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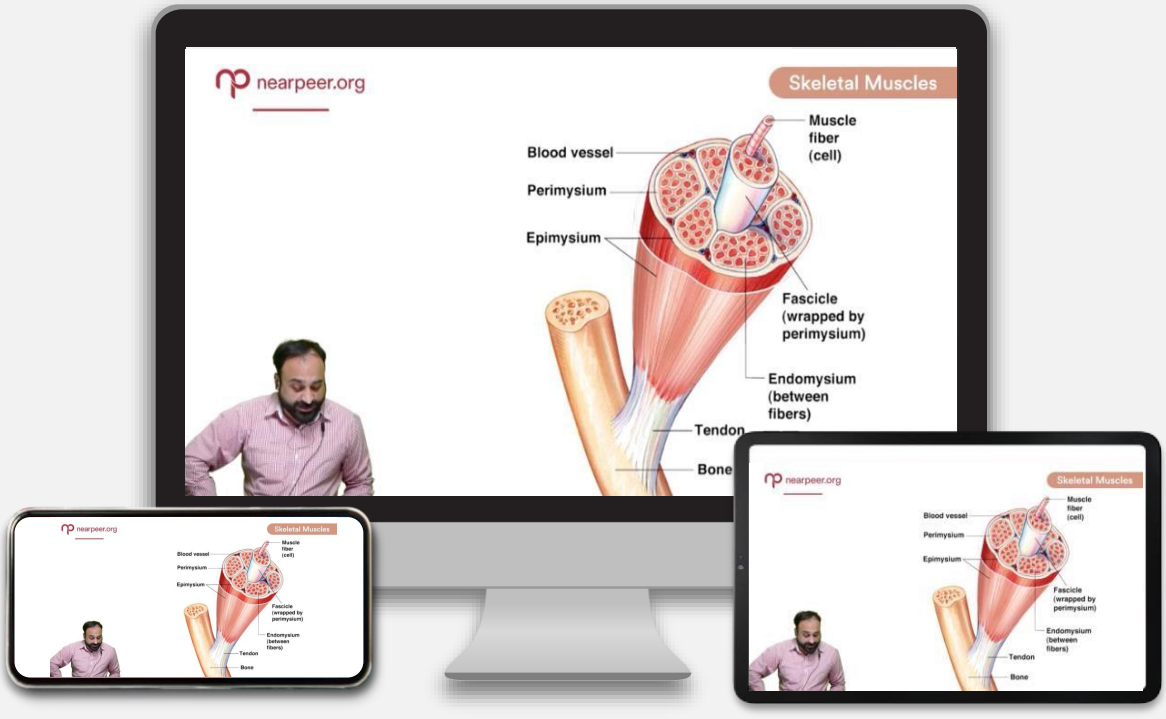
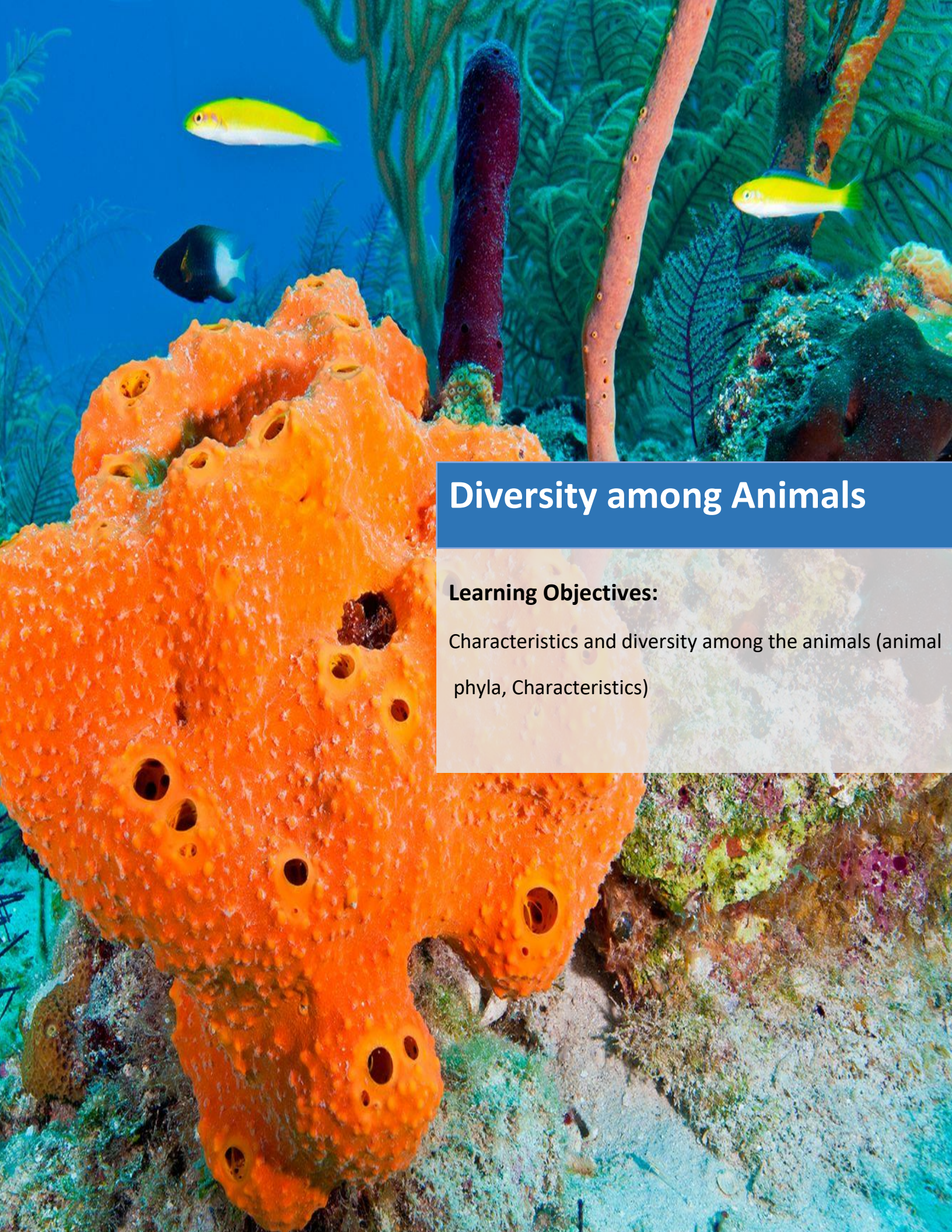


