

# Salafiu Model School Pamfere

Class - 9<sup>th</sup>

Subject :- Biology

Term - I

Study Material

S.No. Name of the Chapter

①

Biodiversity

# Lesson No. 3

## Bio-diversity

**Q.1** *What is bio – diversity?*

Ans.: The living organisms exist in different forms. They have different morphological and anatomical characters. This variation in the characters of living organisms is called Bio - diversity.

**Q.2** *What is classification?*

Ans.: Classification is the grouping and sub grouping of living organisms on the basis of their similarities, relationship and evolution.

**Q.3** *What are advantages of classification?*

Ans. Classification has the following advantages:

1. It makes the study of wide varieties of living organisms easier.
2. It helps us in the identification of living organisms.
3. It is not possible for man to study all the organisms, but the study of a few representatives of each group help us to know the characteristics of whole group.
4. It helps us to know the relationship between different groups of organisms.
5. It gives us information about the animals which are not present in our own locality.

**Q.4** *Give the history of classification of living organisms?*

Ans. (a) Natural system of classification: In natural system of classification many characteristics are taken into account. Practically all aspects of morphology, anatomy, cytology, physiology, development, reproduction, behaviour and biochemistry are taken into account.

(b) Artificial System of classification:- Artificial system of classification is that system of classification in which habit, habitat, or one to two morphological characters are basis for grouping of organisms. The first artificial system of classification was used by Manu in the East and Pliny in the west. Pliny used this classification in his book 'Historia naturils'. He divided animals into two groups (i) Flight animals (ii) Flightless animals. The flight animals included birds, bats and insects. Plants were divided into groups such as herbs, shrubs, vines, trees, succulents etc.

**Q)** Define the following terms:

- (a) Systematics:- Systematics is that branch of biology which deals with the classification or arrangement of different kinds of organisms on the basis of existing relationships among them selves.
- (b) Classification: Classification is the ordering of plants and animals in to groups on the basis of their relationship.

(c) **Phylogeny:** The evolutionary history of a particular group of organisms is called phylogeny.

**Q.5 What is two kingdom system of classification?**

Ans. Two kingdom system of classification was established by a Swedish biologist Carolus Linnaeus in 1758. Carolus Linnaeus divided all organisms into two distinct kingdoms. (i) Plant Kingdom and (ii) Animal Kingdom. According to this scheme of classification, plants are the stationary organized bodies having life and no sensation. The animals are the organized bodies having life, sensation and power of locomotion. Carolus Linnaeus published his scheme of classification in the famous book "Systema Natura"

**Disadvantages of two – kingdom system of classification:**

- (a) Two kingdom system of classification became inadequate with the discovery of a large number of new animals.
- (b) The two kingdoms are not clearly defined at the lower level of organization.
- (c) Two kingdom system of classification does not depict evolutionary relationship of organisms.
- (d) In two – kingdom system of classification all the prokaryotes have been included in plant kingdom.
- (e) Euglena having the characteristic property of both plants (Photosynthesis) and animals (locomotion) was a drawback of two kingdom system of classification.
- (f) Chlamydomonas is unicellular algae. It is motile like animals but has photosynthetic property like green plants.

**Q. 6 What is phylogenetic system of classification?**

Ans. Phylogenetic system of classification is that system of classification in which plants and animals are classified into various groups on the basis of their evolutionary sequence (History)

**Q.7 What is the scientific name?**

Ans. Those names which are used in biological writings and universal applications are called scientific names. It was developed by Carolus Linnaeus.

**Q.8 What is five kingdom system of classification?**

Ans. The five kingdom system of classification was given by Robert H. Whittaker in 1969 to overcome the drawbacks present in the two kingdom system of classification. According to five kingdom system of classification all organisms in the world were divided into five kingdoms namely:

- (i) Kingdom Monera (ii) Kingdom protista (iii) Kingdom Fungi (iv) Kingdom Plantae and
- (v) Kingdom Animalia

The five kingdom system of classification is based on (i) Complexity of cell structure (ii) Complexity of organisms body (iii) Mode of nutrition (iv) Phylogenetic relationship.

**Q.9 What are the characteristic features of kingdom monera?**

- Ans. 1.They are all pro-karyotic, unicellular organisms  
2.They lack the membrane bound organelles such as mitochondria, chloroplast, nucleus etc.  
3.The genetic material i.e. D. N. A lies free in the cytoplasm  
4.They include both autotrophic (cynobacteria) and heterotrophic (lactobacillus) organisms.  
5.Ribosome's are of 70s types, they process a cell wall in their cells.  
6.The cell wall may be surrounded by slimy layer.

