coloured because of the pigment porphyrin.
- Three regions in the body of earthworm are **preclitellar region** (1-13), **clitellar region** (14, 15, 16) and **postclitellar region** (17-last).
- **Setae** help in locomotion.
- Body cavity is a true coelom (schizocoel), containing milky white alkaline coelomic fluid. During burrowing, the coelomic fluid becomes turgid and acts as hydraulic skeleton.
- Chloragogen cells are small yellow cells, concerned with storage of reserve food, formation of urea and also excretory (analogous to the liver) in function.
- **Typhlosole** (26-35 segments) is a highly glandular, vascular longitudinal ridge increasing the area for absorption of digested food.
- Blood vascular system of earthworm is closed type. Blood is red in colour, respiratory pigment haemoglobin, dissolved in the blood plasma.
- Earthworm respire, but has no respiratory organs, exchange of gases takes place through moist skin.
- Excretory organs are segmental nephridia analogous to vertebrate kidney. Pores in the body wall concerned with reproduction are 11.
- They are spermathecal pores present in the intersegmental grooves of 5/6, 6/7 7/8 and 8/9 (4 pairs).
- Female genital pore is mid-ventral on 14th segment.
- Male genital pores are ventrolateral (1 pair) on 18th segment. Male genital papillae are present on segments 17 and 19 (2 pairs). Spermathecae are used to store sperms after copulation. Cocoons are formed by glandular clitellum. Cleavage is holoblastic and unequal, development is direct without any larval stage.

Hirudinaria

- It is a freshwater and ectoparasitic annelid.
- Body is elongated and divided into 33 metameres by annuli.
- It is sanguivorous and feeds upon the blood of cattle.
- Blood is stored in a 10-chambered crop and blood clotting is prevented by mixing an anticoagulant called hirudin.
- It shows cutaneous respiration.
- Male and female gonopores lie on ventral side of 10th and 11th segments respectively. It is hermaphrodite but shows cross-fertilisation due to protandrous condition. Development is direct.

Phylum–Arthropoda

General characteristics of this phylum are as follows

- This phylum is the largest in the animal kingdom comprising of more than 75% of the animal species.
- These are free-living, aquatic (freshwater or marine) or terrestrial and some are parasitic forms also.
- Body is elongated and segmented, usually distinguished into regions-like head, thorax and abdomen.
- Body has exoskeleton made up of a hard, impermeable substance called **chitin**.
- Digestive system is complete with mouth and anus. Circulatory system is of open type. Blood flows freely in the body cavity (haemocoel).
- Respiration through gills or trachea or book lungs.
- Excretion through coxal glands or Malpighian tubules.
- Nervous system consists of a nerve ring and double ventral nerve cord.
- Locomotory organs are represented by segmentally arranged **jointed appendages**. Cilia are totally absent. Reproduce sexually, sexes are separate. Development may be direct or indirect.
- Luminescent insects *Photinus*, *Lampreys* and some other genera bear light producing organs on abdomen, e.g. mosquito, cockroach, *Apis* (honeybee), *Aranea* (spider), *Palaemon* (prawn), *Scolopendra* (centipede).

Characteristics of Classes of Phylum–Arthropoda

Class (habitat)	Respiratory Organ	Walking Leg	Common Example
Diplopoda (terrestrial)	Trachea	Many, two pairs in each segment	Millipede
Chilopoda (terrestrial)	Trachea	Many, one pair in each segment	Centipede
Crustacea (aquatic)	Gills	Five pairs	Crab, prawn, lobster
Arachnida (terrestrial)	Book lungs	Four pairs	Scorpion, spider
Insecta (terrestrial)	Trachea	Three pairs	Cockroach, butterfly
Onychophora (terrestrial)	Trachea	Many, unjointed	<i>Peripatus</i>

Common Insect Orders with Important Examples

Order	Example
Thysanura	<i>Lepisma</i> (silver fish, wingless insect)
Orthoptera	<i>Schistocerca</i> (locust), <i>Poecilocerus</i> (grasshopper), <i>Gryllus</i> (house cricket)
Dictyoptera	<i>Periplaneta</i> (cockroach), <i>Mantis</i> (praying mantis)
Phasmida	<i>Phyllium</i> (leaf insect), <i>Carausius</i> (stick insect)
Isoptera	<i>Microtermes</i> (termites = white ants)
Odonata	<i>Sympetrum</i> (dragonfly)
Anoplura	<i>Pediculus</i> (human louse)
Ephemera	<i>Ephemera</i> (may fly)
Hemiptera	<i>Cimex</i> (bed bug), <i>Dysdercus</i> (red cotton rug)
Homoptera	<i>Aphis</i> (aphid – plant louse), <i>Laccifer</i> or <i>Tachardia lacca</i> (lac insect)
Coleoptera	<i>Coccinella</i> (lady bird beetle), <i>Sitophilus</i> (rice weevil)
Lepidoptera	<i>Bombyx</i> (silk moth), <i>Pieris</i> (cabbage butterfly)
Diptera	<i>Musca</i> (housefly), <i>Anopheles</i> , <i>Culex</i> , <i>Aedes</i> (all the three-mosquitoes), <i>Glossina</i> (tse-tse fly)
Siphonaptera	<i>Xenopsylla cheopis</i> (rat flea)
Hymenoptera	<i>Apis</i> (honeybee), <i>Vespa</i> (wasp), <i>Camponotus</i> (common black house ant)

Housefly

- Common housefly (*Musca domestica*) is a genera of order–Diptera.
- Its body is divisible into head, thorax and abdomen. The head bears two antennae, a pair of compound eyes. consisting of ommatidia and three ocellia (light sensitive spots).
- Mouth parts are sponging type, adapted to suck liquid. They consist of long fleshy proboscis formed by labium. Mandibles are absent.