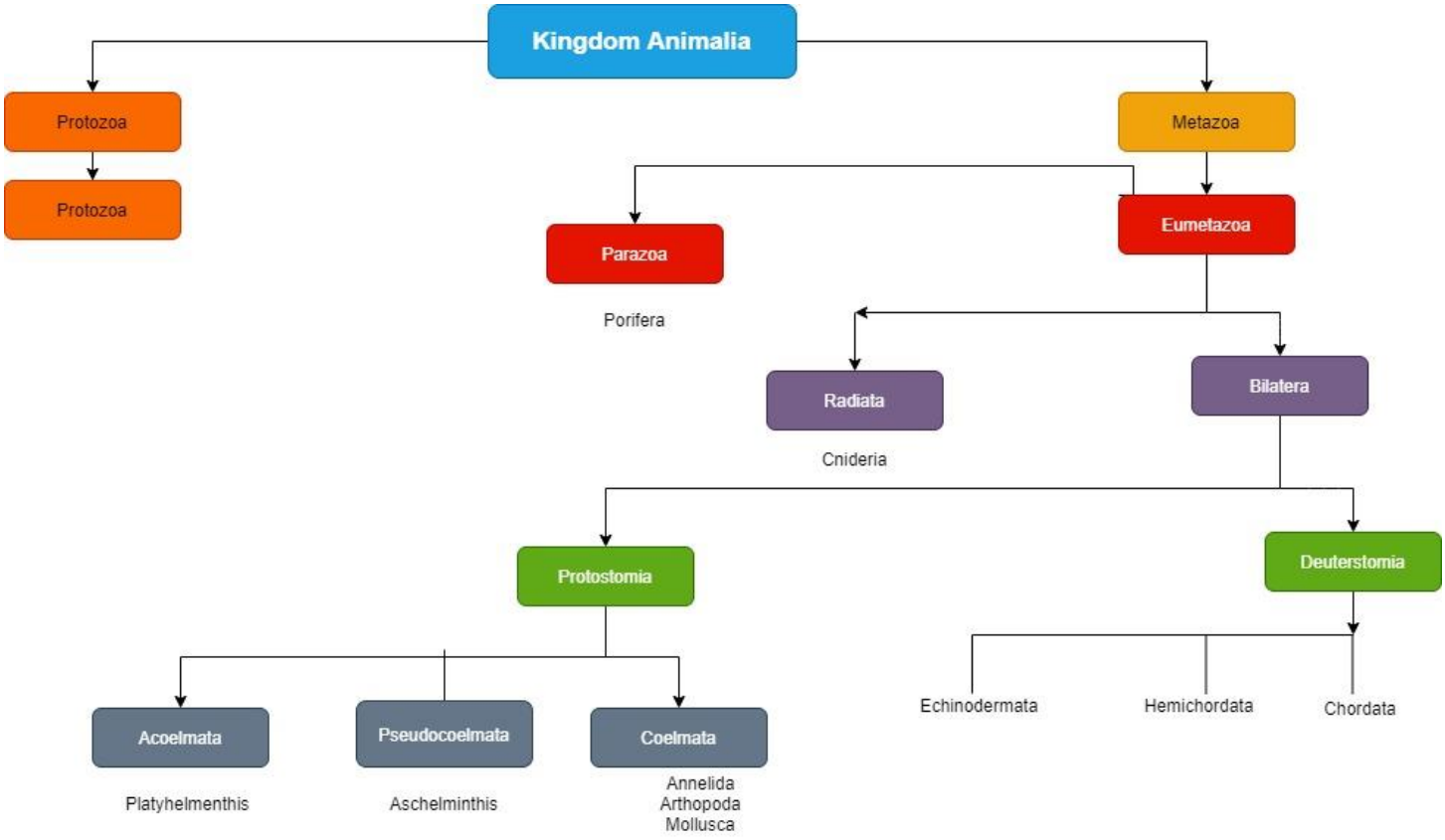


Diversity among Animals

Learning Objectives:

Characteristics and diversity among the animals (animal phyla, Characteristics)

Kingdom Animalia:



Kingdom Animalia:

- Kingdom Animalia includes all the animals.
- The name Animalia is derived from Latin word anima which means breath or soul.
- Kingdom Animalia consists of all animals which are **multi-cellular, diploid, eukaryotic, Ingestive, heterotrophs and develop from two different haploid gametes (a large egg and a smaller sperm).**

Classification:

Kingdom Animalia is divided into two subkingdoms:

1. **Subkingdom Parazoa:**

   In these animals there is no tissue organization and have organs. They have indeterminate (indefinite) shape and an asymmetrical. These are the simplest animals Phylum Porifera is included in this sub kingdom.

2. **Subkingdom Eumetazoa:**

   In these animals the tissues are organized into organs and organ systems, most of the phyla of kingdom Animalia (about 29) belongs to subkingdom Eumatazoa. These phyla are other than porifera. Grade Radiata and Grade Bilatera are included in this subkingdom.

Grade radiata/diploblastic organization:

These animals arc simplest of Eumctazoa and are diploblastic.

1. **Systematic Position:** Diploblastic animals belong **10 division** radiata (subkingdom Eumatazoa)
2. **Body:** The body wall of these animals consists of two layers of cells, outer ectoderm and inner endoderm. There is a jelly like mesenchyme or mesoglea which in most cases is non-cellular.
3. **Less Specialization:** These animals show lesser specialization and they do not from specialized organs.
4. **Symmetry:** These animals have radial symmetry. In radial symmetry the parts of the body arc arranged around a central axis in such a way that any plane passing through the central axis divides the animal into two equal halves.

   The cylindrical body of a sea-anemone can be cut in two equal halves vertically in any plane.
5. **Digestive System:** There is only one cavity in the body called gastro vascular cavity which has only mouth. Through this mouth the food and water enters and also the wastes are removed alone with water. This is known as sac like digestive system.
6. **Transportation:** A special transport system is absent; most substances are distributed within the body by the process of diffusion.

7. **Nervous System:** Central nervous system is absent. However, a network of neurons is present.
8. **Animals in this Group:** Animals included in phylum Cnidaria (coelenterata) are diploblastic.

Grade bilateria/triploblastic organization:

- These animals have bilateral symmetry in bilateral symmetry an animal can he divided into two equal parts by an imaginary line only in one plane.
- In these animals the right side is approximately equal to the left side and there is a distinct anterior and a posterior end. The head is present at the anterior end. They also hay c a dorsal and a ventral surface.
- All the animals included in grade Bilateria are triploblastic. These may be acoelomate, pseudococlomate or coclomate.
- **Acoelomata:** The animals without coelom (body cavity) arc called Acoelomata.
- **Pseudocoelomata:** The animals with a false coelom (pseudocoele) are called Pscudocoelomata.
- **Coelomata:** The animals with a true coelom arc called Coelomates.
- The body wall of these animals is-made of three layers which are ectoderm mesoderm and endoderm.
- In most triploblastic animals during embryonic development, these layers' form following structures:
- The ectoderm forms integumentary and nervous system.
- The mesoderm forms muscular, skeletal and reproductive systems.
- The endoderm forms the lining of digestive tract and the glands of digestive system (such as liver and pancreas)
- Specialization: The cells of these animals show greater degree of specialization. These have specialized organs and organ systems.
- Symmetry: These animals haw bilateral symmetry.
- Digestive System: The digestive system is mostly of tube type. In tube type digestive system, the mouth is at the anterior end while the anus is at the posterior end.
- Transportation: Special transport system i.e. blood vascular system is present in most of the cases.
- Nervous System: Central nervous system is present
- Types of Triploblastic Animals: Triploblastic animals may be acoelomate pseudo coelomate or coelomate.

  The animals belonging to phyla, Platyhelminthes, Nematoda, Annelida, Mellusca Arthropoda, Echinodermata, Hemichordata and Chordata are included ill grade bilateria. Thelarvae of echinoderms have bilateral symmetry.

However, the adult Echinoderm, have secondarily developed radial symmetry, due to their special mode of life.

Acoelomata, pseudocoelomata and coelomate:

1. **Acoelomata:** The animals without coelom (body cavity) are called Acoelomata (Phylum, Platyhelminthes). It has following characters:
   (i) Mesenchyma: The mesoderm forms a loose, cellular tissue called mesenchyma or parenchyma which tills the space between the ectoderm and the endoderm. Mesoderm also forms a packing around the internal organs to support and protect them.
   (ii) The Gut: The gut is **sac-type**
   (iii) Transportation: There is no special transport system and most substances arc distributed within the body by the process of diffusion
   (iv) Excretory System: This system consists of flame cells, excretory ducts and excretory pores; it is for the transport of excretory products.
   (v) Nervous System: The nervous system is well developed.
2. **Pseudocoelomata:**
   The animals with a false coelom (pseudocoele) are called Pseudocoelomata (Phylum Aschelminthes/Nematoda).
   In these animals the space between the body wall and the digestive tube is called pseudocoelom (false body cavity). Pseudocoelom is not homologous to true coelom because it is not lined by coelomic epithelium, similarly it has no relation with the reproductive and excretory organs.
   Pseudocoelom develops from the blastocoel of the embryo and is hounded externally by the muscle and internally by the cuticle of the intestine.
3 **Coelomata:**
   The animals with a true coelom (body cavity} are called Coelomata, The animals from annelid, to chordates are included. These animals have following characters:

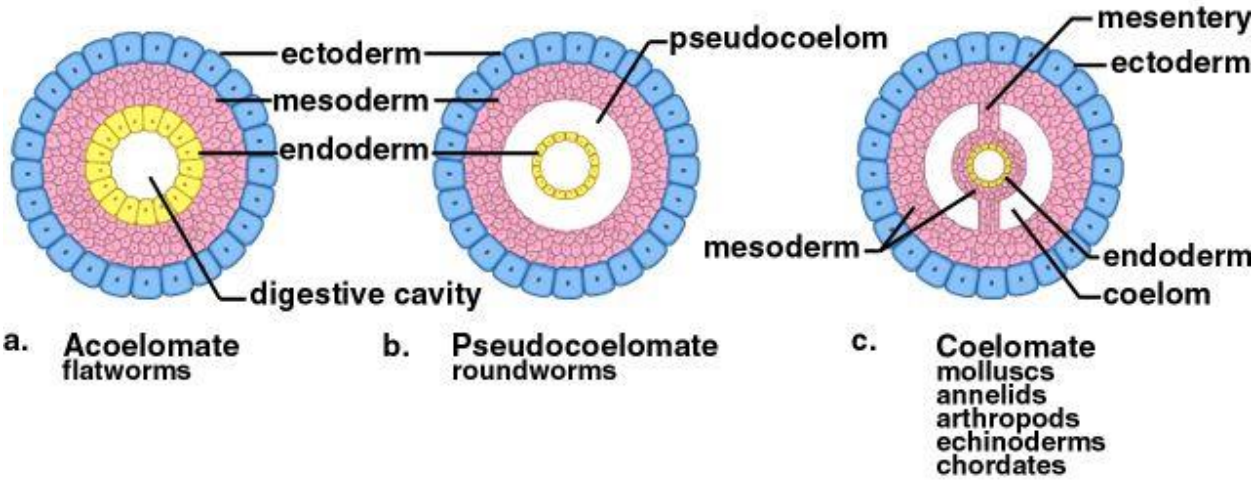
Coelom:

These animals have coelom. Coelom is a cavity between the body wall and the alimentary canal and is lined by mesoderm. The mesoderm splits into:
Outer parietal layer which underlines the body wall and
The visceral layer which covers the alimentary canal
The cavity between both is the true coelom. It is filled with fluid called coelomic fluid.