**Q.10 Give the salient features of kingdom protista?**

- Ans. Following are the salient features of kingdom protista:
- (i) The kingdom protista includes the unicellular eukaryotic organisms.
  - (ii) They have a complete set of cell organelles in them.
  - (iii) The ribosomes are of 80S types
  - (iv) Genetic material is enclosed inside the nuclear membrane
  - (v) There are many chromosomes in the cells of protista.
  - (vi) The genetic material DNA is not naked but is associated with histone proteins.
  - (vii) Locomotion is performed by Cilia, flagella or pseudopodia.
  - (viii) They do not possess a cell wall in their cells.
  - (ix) They are both autotrophic (euglena) and heterotrophic (plasmodium) amoeba, Giardia, Trichomonas etc.

**Q.11 What are the salient features of kingdom fungi?**

- Ans. The kingdom Fungi includes, yeast, moulds, mushrooms etc.
- (i) They are predominantly multi cellular eukaryotes without chlorophyll.
  - (ii) The body of fungus is filamentous and is called mycelium. The mycelium is formed of filaments called hyphae, which are formed of fungal cells.
  - (iii) Fungal cells have cell wall composed of chitin.
  - (iv) They have reserve food material in the form of glycogen.
  - (v) They reproduce sexually and asexually.
  - (vi) They have saprophytic mode of nutrition.
  - (vii) Some fungi remain in symbiotic association with algae forming an entity called lichen.
  - (viii) Some fungi remain in association with roots of higher plants. This association is called Mycorrhiza. Example, Mushroom, Mould, Aspergillus etc.

**(A) Kingdom Animalia**

**Introduction:** Animals make up millions of species and are among the most bountiful living things. They are very diverse in form, ranging from single celled microscopic one to multicellular macroscopic organisms.

**Q1)**

**Ans: Grades of Organisation and body plan:** Animals though show different shapes & sizes but possess either cellular, tissue, organ or organ system of organization. The cellular grade of organization can be observed in all protozoans (unicellular or acellular) where all the vital activities of the body are performed by a single cell, e.g. Amoeba. The next higher level of body organization is observed in multicellular animals, which are called Metazoans. Based on complexity of organization, metazoans are further subdivided into two subkingdoms- Parazoa and Eumetazoa . In Parazoa (e.g; Sponges), the cells are loosely aggregated and do not form tissues or organs. In Eumetazoans, which includes the rest of animals, the cells are organized into structural and functional units called tissues, organs and organ systems.

**Q.2)**

**Ans: Diploblastic & Triploblastic organization :** In radiate animals , the cells are arranged into two fundamental layers, an external ectoderm & an internal endoderm with an intervening mesoglea. Such animals are therefore called diploblastic. In Bilateria, a third germ layer, mesoderm is present in between ectoderm and endoderm . Hence they are called Triploblastic animals.

**Q.3) Segmentation:** In some Bilateria the body is of many segments , which show serial repetition of parts(e.g ; Earthworm). This kind of segmentation is called metameric segmentation and the phenomenon is known as Metamerism.

**Q.4) Phylum Protozoa & its general characters?**

**Ans:** They are microscopic organisms in which a single cell performs all the vital activities . For this reason , Protozoans are also referred to as acellular organisms . There are about 15,000 species of Protozoans known to exist in the world.

**General Characters:**

- i) They are aquatic (fresh water or marine) and cosmopolitan in distribution.
- ii) Some forms are parasitic.
- iii) The protozoan cell body is either naked (e.g ; Amoeba) or surrounded by a non rigid pellicle. Cellulose is absent in pellicle.
- iv) Some Protozoans secrete shells of various inorganic compounds as external covers.
- v) Locomotory organs may be flagella (flagellates) or cilia (ciliates) or Pseudopodia (Sarcodines). Locomotory organs are absent in parasitic forms (e.g; sporozoa). In them, neurofibrils are present underneath the cell surface.
- vi) Mode of nutrition is generally holozoic and feed largely on bacteria, microscopic algae and minute animals such as rotifers or on other protozoans including members of their own species. Some protozoans are holophytic; they contain chlorophyll and prepare their own food by photosynthesis (e.g; Euglena).

- vii) Contractile vacuole is found in almost all fresh water protozoans for osmoregulation . It also helps in excretion.
- viii) Mode of reproduction is also very specialized . Most sarcodines , flagellates and ciliates show asexual reproduction by binary fission, multiple fission or even budding . Some ciliates, e.g; Paramoecium reproduces by sexual means (through conjugation).

**Examples of Protozoans:**

**Free living-**Euglena, Amoeba, Paramoecium etc.

**Parasitic-** Monocystis, Entamoeba, Plasmodium, Trypanosoma & Giardia.

**Q.5) Phylum Porifera & its general characters?**

**Ans:** Members of this phylum are also called as sponges and are the most primitive group of multicellular animals, with about 5000 known species .