- The abdomen is 8 segmented in male and 9 segmented in female. Last four segments form genital pouch and other accessory reproductive structures.
- Mesothorax possess a pair of **halteres** which perceive sound and acts as balancing organ during flight.
- Sexes are separate, females are bigger than males, under complete metamorphosis and the larva moults twice, thus indicating three stages of instars.

Phylum–Mollusca

General characteristics of this phylum are as follows

- It has free-living aquatic forms (freshwater or marine) and some are amphibious.
- Body is soft and unsegmented. Body can be differentiated into three regions, i.e. head, visceral hump and foot. Visceral hump is covered by a thin, fleshy mantle which secretes a calcareous shell (external or internal).
- Coelom is reduced to a cavity around the heart.
- The study of molluscs is called ‘malacology’.
- Digestive system is complete. Respiratory organs are in the form of gills called ctenidia. Locomotory structure is represented by muscular foot.
- Reproduction is sexual, organisms are either unisexual or bisexual, development is direct, e.g. *Pila* (snail), *Sepia*, *Unio* (freshwater mussel), *Octopus* and *Chiton*.

Pila

- It is also known as apple snail. It is an amphibious mollusc found in ponds, rice, field, etc.
- It shows creeping locomotion, herbivorous in nutrition, aestivates during summer, respire with gill in water and with pulmonary sac on land.
- Body is covered by a univalvular, unilocular and spirally-coiled shell which has vertical lines of growth.
- Lowermost hole, called **body whorl**, is largest and is opened by lunate-shaped mouth, which can be closed by an **operculum** during defence.
- Sexes show **sexual-dimorphism** (male has large sized penis). Fertilisation is internal. Female is oviparous and development is direct.

Sepia

- It is also called cuttle fish.
- It is a marine mollusc, a good swimmer and carnivorous in nutrition (feed on fishes, crustaceans, etc.).
- It defends by protective colouration, a smoke-screen of *Sepia* ink and backward darting (with its siphon).
- Body is differentiated into two parts, i.e. head and trunk.
- Head has one pair of eyes, 8 sucker-bearing arms and 2 long tentacles surrounding the mouth.
- Trunk bears one pair of lateral fins for swimming. On the ventral side on junction of head and trunk, it has a funnel or siphon for backward darting.

- Sexes show **sexual-dimorphism** (male with hectocotyliised arm). Fertilisation is internal, development is direct.

Phylum–Echinodermata

Salient features of this phylum are as follows

- These are free-living, exclusively marine forms.
- Adults are radially symmetrical, while larvae are bilaterally symmetrical.
- Body is represented by a central disc covered by ossicles with spines called **pedicellariae**.
- Disc may bear extensions called arms.
- Digestive system is complete.
- A unique ambulacral or water vascular system is present.
- Tube feet are present for locomotion and respiration. These are extended and retracted by variation in hydraulic pressure of the fluid in them and contraction of their muscles.
- Nervous system has a central nerve ring with five radiating nerves.
- Reproduction is sexual, sexes are separate and development is indirect. It shows very high power of regeneration.

Characteristics of Classes of Phylum–Echinodermata

Class	Nature of the Disc	Nature of Arm	Example
Asteroidea	Compressed along the oro-aboral axis	Five, continuous with the disc	<i>Asterias</i> (starfish)
Ophiuroidea	Compressed along the oro-aboral axis	Five, long and slender joined arms	<i>Ophiothrix</i>
Echinoidea	Globular or flat	Absent	<i>Echinus</i> (sea urchin)
Holothuroidea	Elongated and cylindrical	Modified into tentacles	<i>Holothuria</i> (sea cucumber)
Crinoidea	Reduced and attached to the substratum	Ten, long and branched	<i>Antedon</i> (sea lily)

Asterias (Starfish)

- Mouth is present on the oral surface, five narrow ambulacral grooves are also found. Bright red eyes lie at the terminal end of each ambulacral groove.
- The aboral surface bears many stout spines which are distributed irregularly. Soft dermal branchiae are present between the spines. They act as respiratory and excretory organs.
- In between two arms, near the anus, a perforated circular plate is present, called the madreporite.

- There are microscopic pincer-like structures known as pedicellariae, which also act as organs of offence. Pedicellariae also remove foreign substances and keep the body surface clean.
- Development is indirect which involves bipinnaria larva.

Echinus

- It is also called sea urchin. It is found in rocky sea bottom. It is omnivorous and use teeth for feeding. The mouth is present in the centre of oral surface.
- It moves with the help of spines which possesses pedicellariae.
- The sea urchin has a masticatory apparatus, called **Aristotle's Lantern**, which is formed by five strong and sharp teeth. It projects slightly through the mouth. The anus is a small aperture.

NOTE *Auricularia* is the connecting link between chordates and non-chordates

Phylum–Hemichordata

- It consist of marine deuterostome animals having worm-like appearance (Acorn worms).
- They are bilaterally symmetrical and triploblastic animals, exclusively marine and have a true body coelom.
- The digestive tract is complete and a buccal diverticulum is present in the proboscis.
- Body is divided into three regions–proboscis, collar and trunk. The proboscis has a glomerulus which is the excretory organ.
- Circulatory system is of closed type and respiration occurs through gills.
- Exhibit sexual reproduction, fertilisation is external, development is mostly indirect through a free-swimming tornaria larva.