Well-Developed Systems:

- The gut is more complex
- The Neuro-sensory system is well developed and centralized
- They have a well-developed circulatory system

- A well-developed excretory system not only removes nitrogenous wastes but also osmoregulation in function
- Respiratory and reproductive systems are also well developed



Parazoa

The sub-kingdom Parazoa includes only one Phylum which is the phylum porifera

Rearrangement, reorganization and regeneration

- If sponge cells are separated they can rearrange and reorganize. Some sponge has regenerative ability.
- The capacity of sponges to regenerate is for restoration of damaged or lost parts & also for complete regeneration of an adult from fragments or even single cells.
- Sponge cells may be separated by mechanical methods (c.g squeezing a piece of sponge through tine silk cloth) or by chemical methods (e.g. elimination of calcium and magnesium from seawater).

- In order for small aggregates of cells to form larger aggregates, the cells arc attached to a surface. There they flatten and develop an envelope of special cells (pinacocytes) this is called the dimorphic stage.
- Reconstitution of the choanocyte chambers and of the canal system follows soon afterward, resulting in a young sponge that is functional and able to grow.
- It is generally believed that the reconstitution process is not comparable with embryonic development, because the various types of dissociated cells participate in the formation of the new sponge.

- During unfavourable conditions, sponges are reduced to small fragments that may consist only one mass of archaeocytes covered by layers of pinacocytes. A complete sponge forms from these fragments when favourable conditions return.
- The regenerative abilities of sponges, their lack of a central coordinating organ (brain) and the peculiar migratory ability of cells within the organisms combine to make it somewhat difficult to define the individuality of a sponge.

Examples:

(i) **Sycon:** Typical marine sponge.

(ii) **Leucoselenia**: A sponge that consists of a group of erect tubes.

(iii) **Euplectella**: It is beautiful and delicate sponge made up of glass) framework. It IS commonly called Venus flower basket.

(iv) **Spongilla**: It is freshwater sponge.

Importance:

- Many artificial sponges have been made from synthetic material however the natural sponges are still in demand.
- The best commercial sponges are found in the warm waters of Mediterranean Sea. Some uses are as follows:
- The skeleton of sponges has long been used for washing and bathing.
- They have great capacity to absorb water. Therefore, they are used in surgical operations for absorbing fluids and blood.
- They are also used for sound absorption in the buildings.

Coral reefs:

- Many colonial coelenterates (such as corals) produce a hard exoskeleton formed of calcium carbonate ($CaCO_3$).
- These polyps are covered by stony cups due to hardening of their secretions.
- It is secreted by epidermal cells that take lime from sea water.
- From the mouth of the stony cup a polyp can pass out its tentacles for keeling and withdraw it when not feeding.
- The stony network or mass of such Coelenterates are called Corals.
- The skeleton of corals is responsible for formation of small coral islands or large coral reefs.
- Most such Coelenterates are colonial.
- Living polyps are found on the surface layer of corals. However, on the lower side and at the base are present masses of dead stony structures called Coral reefs.
- Coral reefs are important habitats. They are thought to support more than I million aquatic species. This includes not only several hundred species of coral, hut thousands 01 fish and invertebrate species such as sponges, crabs, shrimps, lobsters, sea anemones, bryozoans, worms, sea stars and sea urchins, octopuses, squid, snails and nudibranchs.

- It is estimated that nearly one-quarter of the world's marine species get shelter and food from coral reefs.
- Coral reefs are found in the coastal waters of Florida, West Indies, East Coast of Africa, Australia and Island of Coral Sea.

Phylum: platyhelminthes - the flatworms

Habitat:

A few species are free living and found in freshwater, for example Dugesia(planaria). Many are parasites (mostly endoparasites). The endoparasite lives inside the host. The most common examples are:

Taenia sodium (tapeworm)

Fasciola hepatica (liver fluke) and

Schistosoma (blood fluke)

Tile parasites are more common in tropics. Some of these cause diseases in humans.

Reproduction:

They reproduce both by sexual and asexual means. Asexual reproduction is by fissior: in which the animal constricts in the middle into two pieces. Each piece regenerates the missing part.

The sexually reproducing species are hermaphrodite (both male and female reproductive organs are present in the same individual).

Development:

Development is direct. Sometimes larval form is present.

Examples:

(i) Dugesia (Planada): A free-living flatworm with a ciliated outer surface.

(ii) Fasciola (Liver Fluke): It is an endoparasite in sheep and rarely in human beings. It attaches to the host tissue by suckers. It completes its life cycle in two hosts: A snail Sheep or man (in the bile duct) Taenia (Tape Worm):

It is an endoparasite that completes its life cycle in two hosts:

- Humans
- Cattle/pig

The intermediate host is pig or cattle. The body is ribbon-like and divided into segments called proglottids which contain sex organs. The segments (proglottids) continue to break off and are passed out tram the intestine along with faeces. Let us discuss infestation and disinfestations of tape worm. The relationship between the host and parasite is a delicate one, since each modifies the activities and functions of the other.

Infestation:

- The zygote begins to develop while it is still inside the uterus of female in Taenia (tape worm).

- The last segments (or proglottids) contain completely developed embryo in t heir uteri.
- The fully mature proglottids break off from the body and come out of the body of man with faeces (undigested waste). Each proglottid may contain upto 80,000 eggs.
- The embryo inside the egg is round in shape and has six chitinous hooks. It shows limited movement of contraction.
- F or further development it must reach a second host which may be a cow (or pig).
- If the embryos are swallowed by the cow (or pig), they bore their way and reach the voluntary muscles. Here they remain embedded. Tape worm in the intermediate host is the bladder worm.
- If an improperly cooked beef is eaten by a person, the parasite (which has not been killed) begins to develop further in the intestine of man. Development of the tape worm in encysted meat is stimulated by the gastric juices of the host. The adults then attach themselves to the intestinal tract (small intestine) of their host by the scolex and absorb pnniall, digested food through their body wall.

Dlsinfestation:

Once the parasite has entered the intestine of man it is difficult to remove completely.

Care and Control:

The beef should he cooked properly before eating it. As a result, there is no chance "I' the parasite entering the digestive system.

Medicine:

I f the parasite has entered then certain medicines are taken to remove it. Its complete removal is necessarily because if only head remains inside the intestine it can grow into new tape-worm once again.

Anema:

Besides treatment with drugs. physicians also give anema to the patient. to fully remove the parasite.

Adaptation for parasitic mode of life:

The Platyhelminthes have adapted following characters for parasitic mode of life:

1. **Cuticle:** The epidermis is absent and resistant cuticle is formed for protection.
2. **Adhesive Organs:** They have developed adhesive organs (such as suckers and hooks) for attachment to the host.
3. **Digestive System:** The digestive system is simple due to increased dependence on host.
4. **Muscular and Nervous System:** Then: is degeneration of muscular system and nervous system.
5. **Reproductive Systems:** The reproductive systems are complicated and the ova are produced in a large number. In this way the continuity of the species is ensured.
6. **Life Cycle:** The complex life cycle and the presence of more than one host during the life cycle increases the chances of survival of the parasite.

Pseudocoelomates achelminthes:

(Pgylummematoda – The Round Worms)

The name Nematoda means pointed ends. The animals of this group have elongated worm like body with pointed ends.

Habitat:

They are mostly parasites.

Reproduction:

The sexes are separate. The female has female gonads called ovaries which produce eggs. The male has male gonads called testes which produce sperms. A zygote is formed as a result of fertilization.

Development:

A larval stage is present in the life cycle. Therefore, the development is indirect. Round worms play important role in breaking down of organic matter. A single rotting apple may contain 90,000 worms. There are billions of roundworms in one acre of topsoil.

Parasitic diseases:

Parasitic Aschelminthes are very important because they cause very serious diseases in man and plants. Some examples are as follows:

1. **Ascaris Lumbericoides:** It is an intestinal parasite of man.