**General characteristics:**

- i) Mostly they are marine and remain attached to rocks(sessile).A few in fresh water(e.g; Family spongilladea).
- ii) They range in size from 1cm to 1m in length.
- iii) Some forms are radially symmetrical, but the larger ones are asymmetrical.
- iv) They are multicellular with cellular grade of body organization.
- v) Body shape is vase or cylindrical like.
- vi) The body surface is perforated by numerous pores, the Ostia through which water enters the body & one or more large openings, the Oscula by which water passes out.
- vii) They are diploblastic.
- viii) The interior body space is either hollow or permeated by numerous canals lined with choanocytes. The interior space of sponge body is called spongocoel.
- ix) They have a characteristic skelton consisting of either spongin fibres, calcareous spicules or siliceous spicules.
- x) They are monoecium & the reproduction is both Sexual or Asexual.
- xi) Fertilization is internal & mostly cross fertilization occurs.

**Q.6) Phylum coelentrata & its characteristics?**

**Ans:** Coelentrata may be defined as diploblastic Metazoa with tissue grade of body organization having nematocysts and a single gastrovascular cavity or Coelenteron.

**General characteristics:**

- i) They are Metazoans with tissue grade of organization.
- ii) They are aquatic, mostly marine except few fresh water forms like Hydra.
- iii) They are sedentary or free swimming and solitary or colonial.
- iv) Individuals are radially or bilaterally symmetrical with a central gastrovascular cavity.
- v) They are diploblastic & Acoelomatic .
- vi) Short and slender tentacles encircle the mouth in one or more whorls.

- vii) The tentacles are provided with nematocysts; tentacles serve for food capture, its ingestion and for defence.
- viii) Skeleton (either endo or ecto) is of common occurrence.
- ix) They are usually carnivorous, digestion is extracellular as well as Intracellular. Anus is absent.
- x) Reproduction is both Sexual & Asexual.
- xi) A ciliated planula larva is usually present in the life history.

**Examples:** Bonganivillea, Halistemma, Vellela, Porpita, etc.

### **Q.7) Phylum Platyhelminthes & their general characters?**

**Ans:** Platyhelminthes are triploblastic, bilaterally symmetrical, dorsoventrally flattened, acoelomate flat worms with organ grade of construction without definite anus, circulatory, skeletal & respiratory but with protonephridial excretory system & mesenchyme filling the space between the various organs of the body.

**Protonephridia:** A hollow cell in the excretory system of certain invertebrates including flat-worms & rotifers, containing a tuft of rapidly beating cilia that serve to propel (drive forward) waste product into excretory tubules.

#### **General characters:**

- i) They are small to moderate in size, varying from microscopic to extremely elongated forms.
- ii) Majority of flatworms are white colourless, some derive colour from the ingested food, while the free living forms are brown, grey, black or brilliantly coloured.
- iii) Anterior end of the body is differentiated into head.
- iv) Ventral surface bearing mouth & genital pores is well marked in turbellarians but is less marked in trematodes & cestodes.
- v) Body is covered with a cellular syncytial one layered partly ciliated epidermis, while in parasitic trematodes & cestodes, epidermis is lacking & the body is covered with cuticle.
- vi) Exo & endoskeleton are completely absent. Hence body is generally soft. Hard parts consist of cuticle, spines, hooks, thorns, teeth, etc.
- vii) They are acoelomates.
- viii) Digestive system is totally absent in Acoela & tapeworms but in other flatworms it consists of mouth, pharynx and blind intestine (anus absent).
- ix) Respiratory & circulatory systems are absent.

- x) Excretory system consists of single or paired Protonephridia with flame cells or bulbs.
- xi) Sexes are generally united with a few exceptions.
- xii) In majority of forms, eggs are devoid of yolk but provided with special type of yolk cells & are covered by egg shell.
- xiii) Cross fertilization in trematodes & self fertilization in Cestodes is very common. Fertilization is internal.

## Mollusca

**Definition:** Molluscs are soft-bodied bilaterally symmetrical, unsegmented, coelomate animals; usually shelled having a mantle, ventral foot, anterior head and a dorsal visceral mass.