Phylum–Chordata

Silent features and classification of

- This phylum is characterised by three unique features, at least during the early stages of their development.
- These include presence of a rod-like structure called notochord lying above the digestive tract, a tubular dorsal nerve cord lying above the notochord and a pair of gill slits in the pharyngeal region. Only the nerve cord persists throughout the life of the organism.
- The notochord is usually replaced by a vertebral column in vertebrates and the gill slits disappear during the embryonic stage. Only in *Amphioxus* all three chordate characters present throughout life.
- The phylum is divided into three subphyla, namely Urochordata, Cephalochordata and Vertebrata.

Subphylum–Urochordata

- It includes marine animals, notochord is found in the tail in larval form. Hollow nerve cord is also present in the larva. Body is covered by a tunic.
- Adult is a sessile filter feeder, structurally nothing like a chordate.
- Gill slits in adult is multiplied to form large filter-feeding pharynx.
- Larva is ascidian tadpole which possesses features like notochord, pharyngeal slits, dorsal tubular nerve cord, segmental myotomes, post-anal tail, e.g. *Herdmania*, *Doliolum*, *Pyrosoma*, *Ciona*

Subphylum–Cephalochordata

- It has headless, tiny fish-like chordates. Notochord, nerve cord without a distinct brain, gill slits and a post-anal tail present.
- Fish-like animals showing all recognisable chordate features.
- Notochord extends along the length of body in larval and adult stages.
- Large pharynx with clefts forms feeding mechanism. Ciliated gill bars.
- Pharyngeal slits open into atrium. Segmental myotomes, e.g. *Amphioxus lanceolatus* (Branchiostoma).

NOTE Hemichordates, urochordates and cephalochordates together known as protochordates.

Subphylum–Vertebrata

It includes the majority of chordates.

- Head is prominent.
- Nervous system and exoskeleton are highly developed.
- Notochord is replaced by a jointed vertebral column and two pairs of appendages (limbs) are present.
- Mammals exhibit the following unique features
 - Presence of mammary glands to nourish the young ones.
 - Presence of muscular diaphragm that separates thorax from abdomen.
 - Presence of external ear called pinna.
 - Presence of seven vertebrae in the neck region, e.g. phylum-Chordata.

Subphylum–Vertebrata is divided into **two sections**; Agnatha and Gnathostomata.

Agnatha

It includes jawless vertebrates, notochord persist throughout life, do not have paired appendages, cold-blooded, single nostril and internal ear has one or two semicircular canals. It has two classes

1. Class–Ostracodermi

- They are extinct, vertebrates which appeared in Ordovician period.
- They had well-developed dermal scales and hence, also called armoured fishes, e.g. *Pteraspis*, *Cephalaspis*, etc.

2. Class–Cyclostomata

- They are circular mouthed fishes and jawless.
- They have 1-16 pairs of gill slits, fins are unpaired,
- Head and brain are poorly-developed, cranial nerves are 8-10 pairs, lateral line sense organs are present.
- Endoskeleton is cartilaginous, stomach is absent, respiration through gills and kidneys are mesonephric.
- Fertilisation is external and development is indirect through ammocoete larva, e.g. *Petromyzon* (Lamprey), *Myxine* (Hagfish).

Gnathostomata

Includes jawed vertebrates in which embryonic notochord is replaced by a vertebral column in adults. Fins and nostrils are paired and internal ear has three semicircular canals.

It is divided into two super-classes

1. Superclass–Pisces

- It includes true fishes with fins.
- Heart is two chambered and have aortic arches, on both sides.
- It is divided into three classes
 - (i) **Class–Placodermi** includes fishes having an external protective armour of bony plates, all species are extinct, e.g. *Cladodus*.
 - (ii) **Class–Chondrichthyes** includes marine, cartilaginous fishes. skin with minute placoid scales.
 - Gill slits not covered by operculum (except in *Chimaera*).
 - Lung or air bladder is absent.
 - Males possess claspers, i.e. copulatory organ.
 - Fertilisation is internal, oviparous or ovoviviparous, development is direct, e.g. *Pristis*, *Torpedo*, *Scoliodon*.
 - (iii) **Class–Osteichthyes** It includes marine or freshwater fishes with streamlined body.
 - Endoskeleton is made up of bone, notochord is persistent throughout life as vertebral column.
 - Skin is covered by cycloid, ctenoid or ganoid scales.
 - Gills are covered by an operculum.
 - Claspers are absent in males.
 - Fertilisation is external, oviparous, development is direct. e.g. *Labeo rohita*, *Anabas*, *Myxus*.

2. Superclass–Tetrapoda

It includes land animals with two pairs of pentadactyl limbs, cornified skin and lungs.

It includes four classes as follows

(i) **Class–Amphibia**

- They can live in both aquatic and terrestrial habitats.
- The skin is moist without scales but possess mucous glands.
- The eyes have eyelids and tympanum represents the ear.
- Heart is three-chambered (2 auricles and one ventricle). They are cold-blooded.
- Respiration occurs through gills (in water) and lungs (on land).
- Sexes are separate and fertilisation is external, development is indirect through tadpole larva, e.g. toad, frogs, salamander, etc.