- It is the most common intestinal parasite in the world, infecting an estimated one billion people. It is also the largest of the round worms reaching an average of forty cm (sixteen inches) in length. It can be as thick as a pencil and weigh almost as much.
- It is pink with bright red "speed stripes" The female grows in the intestines producing an enormous number of eggs estimated to be about twenty-seven million in her lifetime of a year or so.
- The eggs expelled in the feces can live outside the body for up to seven years in warm soil. Food, water, and soil contamination are the means of infection for humans. However, humans are not a viable host for the: mature worm but the immature form is the one that causes the disease.
- When the larvae hatch. they travel to various parts of the bod) like the lungs, liver, brain, or eye.
- Children contract the worm since they often play in dirt and then put their hands into their mouths.
- Symptoms in children are nervousness and irritability, allergic reactions, dry cough, restlessness at night, convulsions or spasms, twitching in various parts of the body, itching or irritation of the nose or anus as well as lactose intolerance.
- Symptoms in adults include: abdominal pain, edema of the lips, allergic reactions, insomnia, anorexia, and weight loss.

2. **Genus Rhabditis:** It contains Plan: species normally found in soil, organic matter or water and feces of man or animals.
3. **Enterobius Vermicularis:**

- It is commonly known as pinworm and is international but more common in Europe and America.
- Pinworms are parasites in the human caecum, colon and appendix.
- Their movement cause intense itching of anus, inflammation of mucous membrane of colon and appendix resulting in insomnia and loss of appetite.

4. **Acyclostoma Duodenale:** It is commonly known as hook worm. It is a parasite of human small intestine in Asia, North Africa and Europe.

- It is a very dangerous because it holds the villi of intestine and sucks blood and body fluid.
- During feeding they produce an anticoagulant to prevent clotting of blood and after feeding leave the wound bleeding.

In children it can cause severe anemia and retard physical and mental growth.

Phylum: arthropoda: animals with jointed legs:

They are commonly called joint footed animals because arthros means joined &pods means feet.

Origin:

These have common origin with annelids because both have segmented body, appendages and cuticle.

Diversity:

The phylum contains mort species than any other phylum. Insects (cockroaches, grasshoppers, butterflies, mosquitoes) are most common arthropods on the earth. They are variable in structure. Some are worm-like centipedes. Other are flying insects with the body divided into three regions which are head, thorax and abdomen.

Habitat:

They are present on the land and in fresh and marine water. Many can fly.

Body Organization:

They are triploblastic, coelom ate and bilaterally symmetrical animals. The coelom is reduced and communicated with blood vascular system. Such a coelom is called blood vascular system.

Segmentation:

The body is segmented. Each segment is attached to its neighbor by a modified portion of cuticle which is thin and flexible.

Appendages:

They have jointed appendages. These appendages have been modified for specialized functions.

Chitinous Cuticle:

The body is covered with waterproof chitinous cuticle secreted by the epidermis.

Digestive System:

II is in the form of alimentary canal with two openings, the mouth and anus. It has different parts each with a specific function. Nutrition is small plants and animals.

Circulatory System:

They have open circulatory system. The blood flows in the body cavity bathing the tissues of the body. However, there is a primitive heart and a main blood vessel. Blood is colourless because it is without hemoglobin.

Respiration:

Most arthropods have extensive tracheal system formed of air tubes called tracheae for the exchange of gases. Main tubes open to the exterior through openings called spiracles. Aquatic arthropods respire through gills.

Excretory System:

It is well developed and consists of Malpighian tubules. The nitrogenous wastes are excreted in the form of solid uric acid ($C_5H_4N_4O_3$).

Nervous System:

It is well developed and consists of paired ganglia (simple brain) connected to a ventral double nerve cord. On the ventral nerve cord a ganglion is present in each segment. Nerves arise from these ganglia. The sensory organs are usually a pair of compound eyes and antennae.

Skeleton:

They have exoskeleton which is in the form of outer covering called cuticle. The cuticle is light in weight and is formed chiefly of chitin. The muscles are attached to the exoskeleton. Exoskeleton provides protection and helps in locomotion.

Locomotion:

The arthropods exhibit active and swift movements. They swim, crawl or fly depending upon the habitat they occupy. The organs of locomotion are paired appendages. Some may also have wings to fly.

Reproduction and life cycle:

The sexes are separate. The testes produce sperms while the ovaries produce eggs. Metamorphosis occurs in the life cycle of insects. Metamorphosis (meta = change + morphe = form) is an abrupt change of form or structure during the life cycle.

There are three morphological forms in the life cycle:

- The egg develops into Ian a.
- Larva is converted into motionless pupa.
- The pupa finally develops into an adult.

In some primitive insects the metamorphosis is incomplete. The larva resembles adult and called nymph or instar. It lives in the same habitat as adult.

Examples: Crab, lobster, Prawn, woodlouse, mosquito, dragonfly, moth, scorpion, spider, mites, ticks, centipede and millipede.

Classification of arthropoda:

Phylum Arthropoda is a large group with a great variety. Some important classes are as follows:

1. Class Crustacea:

(i) **Habitat:** They are aquatic

(ii) **Gills:** The have gills for respiration.

(iii) **Exoskeleton:** An exoskeleton of chitin is present which becomes harder due to deposition of salts. On the dorsal side of the Cephalothroax the exoskeleton is in the form of carapace.

(iv) **Appendages:** The appendages are modified for capturing food, walking, swimming, respiration and reproduction. Head has two pairs of antennal appendages.

(v) **Coelom:** I t is reduced and hemocoel is present.

(vi) **Mandibles and Maxillae:** One pair of Mandibles (jaws) and t\\ 0 pairs of Maxillae.

(vii) **Sexes:** Sexes are mostly separate.

Examples: Daphnia, Cyclops, Crabs, lobsters, prawn, woodlouse etc.

2. Class Insecta:

(i) **Habitat:** Insects are found everywhere. Many show social behaviour.

(ii) **Largest Group:** This is the largest group not only of Arthropoda but of all the animal kingdom. Of species of organisms 53.1% are insects.

(iii) **Biodiversity:** It has great variety.

(iv) **Body Regions:** It has three distinct regions which are head. thorax and abdomen.

(v) **Head:** The head is usually vertical to the body and jaws are ventrally placed. There is a pail antennae and compound eyes on the head.

(vi) **Thorax:** The thorax has three segments in which are present three pairs of jointed legs. Man) them may have one or two pairs of wings.

(vii) **Abdomen:** Abdomen has varying number of segments.

(viii) **Nervous System:** It is composed of brain and double nerve cord. Brain is formed of fused ganglia double nerve cord is ventral.

(ix) **Reproduction:** Sexes are separate. Animals are oviparous.

(x) **Development:** Metamorphosis takes place during development.

Examples: Dragonfly, mosquito, butterflies, moths, wasps and beetles etc.

3. **Class Arachnida:**

(i) **Segmentation:** Anterior segments are fused to form Cephalothorax.

(ii) **Appendages:** Cephalothorax bears a pair of appendages called chelicerae with claws, two pairs as pedipalps and four pairs of legs.

(iii) **Antennae:** There are no antennae.

(iv) **Jaws:** They have no true jaws.

(v) **Abdomen:** Abdomen may be segmented or un-segmented and is with or without appendages.

(vi) **Respiration:** It is by gills, lungs or special structures called book lungs.

(vii) **Excretion:** It is by the Malpighian tubules.

(viii) **Eyes:** Eyes arc simple. Most spiders have eight eyes placed in such a way that they can easily look at the predators and prey.

(ix) **Reproduction:** Sexes are separate. They are oviparous (lay eggs).

(x) **Development:** No true metamorphosis.

Examples: Scorpions, spiders, mites and ticks.

4. **Class Myriapoda:**

(i) **Body Shape:** Elongated and dorsoventrally flattened.

(ii) **Segmentation:** The body is divided into large number of segments each having a pair of legs.

(iii) **Antenna and Eyes:** A pair of antennae and a pair of eyes are present on the head.

Examples: Centipedes and millipedes.

General organization of Arthropods:

Arthopods are at the peak of invertebrate evolution. They have some advanced characters such as hi lateral symmetry, triploblastic organization, coelomic cavity and developed organ systems etc. Two main achievements are:

- The chitinous exoskeleton and
- Jointed appendages (locomotoy mechanism)

The Chitinous Exoskeleton:

1. Arthropods have chitinous exoskeleton which is formed f chitin.

- Chitin is nun-living, non-cellular protein carbohydrate compound and is secreted by the inderlying epidermis, on the outer side if has a waxy layer.
- In some arthropods chitin is soft and flexible while in others it is hard, in one organization. In some parts of the body it is soft and flexible while in other it is hard.

Functions of Chitin:

- The exoskeleton protects the body
- It acts as lever for the movement omuscles of jointed limbs.
- The chitin in the jaws is used for biting and crushing food.