### **General characters:**

1. Molluscs are essentially aquatic mostly marine, few freshwater and some terrestrial forms.
2. The body is soft, unsegmented, bilaterally symmetrical and consists of head, foot, mantle and visceral mass.
3. The body is clothed with one layered often ciliated epidermis.
4. Body is commonly protected by an exoskeletal calcareous shell of one or more pieces, secreted by mantle.
5. Head is distinct, bearing the mouth and provided with eyes, tentacles and other sense organs except in Pelecypoda and Scaphopoda.
6. Ventral body wall is modified into a muscular flat or plough-like surface, the foot which is variously modified for creeping, burrowing and swimming.
7. Mantle or pallium is a fold of body wall that leaves between itself and the main body mass, the mantle cavity.
8. Visceral mass contains the vital organs of the body in a compact form taking form of a dorsal hump or dome.
9. Body cavity is haemocoel. The true coelom is generally limited to the pericardial cavity and the lumen of the gonads and nephridia.
10. Digestive tract is simple with an anterior mouth and posterior anus but in gastropods, scaphopods and cephalopods the intestine becomes U-shaped bringing the anus to an anterior position.
11. Pharynx contains a rasping organ the radula except in Pelecypoda.
12. Circulatory system is open except in cephalopods which shows some tendency towards a closed system.



13. Respiratory organs consists of numerous gill or ctenidia usually provided with osphradium at the base. Lung is developed in terrestrial forms. Respiratory pigment is usually haemocyanin.
14. Excretory system consists of a pair of metanephridia which are true coelomoducts and communicate from pericardial cavity to the exterior by nephridiopore.
15. Nervous system consists of paired cerebral, pleural, pedal and visceral ganglia joined by longitudinal and transverse connectives and nerves.
16. Sexes usually separate (dioecious) but some are hermaphroditic.
17. Fertilization is external or internal.
18. Development is either direct or with metamorphosis through the trochophore stage called veliger larva.

### Arthropoda

**Definition:** Arthropods are bilaterally symmetrical , triploblastic, metamerically segmented animals with coelom which is reduced and modified. Their body is covered externally in a chitinous exoskeleton which moults periodically and their appendages are jointed.

#### **General characters:**

1. Arthropods are triploblastic , bilaterally symmetrical, metamerically segmented animals.
2. Body is covered with a thick chitinous cuticle forming an exoskeleton.
3. Body segments usually bear paired lateral and jointed appendages.
4. Musculature is not continuous but comprises separate striped muscles.
5. Body cavity is haemocoel. The true coelom is reduced to the spaces of the genital and excretory organs.
6. Digestive tract is complete, mouth and anus lie at opposite ends of the body.
7. Circulatory system is open with dorsal heart and arteries but without capillaries.
8. Respiration through general body surface, by gills in aquatic forms, tracheae or book lungs in terrestrial forms.
9. True nephridia are absent, excretion by coelomoducts or Malpighian tubules or green or coxal glands.

10. Cilia are entirely absent from all parts of the body.
11. Sexes are generally separate and sexual dimorphism is often exhibited by several forms.
12. Fertilization is internal. Development is usually indirect through larval stages.
13. Parental care is also often well marked in many arthropods.
14. Most diversified group inhabiting the land, water and air.

### Echinodermata

**Definition:** Echinoderms are enterocoelous coelomates with pentamerous radial symmetry, without distinct head or brain having a calcareous endoskeleton of separate plates or pieces and a peculiar water vascular system of coelomic origin with podia or tube-feet projecting out of the body.

#### **General Characters:**

1. The echinoderms are exclusively marine and are among the most common and widely distributed of marine animals.
2. They occur in all seats from the intertidal zone to the great depths.
3. Symmetry usually radial, nearly always pentamerous.
4. Body is triploblastic, coelomate with distinct oral and aboral surfaces and without definite head and segmentation.
5. They are of moderate to considerable size but none are microscopic.
6. Body shape rounded to cylindrical or star-like with simple arms radiating from a central disc or branched feathery arms arise from a central body.
7. Surface of the body is rarely smooth, typically it is covered by five symmetrically spaced radiating grooves called ambulacra with five alternating inter-radii or inter-ambulacra.
8. Body wall consists of an outer epidermis, a middle dermis and an inner lining of peritoneum.
9. Endoskeleton consists of closely fitted plates forming a shell usually called theca or test or may be composed of separate small ossicles.
10. Coelom is spacious lined by peritoneum, occupied mainly by digestive and reproductive systems and develops from embryonic archenteron, i.e. enterocoel.
11. Presence of water vascular or ambulacral system is the most characteristic feature. It consists of tubes filled with a watery fluid.