(ii) **Class–Reptilia**

- They are terrestrial animals that exhibit creeping mode of locomotion.
- Their body is covered by dry and cornified skin, epidermal scales or scutes. Snakes and lizard shed their scales as skin cast.
- External ear opening is absent, ears are represented by tympanum.
- Heart is three-chambered, except in crocodiles (4-chambered), they are poikilotherms.
- Sexes are separate, fertilisation is internal, oviparous, eggs are with tough coverings and development is direct, e.g. *Chelona* (turtle), tortoise, *Chameleon*, crocodile, snakes.

(iii) **Class–Aves**

- They possess feathers for flying and forelimbs are modified into wings.
- The hindlimbs are modified for walking, swimming, claspings, etc., and have scales.
- Skin does not possess glands except oil glands which are found at the base of the tail.
- Endoskeleton is ossified (bony) and long bones are pneumatic, i.e. possess air cavities.
- The digestive tract is complete and has additional chambers–crop and gizzard.
- Heart is four-chambered and they are warm-blooded or homeotherms, i.e. they can maintain a constant body temperature.
- Respiration through lungs which are connected to air sacs.

- Sexes are separate, fertilisation is internal and development is direct, e.g. crow, pigeon, ostrich, etc.

(iv) **Class–Mammalia**

- They are terrestrial (except blue whale and dolphin) animals. Their skin is covered by hairs.
- They possess milk producing mammary glands.
- They are viviparous (except platypus and echidna which is oviparous) and produce live young ones.
- They are warm-blooded, heart is four-chambered and respiration occurs by lungs.
- External ear or pinnae are present, different types of teeth are present in the jaws.
- Sexes are separate, fertilisation is internal and development is direct.

Comparison between Invertebrata and Vertebrata

Feature	Invertebrata	Vertebrata
Symmetry	Radial, biradial or lacking	Bilateral
Grade of organisation	Protoplasmic level to organ system	Organ system
Germ layers	Diploblastic or triploblastic or lacking	Triploblastic
Coelom	Acoelomate, pseudocoelomate or true	True coelomate
Notochord	Lacking	Present or replaced by a backbone made up of vertebrae
Gut position	Dorsal to nerve cord	Ventral to nerve cord
Pharyngeal gill slits	Absent	They present at some stages of life
Blood vascular system	Open, closed or absent	Closed and much developed
Heart	Dorsal, lateral or absent	Ventrally placed
Dorsal blood vessel	Blood flows anteriorly	Blood flows posteriorly
Hepatic portal system	Absent	Present
Haemoglobin	In plasma or absent	In red blood corpuscles
Respiration	Through body surface, gills or trachea	Through gills or lungs
Nervous system	Solid	Hollow
Brain	Above pharynx or absent	Dorsal to pharynx in head
Nerve cord	Double and ventral	Single and dorsal
Body temperature	Cold-blooded	Cold or warm-blooded

DAY PRACTICE SESSION 1

FOUNDATION QUESTIONS EXERCISE

- 1 Schizocoelomates and enterocoelomates are
 (a) acoelomates (b) true coelomates
 (c) invertebrates (d) echinoderms only
- 2 Which of the following is not correct?
 (a) Sponges have tissue level of organisation
 (b) Organ level of organisation is found in Platyhelminthes
 (c) In annelids, arthropods, molluscs, echinoderms and chordates organ system level of organisation is found
 (d) Coelenterates, ctenophores and echinoderms have radial symmetry
- 3 Body having meshwork of cells, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum
 → CBSE-AIPMT 2015
 (a) Coelenterata (b) Porifera
 (c) Mollusca (d) Protozoa
- 4 In case of poriferans, the spongocoel is lined with flagellated cells called
 → NEET 2017
 (a) ostia (b) oscula
 (c) choanocytes (d) mesenchymal cells
- 5 Canal system in Porifera is not concerned with
 (a) respiration (b) nutrition
 (c) sexual reproduction (d) None of these
- 6 The previous marriage gift in Japan is
 (a) *Leucosolenia* (b) *Euplectella*
 (c) *Hyalonema* (d) *Spongilla*
- 7 Select the taxon mentioned that represents both marine and freshwater species
 → CBSE-AIPMT 2014
 (a) Echinodermata (b) Ctenophora
 (c) Cephalochordata (d) Cnidaria
- 8 Which of the following is not correctly matched?
 (a) *Physalia* — Portugese man of war
 (b) *Pennatula* — Sea anemone
 (c) *Gorgonia* — Seafan
 (d) *Meandrina* — Brain coral
- 9 Which one of the following living organisms completely lacks a cell wall?
 → CBSE-AIPMT 2014
 (a) Cyanobacteria (b) Seafan (*Gorgonia*)
 (c) Saccharomyces (d) Blue-green algae
- 10 Precious red coral which is used as ornament is
 (a) *Astraea* (b) *Fungia* (c) *Corallium* (d) *Tubipora*
- 11 Asexual reproduction in *Hydra* occurs in
 (a) Scyphozoa (b) Hydrozoa
 (c) Actinozoa (d) Cnidaria
- 12 Acoelomate, triploblastic body with bilateral symmetry is characteristic of
 (a) flatworm (b) roundworm
 (c) segmented worm (d) mollusc
- 13 The excretory structure of flatworm/*Taenia* are
 (a) flame cells (b) nephridia
 (c) Malpighian tubules (d) green glands
- 14 Which is not a characteristic of *Taenia*?
 (a) Apolysis (b) Proglottids
 (c) Metamerism (d) Strobila
- 15 Which one of the following kinds of animals are triploblastic?
 → CBSE-AIPMT 2010
 (a) Flatworms (b) Sponges
 (c) Ctenophores (d) Corals
- 16 In contrast to annelids, the platyhelminths show
 (a) radial symmetry (b) the presence of pseudocoel
 (c) bilateral symmetry (d) the absence of body cavity
- 17 One example of animal having a single opening to the outside that serves both as mouth as well as anus is
 → CBSE-AIPMT 2010
 (a) *Octopus* (b) *Asterias* (c) *Ascidia* (d) *Fasciola*
- 18 *Planaria* possesses high capacity of
 → CBSE-AIPMT 2014
 (a) metamorphosis (b) regeneration
 (c) alternation of generation (d) bioluminescence
- 19 Elephantiasis is caused by a member of
 (a) Aschelminthes (b) Platyhelminthes
 (c) Annelida (d) Arthropoda
- 20 Which one of the following statements about certain given animals is correct?
 → CBSE-AIPMT 2010
 (a) Roundworms (Aschelminthes) are pseudocoelomates
 (b) Molluscs are acoelomates
 (c) Insects are pseudocoelomates
 (d) Flatworms (Platyhelminthes) are coelomates
- 21 Which one of the following groups of animals is bilaterally symmetrical and triploblastic?
 → CBSE-AIPMT 2009
 (a) Coelenterates (cnidarians)
 (b) Aschelminthes (roundworms)
 (c) Ctenophores
 (d) Sponges
- 22 Heart to pump blood evolved for the first time in
 (a) annelids (b) arthropods (c) roundworms (d) flatworms
- 23 Which one of the following animals does not undergo metamorphosis?
 → NEET 2018
 (a) Moth (b) Tunicate (c) Earthworm (d) Starfish