- It forms lens of thecompound eye.
- It also forms the copulatroy organs and the organ of defense and offense.
- Moulting or Ecdysis:
- The process of shedding of exoskeleton is called moulting or ecdysis.
- In the young arthropods (such as insect larvae) chitinous exoskeleton is shed from time to timefor the growth of the larva.

2. **Jointed appendages:**

- In Arthropods each somite has a pair of jointed appendages provide an efficient mean of locomotion.
- The segment and appendages are often modified for different functions (like locomotion offence and defense and reproduction) in different sub-groups. These animals call walk swim or fly.

Affinities with anilida

Arthropods share following characters with annelids.

- Both have cuticle
- Both have segmented body. However, in Arthropods the segmentation is not metameric and organs are not repeated in different segments.
- Both have appendages. However, in Arthropods each somite has a pair of jointed appendages. The segments and appendages are often modified for different functions in different habitats.
- Both have similar plan of nervous system.

Economic importance

- Insects compete with man tor same food and space. Insects attack man, domestic animals and crops and produce man) diseases.
- They are not only dangerous to health but also cause economic loss to mall by destroying his property and crops.
- Some insects arc useful (such as the hone) bee or the silk worm). Insects are therefore of great importance to mankind.

Harmful arthropods:

1. **Transmission of Disease Causing Organisms:**

Many types of mosquitoes, flies, fleas, lice and hugs transmit disease causing organisms to man and domestic animal. Some examples are as follows:

- The female mosquito of genus Anopheles transmit Plasmodium that causes malaria in man.
- Mosquitoes can also cause yellow fever and filariasis.

- The Tse-tsefly of African countries transmits trypanosome, the cause of sleeping sickness and skin diseases. Some species of trypanosome cause diseases in cattle.
- The common housefly carries arthropos. The result is cholera and hepatitis etc.
- Fleas are also a type of harmful arthropod. The bites from fleas transferred the disease-causing bacteria for the bubonic plague.
- Ticks are another type of harmful arthropod. Rocky Mountain spotted fever is characterized by a significant hemorrhagic rash and is caused by rickettsia organism. The infection is transmitted by ticks.

2. **Crops Damage:**

   Many insects lay eggs on fruits and other commercial crops such as sugarcane, maize, cotton and vegetables etc. The larvae of these insects' damage fruits and the crops resulting in economic loss to farmers. The locust that move in large numbers from country to country cause damage to standing crops and other plants.

Beneficial arthropods:

- The honey bee provides honey and wax Ike wax is used in cosmetics.
- Silkworm gives us silk.
- Some insects are predaceous on other harmful insects. Lady Hugs are another type of beneficial arthropod. They are used to control aphids for gardens and farms.
- Some insects are scavengers. They cat up dead animal and vegetable matter.
- Insect Ian ac arc the source of food for fish.
- Crabs arc also a type of beneficial arthropod. We cook and eat crabs so we have enough energy and nutrition to live.
- Spiders are very beneficial arthropods. Spiders arc beneficial to man by killing harm fill insects. There are very few spider species that actually have venom that are poisonous to man.
- Some insects like ants cat up the dead plants and animals thereby keeping the environment clean.

KEY POINTS

- The name animalia is derived from Latin word anima which means breath or soul.
- Kingdom animalia includes all the animals from phylum porifera to phylum chordate.
- Kingdom animalia consists of all animals which are multi-cellular, diploid, eukaryotic, ingestive, heterotruphs and develop from two different haploid gametes (a large egg and a smaller sperm).
- In the two-kingdom classification system the Kingdom Animalia is divided into two different groups which are protozoa and metazoa, The protozoa arc one-celled animals while metazoa are multi-cellular animals.
- According to five kingdom system of Robert Whittaker the kingdom animalia has two subkingdoms which are parazoa and metazoa. Protozoans are included in kingdom Protoctista.
- All biologists agree that animals evolved from protoctists.
- Although multi-cellularity is present in all the kingdoms (Fungi, Plantae and Animalia), but it is well developed in animals.

Additional / related readings (animalia)

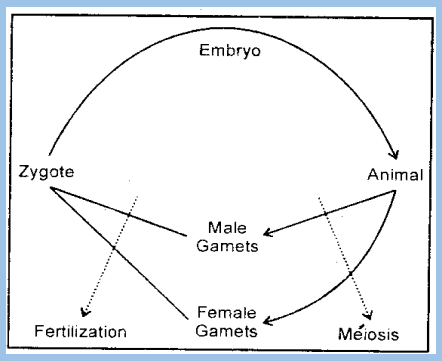


Fig. General life cycle of animals

1. The name Animalia is derived from Latin word anima which means breath or soul.
2. Kingdom Animalia includes all the animals from phylum porifera to phylum chordata.
3. Kingdom Animalia consists of all animals which are multi-cellular, diploid, eukaryotic, ingestive, heterotrophs and develop from two different haploid gametes (a large egg and a smaller sperm).
4. In the two-kingdom classification system, the Kingdom Animalia is divided into two groups which are protozoa and metazoa. The protozoa are one-celled animals while mctazoa are multicellular animals.
5. According to five kingdom system of Robert Whittaker the kingdom animalia has two subkingdoms which are parazoa and metazoa. Protozoans are included in kingdom Protoctista.
6. All biologists agree that animals evolved from protoctists.
7. Although multi-cellularity is present in all the kingdoms (Fungi, Plantae and Animalia), but it is well developed in animals.
8. In animals the junction that controls communications is the brain. The junction that controls the flow of materials is the heart.
9. The smallest animals are microscopic which are smaller than many protoctists.
10. The largest animals are whales (sea mammals) included in Phylum Chordata.
11. In parazoa there is no tissue organization and have no organs. They have indeterminate (indefinite) shape and are asymmetrical. These are the simplest animals.

12. In the animals of subkingdom eumetazoa, the tissues are organized into -organs and organ systems.
13. Most of the phyla of kingdom Animalia (about 29) belong to subkingdom Eumatazoa.
14. In rural symmetry he parts of the body arc arranged around a central axis in such a way that any plane passing through the central axis divides the animal into two equal halves.
15. In bilateral symmetry an animal can be divided into two equal parts by an imaginary line only in one plane.
16. The larvae of echinoderms have bilateral symmetry. However, the adult echinoderms have secondary developed radial symmetry, due to their special mode of life.

Series Proterostomia (Protostomes)	Series Deuteristomia (Deuterostomes)
Cleavage or division of the zygote is spiral and determinate.	Cleavage is radical and indeterminate.
Suring development the mouth arises from the blastopore from its anterior margin.	During development the mouth is formed at some distance anterior to the blastopore and blastopore forms the anus.
Coelom or body cavity is formed due to splitting of mesoderm (schizocoelous)	Mesoderm is developed as an outpounding of archenterons (enteerocoelous)
Mesoderm is derived from cells on the lip of blastopore.	Mesodem is derived from the wall of developing gut (archenteron)
It includes animals belonging to the phyla, aschelminthes (Nomatoda) Annelida, Molusca and arthropoda,	It includes animals belonging to the phyla Echinodermata, Hemichordata and Chrodata.

Series Proterostomia (Protostomes)	Series Deuteristomia (Deuterostomes)
The planes of cleavage are not symmetrical between poles but are diagonal to the polar axis.	The planes of cleavage are symmetrical to the polar axis.
As a result unequal cells are produced around the axis of polarity.	As a result the tiers of cells are produced on the top of each other.
The fate of each blastomere is predetermined. Therefore, all the blastomeres have determinate role in the formation of embryo.	The fate of each blastomere is not predetermined. Therefore in some animals any blastomere can produce a complete embryo.