12. Alimentary tract is usually coiled tube extending from the mouth located on the oral surfaces to the anus on the aboral or oral surface.
13. Circulatory or haemal or blood lacunar system is typically present.
14. Respiration occurs through a variety of structures, i.e., papulae in starfishes, peristomial gills in sea urchins, genital bursae in brittle stars and cloacal respiratory trees in holothurians.
15. Excretory system is wanting.
16. Nervous system is primitive, consisting of networks concentrated into the radial ganglionated nerve cords.
17. Sense organs are poorly developed.
18. Sexes are usually separate (dioecious) with few exceptions. Gonads are simple with or without simple ducts.
19. Reproduction is usually sexual, few reproduce asexually or by regeneration.
20. Fertilization is external, while few echinoderms are viviparous.
21. Development is indeterminate including characteristic larvae which undergo metamorphosis into the radially symmetrical adults.

### Q) Ancestry of chordates?

**Ans:** Phylum chordate marks the climax of animal evolution. Its representatives called chordates, are the most familiar, adaptable, successful, and most widely distributed animals with diverse form in their habit and habitats. Approximately 30 animal phyla have been currently recognized, the last and major among these being phylum chordata. It was created by Balfour in 1880. Word chordate is derived from two Greek words "Chorde" means String/chord and "ata" means bearing. They represent as a group, the background of man himself.

All the chordates possess three outstanding, unique characteristics at some stages of their life history. These three fundamental characters are

1. A dorsal hollow or tubular nerve chord.
2. A longitudinal supporting rod-like notochord/chorda dorsalis.
3. A series of paired pharyngeal gill slits.

i) **Dorsal Nerve chord:** The central nervous system of chordates consists of a single, tubular, fluid-filled, non ganglionated nerve chord, situated along the mid dorsal line above the notochord above the coelom. The nerve chord or neural plate is derived by sinking in of the median dorsal

strip of ectoderm of embryo . Its cavity is called as neurocoel. It persists throughout the life of all chordates and is differentiated into an anterior short, wide brain and a posterior long, slender spinal-cord.

ii) **Notochord/Chorda dorsalis:** It is a solid , unjointed rod, located in the mid dorsal line between the Gut and the central nervous system outside the coelom. The phylum derives its name from their structure i.e. in Greek noton= back and in latin chorda= a chord. It develops as a longitudinal outfold from the dorsal part of the Gut wall. It originates from the endodermal roof of the embryonic archaenteron. It consists of large, vacuolated thin epithelial cells called notochordial cells. The epithelium secretes two sheathes- the inner thick sheath of fibrous connective tissue and the outer thin sheath of elastic connective tissue. It serves as an axial endoskeleton, giving support to the body. In some lower chordates, notochord persists throughout the life but in most higher chordates it is partly or wholly replaced in the adult stage by a jointed backbone or vertebral column.

iii) **Gill Slits:** Gill slits also called visceral or branched clefts , are paired perforations on the lateral sides of the anterior part, leading from pharynx to the exterior of the body. They develop in the embryo as ectodermal invaginations that meet and fuse with corresponding endodermal evaginations from the pharyngeal wall. They persist throughout the life in all lower chordates,(branchiostomes), fishes and some amphibeans. They disappear or become modified in the adult with the acquisition of pulmonary respiration.

iv) **Tail:** It lies behind anus , contains notochord , nerve chord, blood vessels and muscles but lacks coelom and viscera. It is present in all chordates .In aquatic forms, it serves for locomotion.

### **Origin and Ancestry of chordates:**

The origin of chordates including lower forms remains obscure. Scientists have not succeeded in determining which lower forms have given rise to them. Their early ancestors mostlikely were soft bodied and have no definite fossil remains. The fossil record of known vertebrates have been reported from the late Cambrian strats, so they must have originated prior to Cambrian period.On the basis of resemblance between the lower chordates and some invertebrates, many theories of

chordate origin have been formulated .Only tow of these, namely , echinoderm theory and Ascidian theory , deserve serious consideration , others being of only historic importance.

**1. Echinoderm theory:** The theory is also called as Echinoderm-Hemichordate Ancestry. The theory traces the origin of chordates, hemichordates and echinoderms from a common ancestor. The relationship between these groups is shown by three lines of evidence embryological, biochemical, and serological.

**A. Embryological evidence:** Both echinoderms and chordates have equipotential and radial cleavage, enterocoelous formation of coelom and mesoderm and deuterostomous mouth. The theory is based on the marked resemblance between bipinnaria larva of certain echinoderms and the tornaria larva of hemichordates. Both have a minute, oval transparent body with identical external ciliated bands (sensory cilia at the anterior end), complete digestive tract having ventral mouth and posterior anus and the same number of coelomic cavities (five). Nervous system develops from dorsal strip of ectoderm in both groups.

**B. Biochemical evidence:** Both echinoderms and chordates use phosphocreatine in the energy cycle of their muscle contraction. However , phosphoarginine is also used by by some groups for the same purpose. Certain hemichordates and few echinoderms use both phosphocreatine and phosphoarginine thereby indicating that they are the connecting links between chordates and invertebrates.