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

- (a) Post-anal tail — *Octopus*
- (b) Ventral central nervous system — Leech
- (c) Pharyngeal gill slits absent in embryo — *Chaemeleon*
- (d) Ventral heart — Scorpion

25 *Pheretima* and its close relatives derive nourishment from
→ CBSE-AIPMT 2012

- (a) sugarcane roots
- (b) decaying fallen leaves and soil organic matter
- (c) soil insects
- (d) small pieces of fresh fallen leaves of maize

26 One very special feature in the earthworm (*Pheretima*) is that
→ CBSE-AIPMT 2011

- (a) the typhlosole greatly increases the effective absorption area of the digested food in the intestine
- (b) the S-shaped setae embedded in the integument are the defensive weapons used against the enemies
- (c) it has a long dorsal tubular heart
- (d) fertilisation of eggs occurs inside the body

27 Insects have

- (a) 2 pairs of legs
- (b) 3 pairs of legs
- (c) 4 pairs of legs
- (d) 1 pair of legs

28 The adhesive pads (soft-pads) present in legs of cockroach are

- (a) galea
- (b) lacinea
- (c) glossa
- (d) plantula

29 Which of the following features is not present in the phylum-Arthropoda?
→ NEET-I 2016

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

30 The arthropod, which is known as living fossil is

- (a) *Bombyx* (silkworm)
- (b) *Locusta* (locust)
- (c) *Limulus* (king crab)
- (d) *Apis* (honeybee)

31 One of the representative of phylum-Arthropoda is

- (a) cuttle fish
- (b) silver fish → NEET 2013
- (c) puffer fish
- (d) flying fish

32 What is true about *Nereis*, scorpion, cockroach and silver fish?

- (a) They all have jointed paired appendages
- (b) They all possess dorsal heart
- (c) None of them is aquatic
- (d) They all belong to the same phylum

33 Metameric segmentation is the characteristic of

- (a) Platyhelminthes and Arthropoda
- (b) Echinodermata and Annelida
- (c) Annelida and Arthropoda
- (d) Mollusca and Chordata

34 Two common characters found in centipede, cockroach and crab are

- (a) compound eyes and anal cerci
- (b) jointed legs and chitinous exoskeleton
- (c) green glands and trachea
- (d) book lungs and antennae

35 Which group of animals belongs to the same phylum?

- (a) Malarial parasite, *Amoeba*, mosquito → NEET 2013
- (b) Earthworm, pinworm, tapeworm
- (c) Prawn, scorpion, locust
- (d) Sponge, sea anemone, starfish

36 Deuterostomate and enterocoelomate invertebrate is

- (a) *Pila*
- (b) *Ascaris*
- (c) *Aphrodite*
- (d) *Asterias*

37 Ink gland occurs in

- (a) *Asterias*
- (b) *Sepia*
- (c) *Pila*
- (d) *Fasciola*

38 Osphradium is meant for

- (a) excretion
- (b) nutrition
- (c) grinding of food
- (d) selection and rejection of food

39 Which of the following is not correctly matched?

- (a) Acoelomated — Platyhelminthes
- (b) Acoelomates — Molluscs
- (c) Pseudocoelomates — Aschelminthes
- (d) Coelomates — Arthropods

40 Which one of the following is a matching set of a phylum and its three examples?

- (a) Cnidaria — *Bonellia*, *Physalia* and *Aurelia*
- (b) Platyhelminthes — *Planaria*, *Schistosoma* and *Enterobius*
- (c) Mollusca — *Loligo*, *Teredo* and *Octopus*
- (d) Porifera — *Spongilla*, *Euplectella* and *Pennatula*