17. The jelly like mesenchyme or mesugloeu in most cases is non-cellular.
18. A special transport system is absent up to phylum number 4 (Nematoda). Most substances are distributed within the body to the process of diffusion.
19. CNS starts from platyhelminthes.
20. In most triploblastic animals during embryonic development the embryonic layers form the following structures:
    (i) The ectoderm forms integumentary and nervous system.
    (ii) The mesoderm forms muscular, skeletal and reproductive systems
    (iii) The endoderm forms the lining of digestive tract and the glands of digestive system (such as liver and pancreas).
21. In Platyhelminthes the excretory system consists of flame cells, excretory ducts and excretory pores.
22. In Pseudocoelomates the space between the body wall and the digestive tube is called pseudocoelom (false body cavity).
23. Pseudocoelom is not homologous to true coelom because it is not lined by coelomic epithelium.
24. Pseudocoelom develops from the blastocoel of the embryo and is bounded externally by the muscles and internally by the cuticle of the intestine.
25. The pseudocoelom consists of vacuolated cells filled with a protein-rich fluid. This fluid develops high hydrostatic pressure.
26. Coelom is a cavity between the body wall and the alimentary canal and is lined by mesoderm. The mesoderm splits into:
    (i) Outer parietal layer which underlines the body wall and
    (ii) The visceral layer which covers the alimentary canal
27. The subkingdom parazoa includes only one Phylum which is the phylum porifera.
28. The word Porifera is derived from Latin porus = pore, ferra = to bear
29. Porifers, coelenterates and Echinoderms are aquatic. Echinoderms are only marine
30. Out of total 5000 species of porifers 150 species live in fresh water while all other are marine.
31. Scolymastrajoubini- a barrel like glass sponge (porifer) of Antarctica is more than a metre tall.
32. In porifers the pores through which water enters the body are called ostia and the pore through which the water leaves the body is known as Osculum (main openinu)
33. The cavity in porifers is spongocoel
34. In most sponges the body wall is formed of two layers:
    (i) The outer layer is pinacoderm. It is made up of cells called pinacocytes

(ii) The inner layer is choanoderm. It is made of flagellated collar cell called choanocytes. Between these two layers is present gelatinous mesenchyme which may contain amoeboid cells and spicules or sponginfibres.

35. In sponges 20 of their food consists of small animals (zooplankton) and plants (phytoplankton) while 80 consists of detrital organic particles.
36. In sponges there is no definite nervous system. However neurosensory and neuron cells are present which coordinate the flow of water
37. In sponges the skeleton is in the form of spicules or sponging fibres.
38. In sponges the spicules are present among pinacocytesosculum and ostia and provides support.
39. The adult sponges are sessile however their larvae are motile.
40. In sponges asexual reproduction is by budding. The buds may be external or internal. The internal buds are called gemmules.
41. Some sponges reproduce sexually. These are mostly hermaphrodite and mostlyprotandrous (male sex cells develop first).
42. A sponge that consists of a group of erect tubes is Leucoselenia
43. The sponge Euplectella is also called Venus flower basket.
44. Spongilla is freshwater sponge
45. The name Cnidaria is given to phylum coelenterata due to the presence or special cells called cnidocytes. These cells give rise to nematocysts (the stinging cells).
46. The coelenterates range in size from microscopic Hydra to macroscopic. Branchioceranth us. Branchioceranthus is a hydrozoan polyp that may reach two metres in length.
47. In coelenterates the nematocysts develop from ectoderm.
48. In coelenterates there is only one cavity which serves as digestive as well as body cavity. It is called gastro vascular cavity or enteron.
49. In coelenterates the stinging cells or nematocysts are for defense and offense.
50. In coelenterates there is no central nervous system (CNS). The nervous system is in the form of neuron cells which are irregularly scattered in the body-wall or form a plexus in the body wall.
51. The coelenterates Hydra, Obelia, Sea-anemone and corals etc are sessile.
52. The coelenterates Hydra, jelly fishes and Sea-anemones are solitary.
53. The coelenterates Physalia, Vellelaetc, are colonial.

54. Zooids are of two basic forms which are polyps and the medusae.
55. Polyps / hydroids arc cylindrical, sessile, nutritive and reproduce asexually (by budding).
56. Medusae are umbrella like, motile and reproduce sexually.
57. A colony is an aggregation of individuals or zoo ids that perform different functions for the colony.
58. In many coelenterates the asexual generation alternates with the sexual generation. Both generations are diploid.
    Example: obelia.
59. In obelia Gonozooid/Blastostyle develops buds
60. The occurrence of structurally and functionally more than two different types of individuals called the zooids within the same organism is called polymorphism.
61. Obelia has 3 kinds of zooids which are the gastrozooids, the gonozooids (blasto style) and the medusae. Some of the colonial members have up to five different types of zooids. These perform different functions for colony. An example is Physuiia (Portuguese man of war).
62. Hydra: A freshwater coelenterate. It exists only in polyp form. Therefore alternation of generations is absent.
63. Obelia: It is a marine coelenterate and has alternation of generations.
64. Aurelia (jelly fish): The polyp is reduced and medusa is dominant in jell fish.
65. Actinia (sea anemone): The body consists of polyp only. Enteron is divided by large partitions called mesenteries.
66. Madrepora: The body is covered by exoskeleton of calcium carbonate. The commonly called corals. The skeleton forms large coral reefs and even small islands.
67. The body of Platyhelminthes is soft and dorsoventrally compressed. Therefore, they are called plastyhminthes (means flatworms)
68. In parasites the digestive system poorly developed or absent.
69. In platyhelminthes asexual reproduction is by fission in which the animal constricts, in the middle into two pieces.
70. In platyhelminthes the sexually reproducing species are hermaphrodite I both male and female reproductive organs are present in the same individually.
71. Fasciola (Liver fluke) is an endoparasite in sheep and rarely in human being. It completes its life cycle in two hosts: (i) a snail. (ii) sheep or man (in the bile duct)
72. The name Nematoda means pointed ends.
73. Nematodes are mostly parasites and are un-segmented.
74. A fluid filled space is present between the body wall and the alimentary canal. It provides tube within tube type structure in the nematodes.

75. Nervous system of Nematodes: dorsal ventral and lateral nerve cords + a nerve ring around the pharynx.
76. In Nematodes the muscles are arranged in four bands (two dorso-lateral and two ventre-lateral). The circular muscles are absent. Therefore the bending is dorso-ventral only.
77. In Nematodes the sexes are separate.
78. In Nematodes a larval stage is present in the life cycle. Therefore the development is indirect.
79. Annelid is a Latin word which means little ring. Most of the worms are included in this phylum.
80. Annelida may be marine (Nereis) freshwater (stylaria) or found in damp soil (earthworms). Some are parasites such as leech (Hirudo).
81. The Annelid body is metamerically segmented and is divided transversely into anumber of segments.
82. In annelids the coelomic fluid serves as hydrostatic skeleton also.
83. In annelids the mouth is overhung by a lobe called prostomium.
84. Annelids are the first group of invertebrates with closed circulatory system.
85. In annelids the skin is kept moist by mucous and coelomic fluid.
86. In annelids excretion is by specialized structures called nephridia. These are present in every segment.
87. In annelids CNS consists of a simple brain and a solid double, longitudinal, ventral nerve cord. Nerves arise in each segment from the nerve cord.
88. In annelids both circular and longitudinal muscles are present.
89. In annelids when circular muscles contract body elongates. When longitudinal musclescontract body becomes short and widen.
90. In annelids the components of locomotion are setae, muscles and hydrostatic skeleton.
91. Neries have parapodia.
92. Setae: chaetae are absent in leech.
93. Most annelids are hermaphrodite (e.g. Earthworm. leech). In some annelids the sexes are separate (e.g. Nereis).
94. A free swimming ciliated larva is Trochophore larva.
95. Phylum Annelida has three classes which are Class Polychaeta, Class Oligochaeta and Class Hirudinea.
96. Nereis and Chaetopterus belongs to Class Polychaeta, they have Palps, tentacles, parapodia and trochophore larva.
97. Earthworms belong to class Oligochaeta.
98. Leech belongs to class Hirudinea.
99. Leech has fixed number of segments (34). Each segment has additional circular rings or markings called annuli.

100. No distinct head is present in the Leeches. Chitinous jaws are present.
101. Anticoagulant secreted by Leeches is Hirudin
102. Arthropods are commonly called joint footed animals because arthros means joined and pods means feet.
103. Arthropods have common origin with annelids because both hale:
    (i) scgmcrredhody
    (ii) appendages and
    (iii) cuticle
104. Largest phylum is Arthropoda. Second largest phylum of invertebrates is Mollusca.
105. In arthropods: The body i. covered with waterproof chitinous cuticle secreted by the epidermis, Chitin is non-living, non-cellular protein carbohydrate compound. On the outer side it has a waxy layer.
106. Arthropods have open circulatory system, primitive heart and blood is colourless(haernolymph) because it is without hemoglobin.
107. Most arthropods have extensive tracheal system formed of airtubles tracheae for the exchange of gases. Main tubes open to the exterior through openings, called spiracles, aquatic arthropods respire through gills.
108. In arthropods excretory system is well developed and consists of Malpighiail tubules. The nitrogenous wastes are excreted in the form of solid uric acid ($CH_4N_4O_3$).
109. In arthropods CNS is well developed and consists of paired ganglia (simple brain) connected to a ventral double nerve cord.
110. When the larva resembles adult it is called nymph or inster. It lives in the same habitat as adult.
111. Most spiders have eight eyes placed in such a way that they can easily look at the predators and prey.
112. Latin Molluscus means soft, there are more than 50000 living species in the phylum Mollusca.
113. The body of Mollusks is un-segmented and soft and can be divided into head, a ventral muscular foot and a dorsal visceral mass.
114. The body of Mollusks is covered by a glandular epithelial envelope (especially over the visceral mass) called mantle which secretes calcareous shell.
115. In the mouth cavity of many mollusks there is a rasping tongue-like radula provided with many horny teeth, Except for Caphalopoda the circulatory system of mollusks is open.
116. A respiratory pigment of blue in color, called haemocyanin is present in the mollusks.