**C. Serological evidence:** A closest resemblance exists between the body fluid proteins of chordates and echinoderms than between chordates and Annelids or Arthropods. As the degree of resemblance of the proteins of live animals shows their evolutionary relationship, the chordates are more related to echinoderms.

Besides the above three lines of evidence, adult chordates and echinoderms resemble in having mesodermal endoskeleton.

From the resemblance between echinoderms, hemichordate and chordates, Hyman (1959) and others concluded that all the three have a common ancestry (probably pterobranch like creatures)

**Q) What are Reptiles. Mention their important characters?**

**Ans:** Reptiles are cold blooded , air breathing vertebrates, a group that includes snakes, lizards, turtles, tortoises, crocodiles and alligators. Many scientists believe that both mammals and birds evolved from this class of animals . In the present world nearly 5000 known species of reptiles are living. They are first true land vertebrates and also first amniotic groups of vertebrate animal.

**General characters:**

1. Reptiles are cold blooded vertebrates.
2. They are terrestrial or aquatic animals.
3. The body of reptiles is covered with horny scales of bonyscutes.
4. Their skin is dry and glands are absent in the skin.
5. Four limbs are present.
6. They are pentadactyl(having five fingers).
7. The vertebrae are gastrocentrous and ribs form a true sternum.
8. Respiratory organ is lungs.
9. Heart is divided into two auricles and ventricle , which is divided into two chambers incompletely.
10. RBC's are nucleated.
11. Kidneys are metanephric.
12. 12 pairs of cranial nerves are seen.
13. Fertilization is internal and eggs are laid on land.

**Q) What are Mammals. Mention their important characters.**

**Ans:** Mammals are warm blooded vertebrates that evolved in the Jurassic period about 175 million years ago. They evolved from reptiles. For over 100 million years , mammals were small and not diverse, but with the extinction of dinosaurs (65 million years ago) , they grew in size and diversified. Common examples include rodents, bats, dogs, bears, cats , deer, sheep,goats and humans. In all there are about 5400 species, distributed in about 1200 genera, 153 families and 29 orders.

### **General characters:**

1. All mammals bear hair on their body at some point in their lives.
2. The jaws of mammals are made up of a single bone on each side.
3. Mammals have unique heart. Although mammals have four chambered heart like birds, the main artery turns left, as it leaves the heart. In birds it turns to right, while as in all other vertebrates, there are more than one artery that originate from the heart.
4. All mammals have two sets of teeth in their life time, i.e. their teeth are replaced only once.
5. All mammals have a sheet of muscles and tendons, known as diaphragm that separated the thoracic cavity from the abdominal cavity.
6. Backbone is present.
7. They are warm blooded.
8. The females of class mammalian have mammary glands that produce milk with which females feed their young ones.

### **Q) What are Amphibians? Mention their general characters?**

**Ans:** An amphibian is any non-amniotic (lacking eggs with a shell), cold blooded, tetrapod animals that spends least part of its time on land. Living examples include frogs, toads, salamanders, newts, etc. There are only about 6200 living species.

### **General characters:**

1. They are cold blooded vertebrates which can live on land and in water.
2. Amphibians show four limbs with which they can swim in water and jump or walk on land (but in Apoda limbs are absent).
3. In Amphibians exoskeleton is absent. But in Apoda animals small cycloid scales are present.
4. In adult Amphibians lungs are present and gills are absent. But in some urodelans the gills are present.
5. Their skin is a respiratory organ.
6. The skull is dicondylic.
7. Ribs are absent.
8. Heart is 3 chambered with two auricles and one ventricle.
9. Kidneys are mesonephric.
10. 10 pairs of cranial nerves are there.
11. In their life history, a larva stage may be present.

## (B) Kingdom Plantae

**Introduction:** The plantae includes all land plants: mosses, ferns, conifers, flowering plants and so on. With more than 250000 species, they are second in size only to the arthropoda. Plants have been appeared in the Ordovician, but did not begin to resemble modern plants until the late Silurian.

### Q1) Classification of plants?(An overview)

**Ans:** Plants were classified on their use, form and structure. Earlier system classified plants on the basis of their habitat as- trees, shrubs, under shrubs & herbs. Gradually, the natural affinities in addition to morphological features became the major consideration for grouping plants. Studies on evolution helped in understanding the phylogeny of organisms. Taxonomists then started using the phylogenetic relationship for classification purpose.

### Q2) What were some of the basic attempts of classification of plants?

**Ans:** In a majority of systems, which recognized only two kingdoms of organisms, the plants were included in plant kingdom, where as the animals in Animal kingdom.

For the classification of plants, several systems were proposed from time to time. Some are given below.