41 In which one of the following, the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct? → CBSE-AIPMT 2012

Genus Name	Two characters	Phylum
(a) <i>Pila</i>	(i) Body segmented (ii) Mouth with radula	Mollusca
(b) <i>Asterias</i>	(i) Spiny skinned (ii) Water vascular system	Echinodermata
(c) <i>Sycon</i>	(i) Pore bearing (ii) Canal system	Porifera
(d) <i>Periplaneta</i>	(i) Jointed appendages (ii) Chitinous exoskeleton	Arthropoda

42 Which one of the following phyla is correctly matched with its two general characteristics?

- (a) Arthropoda Body divided into head, thorax and abdomen and respiration by trachea.
- (b) Chordata Notochord is present at some stage and separate anal and urinary openings to the outside.
- (c) Echinodermata Pentamerous radial symmetry and mostly internal fertilisation.
- (d) Mollusca Normally oviparous and development through a trochophore or veliger larva.

- 43** In phylum–Echinodermata,
 (a) adults are radially symmetrical, but larvae are bilaterally symmetrical
 (b) adults are bilaterally symmetrical and larvae are radially symmetrical
 (c) adults and larvae both are bilaterally symmetrical
 (d) adults and larvae both are radially symmetrical

- 44** Which of the following statements are true/false?
 I. In higher phyla, cellular level of organisation is seen.
 II. Phylum–Platyhelminthes have cellular level of organisation.
 III. Cellular level of organisation is seen when the cells are not arranged as loose cell aggregates.
 IV. Molluscs exhibit tissue level of organisation.

Choose the correct option of the following

- (a) I and II are true but III and IV are false
 (b) III and IV are true but I and II are false
 (c) All statements are true
 (d) All statements are false
- 45** Acorn worms are included in
 (a) Cestoda (b) Trematoda
 (c) Hemichordata (d) Echinodermata
- 46** Larva of *Balanoglossus* is
 (a) Muller's larva (b) tadpole
 (c) tornaria larva (d) kentrogon larva
- 47** The animal having notochord throughout life is
 (a) fish (b) *Amphioxus*
 (c) snakes (d) birds
- 48** An important characteristic that hemichordates share with chordates is → NEET 2017
 (a) absence of notochord (b) ventral tubular nerve cord
 (c) pharynx with gill slits (d) pharynx without gill slits
- 49** Match the following columns. → NEET 2013

Column I	Column II	Column III
(a) <i>Petromyzon</i>	Ectoparasite	Cyclostomata
(b) <i>Ichthyophis</i>	Terrestrial	Reptilia
(c) <i>Limulus</i>	Body covered by chitinous exoskeleton	Pisces
(d) <i>Adamsia</i>	Radially symmetrical	Porifera

- 50** Which one of the following pairs of animal comprises 'jawless fishes'? → CBSE-AIPMT 2009
 (a) Lampreys and eels
 (b) Mackerals and rohu
 (c) Lampreys and hag fishes
 (d) Guppies and hag fishes
- 51** Choose the correct statement. → NEET-I 2016
 (a) All mammals are viviparous
 (b) All cyclostomes do not possess jaws and paired fins
 (c) All reptiles have a three-chambered heart
 (d) All pisces have gills covered by an operculum

- 52** A marine cartilaginous fish that can produce electric current is → CBSE-AIPMT 2014
 (a) *Pristis* (b) *Torpedo*
 (c) *Trygon* (d) *Scoliodon*

- 53** Which of the following characteristic features always holds true for the corresponding group of animals? → NEET-I 2016
 (a) Viviparous–Mammalia
 (b) Possess a mouth with an upper and a lower jaw–Chordata
 (c) 3-chambered heart with one incompletely divided ventricle–Reptilia
 (d) Cartilaginous endoskeleton–Chondrichthyes

- 54** What will you look for to identify the sex of the following? → CBSE-AIPMT 2011
 (a) Male frog — A copulatory pad on the first digit of the hindlimb
 (b) Female cockroach — Anal cerci
 (c) Male shark — Claspers borne on pelvic fins
 (d) Female *Ascaris* — Sharply curved posterior end

- 55** Urinary bladder is absent in
 (a) amphibians (b) mammals
 (c) lizards (d) aves

- 56** Which one of these animals is not a homeotherm? → NEET 2018
 (a) *Camelus* (b) *Chelone*
 (c) *Macropus* (d) *Psittacula*

- 57** Identify the vertebrate group of animals characterised by crop and gizzard in its digestive system. → NEET 2018
 (a) Aves (b) Reptilia
 (c) Amphibia (d) Osteichthyes

- 58** Compared to those of humans, the erythrocytes in frog are → CBSE-AIPMT 2012
 (a) Without nucleus but with haemoglobin
 (b) nucleated and with haemoglobin
 (c) very much smaller and fewer
 (d) nucleated and without haemoglobin

- 59** In which one of the following the genus name, its two characters and its class/phylum are correctly matched? → CBSE-AIPMT 2011

Genus	Two characters	Class/phylum
(a) <i>Salamandra</i>	(i) A tympanum represents ear (ii) Fertilisation is external	Amphibia
(b) <i>Pteropus</i>	(i) Skin possesses hair (ii) Oviparous	Mammalia
(c) <i>Aurelia</i>	(i) Cnidoblast (ii) Organ level of organisation	Coelenterata
(d) <i>Ascaris</i>	(i) Body segmented (ii) Males and females distinct	Annelida