117. The space between the shell and the mantle cavity contains gills in some mollusks. The gaseous exchange is by gills mostly, In some cases such as skate, the mantle cavity is converted into a lung.
118. In the Mollusks, the excretory organs are paired nephridia.
119. In the Mollusks the nervous system consists of three pairs of interconnected ganglia present in the head, foot and body regions.
120. The mollusks have six classes. The major classes are Gastropoda, Bivalviaand Cephalopoda.
121. Gastropoda has both aquatic and terrestrial species. Examples are Helix aspersa (garden snail) and Lima (slug).
122. Bivalvia (Pelecypoda) is aquatic, shell of two pieces. Examples are Mytilus: (murine mussel) Anodonta (freshwater mussel) Ostrea (oyster).
123. Cephalopoda are aquatic, examples are loligo (squid), sepia (cuttlefish) and Octopus.
124. Among the invertebrates the brain of Octopus is very large, complex and highly developed. It is enclosed in a shell-like case of ·Cartilage.
125. The giant squid is the largest invertebrate animal. Its length is up to 15 meters (almost 50 feet), including tentacles or arms (weight about 2000 Kg)
126. Teredo (a shipworm) damages wooden parts of ships.
127. There are over 5.000 known species of Echinoderms.
128. In echinoderms the skeleton / exoskeleton is mesoderm I in origin.
129. In echinoderms the mouth is on lower surface (oral) and anus is on upper surface (aboral).
130. In echinoderms the body may be flattened like biscuit (cake urchin), star-shaped with short arms (starfish), star-shaped with long arms (brittle star), globular (sea urchin) or elongated (sea-cucumber).
131. In echinoderms the water vascular system present in their coelom. It is a complex system of tubes and spaces surrounding the mouth and passing into the arms and tube feet. The water circulates through these channels. Water enters these canals through a sieve-like plate called madreporite present on the aboral (upper) body surface.
132. In Echinodermata no special organs for respiration or excretion, circulatory and Nervous system poorly developed while digestive and reproductive s: stem are well developed.
133. In Echinodermata there is no brain but a nerve ring is present around the pharyngeal region.
134. In Echinodermata locomotion is by tubefeet which are sac-like structures present along the edges of grooves present in the arms.

135. The larvae of Echinodermata are bipinnaria and brachiolaria. These are with bilateral symmetry.
136. Regeneration is very common in the Echinodermates.
137. Echinodermates, hemichordates (Prechordates) and chordates are Deuterostomes
138. Hemichordates are worm-like with soft body.
139. The body of Hemichordates is divided into an anterior proboscis, collar and trunk.
140. The body wall of Hemichordates is made of unicellular epidermis with mucus-secreting cells.
141. Examples of Hemichordates: Balanog/ossusand Saccoglossus .
142. The name chordata is given due to a common character – the Notochord.
143. All the chordates have three basic characters:
    (i) the Notochord
    (ii) hollow dorsal CNS
    (iii) paired gill slits
144. The Notochord is a rod-like semi rigid body of the vacuolated cells which are filled with proteinacoeus material which may extend the length of the body between enteric canal and the dorsal hollow central nervous system.
145. Notochord is present in all members of the phylum either in the larval or embryonic stages or throughout life. Its main function is to support and stiffen the body. Therefore it acts as skeletal axis.
146. All chordates have paired gill slits in embryonic stage. In some these are non-functional. In others these are functional for some period in their life history (e.g. frogs etc.). In still others these are functional throughout life (e.g. Amphioxus, and fishes etc.).
147. Chordates are divided in to lower chordates/Acraniates (e.g. Amphioxus etc.) and higherchordates (vertebrates/Craniates).
148. Two subphyla of f lower chordates are Urochordata and Cephalochordata.
149. Urochordates are also called Tunicates because they are enclosed in a covering called Tunio. Example is Molgula.
150. In the Cephalochordata Notochord and nerve cord is present in the entire length of the body and remains throughout life (e.g. Amphioxus).
151. Vertebrates may also be divided into:
    (i) An amniotes: These are without foetal membranes (cyclostomata, chondrichthyes, osteichthyes and amphibia).
    (ii) Amniotes: These are with foetal membranes (reptiles. aves and mammals). Foetal membranes are aminion, allantois and chorion.

152. In class cyclostomata are included most primitive living vertebrates which are withoutjaws. **Examples** are Lampreys and hagfish. Hag fishes are helmaphrodite.
153. In Cyclostomata: Eel-like body; Scales absent; No paired appendages; Six to fourteen pairs of gills: Long larval period in larnpray.
154. In class Chondrichthyes: Cartilaginous fishes; Body fusiform; 5 – 7pairs of gills; Examples are sharks and rays; Placoidscales on the body. With the exception of whale the sharks are the largest living vertebrates (some reach 30 – 50feet in length).
155. The skates and rays live in the bottom. In these anterior pairs of fins (pacoral fins) are large and used for swimming like wings.
156. Shark liver oil is extracted and used in medicine as source of vitamin A and D.
157. Class osteichthyes (Bony fishes) Notochord may remain in parts, the skin has dermal scales which are ganoid, cycloid or ctenoid. Mouth is terminal, swim bladder usually pressure, brain with 10 pairs of cranial nerve.
158. Paired fins are pectoral and pelvic, unpaired fins are dorsal, caudal (tail) and anal fins.
159. Dipnoi (double breathing) is lungs fish (lobe-finned fish).
160. Oxygen is more in the air than in water.
161. Temperature changes are more sever in the terrestrial environment.
162. Amphibians are intermediate between aquatic ad true terrestrial animals (Reptiles).
163. In the evolution from water to land, amphibians have developed limbs in place of fin, lungs in place of gills and some changes in the skin.
Note: First land vertebrates are amphibians while first successful land vertebrates are reptiles.
164. Caecllians are legless amphibians.
165. Amphibians and reptiles are cold blooded (poiklothermic) animals and hibernate in winter.
166. In amphibians there is external fertilization and development while newts and salamander are tailed amphibians.
167. In retiles the ventricle of heart is incompletely partitioned, in crocodile ventricle is completely partitioned into two.
168. Reptiles were dominant in mesozoicperiod (225 – 65 million years).
169. The climate suitable for reptiles becomes less favourable in tertiary period, so most of them become extinct, now out of a dozen or more main lines, only four exist.
170. The reptiles of today have been derived from dinosaurs of Jurassic (195 – 136 million years) and cretaceous period (136 – 65 million years),

171. The crocodiles are the reptiles from which modern birds were derived.
172. Both birds and mammals have evolved from reptiles along different lines.
173. The earliest known fossil bird is archaeopteryx: about the size of a crow, bony teeth in the jaw socket, each wing with three claws.
174. The archaeopteryx is a connecting link between reptiles and birds.
175. The body of the bird has four divisions which are head, neck, trunk and tail.
176. Birds and mammals are homoeothermic.
177. The birds do not have teeth. Therefore, they have developed a thick muscular structure (Gizzard) which is used for crushing the food.
178. In birds the organ of voice is called syrinx. It is present at the lower end of trachea near the origin of the two bronchi. In mammals voice apparatus is Larynx which is present at the upper and of trachea.
179. Ostrich and Kiwi are running birds.
180. In the penguin, the fore-limbs are modified into flippers for swimming (e.g. penguin).
181. The terms mammal was given by Linnaeus to the animals nourished by milk from the breast of the mother.
182. Well-developed brain/CNS in mammals.
183. The mammals have evolved from reptilian ancestors the cotylosaurs.
184. Varnope fossil (found in Texas) 50 % mammals.
185. Mammals become dominant in the Cenozoic period.
186. Most mammals have hair on the body for insulation and temperature regulation. In some the hair, have become modified into scales (Pangolin) and spines (porcupine).
187. Diaphgram is present in the mammals. Diaphragm is a muscular sheet which separates the thoracic and abdominal cavities.
188. In the mammals there is achain of three bones in the internal ear which are Incus Maleus and stapes.
189. In Mammals red blood cells are non-nucleated.
190. Mammals are classified into three sub-classes. Prototheria (egg lying mammals) metatheria (pouched mammals) and eutheria (Placcental Mammals).
191. Prototheria: connecting link between reptiles and mammals. **Examples**are duck bill platypus and echidna (spiny anteater).
192. In Metatherians, Marsupium is present the young when born are immature in rudimentary form development is complete in the marsupium,
Example opossum kangaroo and Tasmanian wolf
193. Sub class eutheria has placental mammals, placenta is formed between fetus and mother