- a) While using the no. and position of stamens, Linnens divided flowering plants into 23 classes, starting with the class Monandria (with a single stamen) & plants with 20 or more stamens were assigned to class Icosandria. He also included all non flowering plants such as algae, fungi, lichens, mosses and ferns in a separate class called Cryptogamia. His system was labeled as artificial since it was based on a few characters. More over, his system places widely unrelated families of monocotyledons & dicotyledons in one class.

Subsequently several systems were proposed from time to time, and it is difficult to discuss all of them.

### Q3) What are cryptogams and phanerogams?

**Ans:** Simple systems which divides plant kingdom into two sub kingdoms – phanerogamae and cryptogamae, considering the presence or absence of flowers and seeds.

All flowering plants which bear seeds are included in phanerogamae (phaneros=visible; and gamos= Marriage).

While as the cryptogamae (cryptos=concealed; and gamos=Marriage) covers all non-flowering plants such as –algae, fungi, lichens, mosses and ferns.

The cryptogames are further classified into three divisions – Thallophyta, Bryophyta and Pteridophyta, each bearing classes assigned on the basis of similarities and differences among each group.

### Q4) What are the divisions of Phanerogames?

**Ans:** Phanerogames are also called as spermatophytes (sperma= seed; and phyton=plant).



The phanerogames are divided into two divisions- a) Gymnospermae and b) Angiospermae.

- a) **Gymnosperms:** Gymnosperms (Gymno=naked, and sperma = seed) are represented by those plants which have naked ovules or seeds without any covering e.g; Cycads , pines and Cedars.
- b) **Angiosperms:** Angiosperms (Angios=enclosed, and sperma= seed) include all the flowering plants which possess seeds and have ovules enclosed in an ovary or fruit.

**Q5) What are the general character of Thallophytes .What are its sub-divisions?**

**Ans:**

1. Plants may be unicellular or multicellular . Plant body is thallus type i.e; not differentiated into Root, stem and leaves.
2. Plants do not bear flowers.
3. They may be green or non-green due to presence or absence of chlorophyll respectively.

Generally Thallophyta is divided into two subdivisions:-

**I) Subdivision Algae:-**

- i) These are generally found in water or in moist places, but on land as well. They are also found on the surfaces of other plants or even animals .
- ii) Thallus may be unicellular flagellated (e.g; Chlamydomonas) or nonflagellated (e.g; Chlorella), a colonial form (e.g; Volvox) or may even be of filamentous type (e.g; Ulothrix & Spirogyra). In some forms, the thallus is flattened & leaf like (e.g; Laminaria), which anchor to rocks with the help of hold fast.
- iii) A variety of pigments in algae provide different colours. In Green algae , there is presence of chlorophyll a and chlorophyll b along with carotenoids as photosynthetic pigments.
- iv) Mode of nutrition is autotrophic i.e; they do photosynthesis and store food material in the form of starch.

**II) Subdivision Fungi:**

It includes non green thallophytes & have the following characters:-

- i) Plants usually grow in moist and dark places. They are found on dead and decaying organic matter or on the body of other organisms.
- ii) Chlorophyll is not present , therefore no photosynthesis occurs and hence mode of nutrition is Heterotrophic.
- iii) They are white , black and brown in colour.
- iv) They store their food in the form of glycogen.
- v) They may be unicellular or multicellular e.g; Mushroom , yeast, Mucor.

**Q6) Write a brief note on Bryophytes?**

**Ans:** Bryophytes are simple & truly land habituating plants, present on moist shady places in tufts. They are small in size and range from few mm's to few cm's . Their

plant body is thalloid and leaf like. Plants are green in colour. Plants represent gametophytic generation which after fusion forms sporophyte, which after meiotic division forms gametophyte, which is called alternation of generation.

Plants may be unicellular, multicellular and smooth walled or tuberculated. Internally the plant body doesn't show any vascular tissue like xylem & Pholem.

### **Q7) Sexual reproduction in Bryophytes?**

**Ans:** Sexual reproduction in Bryophytes in Oogamous type and take place by Anthredia and Archegonia . Anthredia produce Antherozoids, which are large, motile and bicilliated structures. Archegonium is a multicellular , flask shaped organ having neck canal cells, neutral canal cells and egg. Water medium is essential for fertilization.

Fusion of antherozoids and eggs result in the formation of zygote or Oospore which is diploid (2N) Sporophytic in nature. Oospore develops into Sporophyte which bears foot, seta and capsule. Spores are formed in capsule after reductional division. All spores are alike . Spores on germination give rise to Gametophytic plant body usually through Protonema.