- 60** Adaptation to colour vision occurs in
 (a) Reptilia (b) Aves
 (c) Mammalia (d) All of these
- 61** Which one of the following characteristics is not shared by birds and mammals? → NEET-I 2016
 (a) Breathing using lungs
 (b) Viviparity
 (c) Warm-blooded nature
 (d) Ossified endoskeleton
- 62** Which among these is the correct combination of aquatic mammals? → NEET 2017
 (a) Seals, Dolphins, Sharks
 (b) Dolphins, Seals, *Trygon*
 (c) Whales, Dolphins, Seals
 (d) *Trygon*, Whales, Seals
- 63** What is common between parrot, platypus and kangaroo? → CBSE-AIPMT 2007
 (a) Homeothermy
 (b) Toothless jaws
 (c) Functional post-anal tail
 (d) Oviparity
- 64** Which of the following animals is not viviparous? → CBSE-AIPMT 2015
 (a) Flying fox (bat) (b) Elephant
 (c) Platypus (d) Whale
- 65** Which one of the following animals is correctly matched with its one characteristic and the taxon?

Animal	Characteristic	Taxon
(a) Millipede	Ventral nerve cord	Arachnida
(b) Duck-billed platypus	Oviparous	Mammalian
(c) Silver fish	Pectoral and pelvic fins	Chordate
(d) Sea anemone	Triploblastic	Cnidaria

- 66** Which one of the following is not a characteristic of class-Mammalia? → NEET-I 2016
 (a) Nucleated RBC
 (b) Presence of muscular diaphragm
 (c) 12 pairs of cranial nerves
 (d) Dicondylic skull

Directions (Q. Nos. 67 and 68) *In each of the following questions a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as*

- (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 (b) If both Assertion and Reason are true, but Reason is not correct explanation of Assertion.
 (c) If Assertion is true, but Reason is false.
 (d) If both Assertion and Reason are false.
- 67 Assertion** Birds were called glorified reptiles by Huxley.
Reason They are originated from reptiles.
- 68 Assertion** Group-Amniota comprises three classes of vertebrates, i.e. reptiles, birds and mammals.
Reason All of these contain a special membrane called amnion.

DAY PRACTICE SESSION 2

PROGRESSIVE QUESTIONS EXERCISE

- 1** Incomplete digestive system is found in
 (a) Porifera, Coelenterata and Ctenophora
 (b) Coelenterata, Ctenophora and Platyhelminthes
 (c) Aschelminthes, Annelida and Arthropoda
 (d) Annelida, Mollusca and Chordata
- 2** Biradial symmetry and lack of cnidoblasts are the characteristics of
 (a) Starfish and sea anemone
 (b) *Ctenoplana* and *Beroe*
 (c) *Aurelia* and *Paramecium*
 (d) *Hydra* and starfish
- 3** The groups of animals, which have radial symmetry are
 (a) Coelenterata, Mollusca, Annelida
 (b) Ctenophora, Arthropoda, Echinodermata
 (c) Coelenterata, Ctenophora, Echinodermata
 (d) Echinodermata, Hemichordata, Chordata
- 4** From the following statements select the incorrect one.
 (a) Millepedes have two pairs of appendages in each segment of the body
 (b) Prawn has two pairs of antennae
 (c) Animals belonging to phylum-Porifera are exclusively marine
 (d) Nematocysts are characteristic of the phylum-Cnidaria
- 5** *Ascaris* is characterised by
 (a) the absence of true coelom but the presence of metamerism
 (b) the presence of neither true coelom nor metamerism
 (c) the presence of true coelom but the absence of metamerism
 (d) the presence of true coelom and metamerism (metamerisation)