195. Deuterostome: any member of the animals in which the blastopore of the developing embryo becomes the anus, while a second opening becomes the mouth.
196. Enterocoelous a coelom formation by out pocking of the archenterons.
197. Gill slit: An opening of the pharynx through which water passing over an aquatic animal's gills leaves the body. Gill slits occur in adult fish and other vertebrate embryos.
198. Hernocoel: A blood-tilled cavity.
199. Marsupial: A mammal, such as the kangaroo, that possesses an external pouch in which the young are matured.
200. Mesoderm: The middle layer (between ectoderm and endoderm) that arises during gastrulation in an embryo. Mesodermal cells give rise to the skeleton, muscles, and circulatory and immune systems, among other structures.
201. Metamorphosis: Among insects, amphibians, and other animals, the developmental transformation form the larval to the adult form.
202 Nerve cord: The spinal cord, located dorsal to the notochord, which is present in all chordates and which coordinates sequential muscle action.
203. Notochord: The stiff but flexible rod that runs the length of a chordate, just ventral to the nerve cord.
204. Placenta: The organ in sharks and mammals that connects a developing embryo to surrounding maternal tissue and through which the fetus may obtain nutrients, gives off wastes, and exchanges O_2 and CO_2.
205. Poikilotherm: Any animal having a variable body temperature that has the temperature of the surrounding environment.
206. Pseudocoelom: The "false", fluid filled body cavity that is a characteristic of the nematodes.
207. Radial symmetry: A body plan that looks circular when viewed form above or below and in which certain structures radiate outward in all directions from the center.
208. Schizocoelous: A coelom formation by the splitting of mesoderm into two layers.
209. Bilateral symmetry: The animal body plan in which an organism's right and left sides are mirror images.

Assessment 1

1. Grade Radiata includes only one phylum and that is:
   (a) Porifera (b) Cnidaria
   (c) Platyhelminthes (d) Echinodermata
2. Radial symmetry occurs in which set?
   (a) Echinodermata & Coelenterata (b) Porifera & Coelenterata
   (c) Mollusca & Arthropod (d) Platyhelminthes & Coelenterata
3. Coelomate animals:
   (a) Have bilateral symmetry (b) Are triploblastic
   (c) Constitute phyla from annelid to chordates (d) All the above
4. Acoelomates are characterized by:
   (a) The absence of brain
   (b) The absence of mesoderm
   (c) A solid body without a cavity surrounding internal organs
   (d) A coelom that is not completely lined with mesoderm
5. An animal that has definite right and left halves has _____:
   (a) Rotational symmetry (b) Radial symmetry
   (c) Bilateral symmetry (d) Helical symmetry
6. The name Platyhelminthes means:
   (a) Pinworms (b) Hookworms
   (c) Roundworms (d) Flatworms
7. Fasciola hepatica is an endoparasite that lives in the:
   (a) Liver of sheep (b) Blood of sheep
   (c) Spleen of sheep (d) Intestine of sheep
8. Taenia solium lacks alimentary canal because:
   (a) It does not require any food (b) It lives in the intestine
   (c) It has saprozoic mode of feeding (d) None of the above
9. In helminthes, flame cells are component of their:
   (a) Reproductive system (b) Excretory system
   (c) Nervous system (d) Respiratory system
10. Taenia solium is the biological name of:
   (a) Tapeworm (b) Liver fluke
   (c) Blood fluke (d) Planaria

Assessment 2

1. Acoelomate, triploblastic body with bilateral symmetry is characteristic of:
   (a) Flatworm (b) Roundworm
   (c) Segmented worm (d) Mollusc
2. The intermediate host in the life cycle of Taenia saginata is:
   (a) Pig (b) Goat
   (c) Dog (d) Cattle
3. Platyhelminthes are best described as:
   (a) Flatworms, triploblastic, acoelomates
   (b) Flatworms, diploblastic, acoelomates
   (c) Flatworms, triploblastic, coelomates
   (d) Flatworms, triploblastic, pseudocoelomates
4. Enterobius vermicularis is:
   (a) Cosmopolitan (b) Endemic
   (c) Discontinuously distributed (d) None of these
5. Roundworms have all of the following characteristics except:
   (a) A pseudocoelom (b) Bilateral symmetry
   (c) An ectoderm germ layer (d) A notochord
6. The genus “Rhabditis” contains numerous species normally found in:
   (a) Soil (b) Water
   (c) Feces of man/animals (d) All the above
7. A parasite of human small intestine in Asia, North Africa and Europe causing severe anemia, and retardation of physical and mental growth in children is:
   (a) Hook worm (b) Pinworm
   (c) Ascaris (d) Tapeworm
8. There are four bands of muscles in Nematodes, two are dorso-lateral and two:
   (a) Ventro-lateral (b) Dorso-ventral
   (c) Dorso-lateral (d) Latero-ventral
9. Nematodes lack respiratory system and:
   (a) Digestive system (b) Nervous system
   (c) Circulatory system (d) All of these
10. In annelids, all of the following body structures/systems are _____ continuous throughout the length of body; penetrating each individual segment except:
   (a) Nerve cord (b) Gut
   (c) Excretory system (d) Blood vessels

Assessment 3

1. Annelids are all except:
   (a) Triploblastic (b) Bilaterally symmetrical
   (c) Coelomates (d) Pointed ended
2. A parasitic annelid is:
   (a) Nereis (b) Stylaria
   (c) Earthworms (d) *Hirudo*
3. The first group of invertebrates which have developed a closed circulatory system is:
   (a) Annelids (b) Platyhelminthes
   (c) Nematodes (d) Molluscs
4. Which system is absent in annelids?
   (a) Circulatory system (b) Respiratory system
   (c) Nervous system (d) Digestive system
5. All of the following are hermaphrodite except:
   (a) Earthworm (b) Leech
   (c) Nereis (d) None
6. Metamerically segmented worms are included in the phylum:
   (a) Coelenterata (b) Nematoda
   (c) Mollusca (d) Annelida
7. Metamerism of earthworms is suitable:
   (a) Feeding (b) Locomotion
   (c) Reproduction (d) Digestion
8. Longitudinal and circular muscles are found in the body wall of:
   (a) Sponges (b) Cnidarians
   (c) Annelids (d) Nematodes
9. Respiratory through skin is found in:
   (a) Planarian (b) Earthworm
   (c) Snail (d) Pinworm

10. Metamerically segmented, bilaterally symmetrical animals bearing jointed appendages. These are characteristic of:
   (a) Helminthes (b) Annelida
   (c) Mollusca (d) Arthropoda

Assessment 4

1. Hemocoelic body cavity is a characteristic of:
   (a) Ascaris (b) Leech
   (c) Cockroach (d) Snails
2. The nitrogenous waste in cockroach is mainly excreted as:
   (a) Urea (b) Uric acid
   (c) Ammonia (d) Urea and uric acid
3. A huge phylum of invertebrates with segmented bodies and ‘‘jointed feet’’:
   (a) Vertebrata (b) Nematoda
   (c) Arthropods (d) Annelida
4. True and complete metamorphosis is found in:
   (a) Silver fish (b) Grasshopper
   (c) Cockroach (d) Moth and mosquito
5. Common house fly (*Musca domestica*) is vector for:
   (a) Dengue (b) Cholera
   (c) Hepatitis (d) Both ‘b’ & ‘c’
6. Bed Bugs contribute to the spread of:
   (a) Typhoid (b) Yellow fever
   (c) Typhus (d) Trench fever
7. The vector for pathogens that causes cholera and hepatitis is:
   (a) Mosquito (b) *Musca domestica*
   (c) Tse tse fly (d) None of these
8. Which of the following is not transmitted by mosquitoes?
   (a) Yellow fever (b) Lymphatic filariasis
   (c) Dengue (d) Cholera

9. Head, foot and visceral mass; this combination of characters is diagnostic of:
   (a) Echinoderms (b) Arthropods
   (c) Molluscs (d) Annelida
10. *Sepia* is commonly known as:
    (a) Star fish (b) Jelly fish
    (c) Cuttle fish (d) Silver fish

Key

Assessment 1

1. b
2. a
3. d
4. c
5. c
6. d
7. a
8. c
9. b
10. a

Assessment 2

1. a
2. b
3. a
4. a
5. d
6. d
7. a
8. c
9. c
10. c

Key

Assessment 3

1. b
2. d
3. a
4. b
5. b
6. d
7. b
8. c
9. b
10. d

Assessment 4

1. c
2. b
3. c
4. d
5. d
6. c
7. b
8. d
9. c
10. c