- 6** Which of the following pairs of animals has non-glandular skin?
- Snake and frog
 - Chameleon* and turtle
 - Frog and pigeon
 - Crocodile and tiger
- 7** Besides Annelida and Arthropoda, the metamerism is exhibited by
- Cestoda
 - Chordata
 - Mollusca
 - Acanthocephala
- 8** What is true about all sponges without exception?
- They are all marine
 - They have flagellated collar cells
 - They have a mixed skeleton consisting of spicules and spongin fibres
 - They reproduce only asexually by budding
- 9** Radial symmetry is often exhibited by animals having
- one opening of alimentary canal
 - aquatic mode of living
 - benthos/sedentary
 - ciliary mode of feeding
- 10** Which of the following is not a characteristic feature of all the chordates?
- The presence of coelom
 - Pharyngeal gill clefts in the early embryonic stages
 - A diaphragm that separates thorax from abdomen
 - Dorsal nerve cord
- 11** Which one of the following sets of animals share a four-chambered heart?
- Amphibian, reptiles, birds
 - Crocodiles, birds, mammals
 - Crocodiles, lizards, turtles
 - Lizards, mammals, birds
- 12** Which one feature is common to leech, cockroach and scorpion?
- Nephridia
 - Ventral nerve cord
 - Cephalisation
 - Antennae
- 13** In retrogressive metamorphosis, the urochordate larva
- lose notochord
 - lose tail
 - experience reduction of nervous system to a visceral ganglion
 - All of the above
- 14** The animal with bilateral symmetry in young stage and radial pentamerous symmetry in the adult stage belong to the phylum
- Annelida
 - Mollusca
 - Cnidaria
 - Echinodermata
- 15** Sycon belongs to a group of animals which are best described as
- multicellular with a gastrovascular system
 - multicellular having tissue organisation, but no body cavity
 - unicellular or acellular
 - multicellular without any tissue organisation
- 16** Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?
- Chordata – Possess a mouth provided with an upper and a lower jaw
 - Chondrichthyes – Possess cartilaginous endoskeleton
 - Mammalia – Give birth to young ones
 - Reptilia – Possess 3-chambered heart with one incompletely divided ventricle
- 17** Which one of the following statements about all the four *Spongilla*, leech, dolphin and penguin is correct?
- Penguin is homiothermic, while the remaining three are poikilothermic
 - Leech is a freshwater form, while all other are marine
 - Spongilla* has special collared cells called choanocytes, not found in the remaining three
 - All are bilaterally symmetrical
- 18** Which one of the following features is common in silver fish, scorpion, dragonfly and prawn?
- Three pairs of legs and segmented body
 - Chitinous cuticle and two pairs of antennae
 - Jointed appendages and chitinous exoskeleton
 - Cephalothorax and tracheae
- 19** True coelom is the space lying between the alimentary canal and body wall enclosed by the layers of
- ectoderm on both sides
 - endoderm on one side and ectoderm on the other
 - mesoderm on one side and ectoderm on the other
 - mesoderm on both sides
- 20** In Arthropoda, head and thorax are often fused to form cephalothorax but, in which, one of the following classes, is the body divided into head, thorax and abdomen?
- Insecta
 - Myriapoda
 - Crustacea
 - Arachnida and Crustacea
- 21** Which one of the following correctly describes the location of some body parts in the earthworm (*Pheretima*)?
- Four pairs of spermathecae in 4-7 segments
 - One pair of ovaries attached at inter segmental septum of 14th and 15th segments
 - Two pairs of testes in 10th and 11th segments
 - Two pairs of accessory glands in 16th-18th segments

22 A larval stage occurs in the life history of all members of the group

- (a) frog, lizard and cockroach
- (b) *Ascaris*, housefly and frog
- (c) housefly, earthworm and mosquito
- (d) butterfly, frog and mosquito

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

- (a) Flying fish, cuttle fish, silver fish – Pisces
- (b) Centipede, millipede, spider, scorpion– Insecta
- (c) Housefly, butterfly, tse–tse fly, silver fish– Insecta
- (d) Spiny anteater, sea urchin, sea cucumber – Echinodermata

24 Which of the following pairs are correctly matched?

Animals		Morphological features
I. Crocodile	—	Four-chambered heart
II. Sea urchin	—	Parapodia
III. <i>Obelia</i>	—	Metagenesis
IV. <i>Lemur</i>	—	Thecodont

- (a) I, III and IV
- (c) I and IV

- (b) II, III and IV
- (d) I and II

25 Match the following columns.

Column I	Column II
A. Nematocyst	1. Acoelomate
B. Platyhelminthes	2. Moulting process
C. Annelida	3. Coelenterata
D. Ecdysis	4. Excretion
	5. Metameric segmentation

Codes

- | | | | | |
|-----|---|---|---|---|
| | A | B | C | D |
| (a) | 3 | 1 | 5 | 2 |
| (b) | 4 | 3 | 2 | 1 |
| (c) | 3 | 2 | 1 | 4 |
| (d) | 1 | 2 | 3 | 4 |

26 Given below are four matchings of an animal and its kind of respiratory organ.

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- I. Silver fish – trachea
- II. Scorpion – book lungs
- III. Sea squirt – pharyngeal gills
- IV. Dolphin – skin

The correct matchings are

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

ANSWERS

SESSION 1

- | | | | | | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 1 (b) | 2 (a) | 3 (b) | 4 (c) | 5 (d) | 6 (b) | 7 (d) | 8 (b) | 9 (b) | 10 (c) |
| 11 (a) | 12 (a) | 13 (a) | 14 (c) | 15 (a) | 16 (d) | 17 (d) | 18 (b) | 19 (a) | 20 (a) |
| 21 (b) | 22 (a) | 23 (c) | 24 (b) | 25 (b) | 26 (a) | 27 (b) | 28 (d) | 29 (b) | 30 (c) |
| 31 (b) | 32 (c) | 33 (c) | 34 (b) | 35 (c) | 36 (d) | 37 (b) | 38 (d) | 39 (b) | 40 (c) |
| 41 (a) | 42 (a) | 43 (a) | 44 (d) | 45 (c) | 46 (c) | 47 (b) | 48 (c) | 49 (a) | 50 (c) |
| 51 (b) | 52 (b) | 53 (d) | 54 (c) | 55 (a) | 56 (b) | 57 (a) | 58 (b) | 59 (a) | 60 (b) |
| 61 (b) | 62 (c) | 63 (a) | 64 (c) | 65 (b) | 66 (a) | 67 (a) | 68 (a) | | |

SESSION 2

- | | | | | | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 1 (b) | 2 (b) | 3 (c) | 4 (b) | 5 (b) | 6 (c) | 7 (b) | 8 (b) | 9 (b) | 10 (c) |
| 11 (b) | 12 (b) | 13 (d) | 14 (d) | 15 (d) | 16 (b) | 17 (c) | 18 (c) | 19 (d) | 20 (d) |
| 21 (c) | 22 (d) | 23 (c) | 24 (a) | 25 (a) | 26 (d) | | | | |