### **Q8) How Bryophytes are different from Tracheophytes?**

**Ans:** Bryophytes are distinguished from Tracheophytes by two important characters;

- i) First, in all Bryophytes the ecologically persistent photosynthetic phase of life cycle is haploid(N) gametophyte rather than diploid (2N ) sporophyte.
- ii) Second no well developed vascular system is found in Bryophytes.

### **Q9) What are the subdivisions of Phylum Bryophyta?**

**Ans:** At one time Bryophytes were placed in one Phylum, intermediate in position between algae and vascular plants.

Modern studies of cell ultra structure and molecular biology however, confirm that Bryophytes comprise three separate evolutionary lineages, which are today recognized as Mosses(Phylum Bryophyta), Liverworts (Phylum Marchantiophyta) and Hornworts (Phylum Anthocerotophyta).

### **Q10) What are pteridophytes. What are their main characteristic features?**

**Ans:** This group of plants derives its name from a fern, pteris, which also represents its silent features.(Pterido=pteris , phyton=plant).

#### **Characteristics:-**

1. They occur in humid and tropical climates and usually grow on soil , rocks, in ponds and as epiphytes on other plants.
2. A typical pteridophyte as represented by a fern has a body differentiated into distinct underground stem like Rhizome , bearing roots and aerial shots with leaves.
3. Pteridophytes have primitive vascular system.
4. Some pteridophytes have simple leaves, while as some have compound leaves.
5. Sporangia are borne on ventral surface of leaves as yellow or brown spots(Sori). The spores bearing leaves are called Sporophylls. The Sori bear groups of Sporangium full of spores.

6) Plant body of pteridophytes is sporophyte (2N).

7) Spores are haploid(N) , which on germination form a thallus like structure called Prothallus, which is multicellular and represents gametophytic phase . The Antheridium & Archegonium sex organs develop on the ventral surface of prothallus.

**Q11) What are the various classes of Pteridophyta?**

**Ans:** On the basis of organization of the plant body including the nature of the leaf, vascular system and location of sporangia, Pteridophyta is divided into four classes . These are;

a) Psilopsida    b) Lycopsidea    c) Sphenopsida    d) Pteropsida

**Q12) What are Gymnosperms. Mention their general characters.**

**Ans:** Earlier Gymnosperms were not recognized as a separate group and the members now included in this group are treated as Angiosperms. But Robert Brown (1827) for the first time recognized them as a separate group.

Gymnosperms are most primitive & simpler spermatophytes with naked ovules borne unprotected on the surface of Megasporophylls. They are some times also called as phanerogames without ovary. Thus in them the naked seeds are produced.

i) Most of the gymnosperms are evergreen trees or shrubs with xerophytic adaptation .

ii) Plant body is sporophytic and is differentiated into roots , stem and leaves.

iii) Plants possess a well developed tap root system.

iv) Stem is usually erect , profusely branched (unbranched in cycas) and woody (but in zamia it is tuberous).

v) Presence of leafy scars on the stem is a characteristic feature of gymnosperms.

vi) Leaves are generally dimorphic and are of Foliage and Scaly type. In some taxa e.g; Ephedra only Scaly leaves are present.

vii) The leaves have thick cuticle and sunken stomata.

viii) The xylem consists of only tracheids and xylem parenchyma . Vessels are absent except in the members of Gnetales.

ix) Phloem consists of sieve tubes and phloem parenchyma. Companion cells are absent.

x) Mesophyll of leaf may be undifferentiated (e.g; pinus, cedrus) or differentiated into palisade and spongy parenchyma(e.g; Cycas).

xi) They are heterosporous and Mega and Microsporangia occur on Mega and Microsporophylls respectively, which usually aggregate to form compact cones or strobili.

xii) Ovules are orthotropous and unitegmic but are bitegmic in Gnetales.

xiii) All gymnosperms are wind pollinated .

xiv) Archegonia lack neck canal cells.

**Q12) What are Angiosperms .Mention their general characters?**

**Ans:** Angiosperms are vascular seed plants, in which the ovule (egg) is fertilized & develops into a seed in an enclosed hollow ovary. The ovary itself is usually enclosed in a flower.

There are more than 300000 species of flowering plants (Angiosperms) . These also represent the largest and most diverse group with in kingdom plantae.

General characters of Angiosperms:-

- i) Angiosperms have well developed vascular tissue that make them well adapted to terrestrial habitats.
- ii) Angiosperms have ovules that are enclosed in an ovary. There are two subtypes of Angiosperms : monocotyledous & dicotyledous, these have one and two colyledous in their embryos respectively.
- iii) Angiosperms are able to grow in a variety of habitats. They can grow as trees, shrubs , bushes as well as herbs.
- iv) They have a very complex root system.
- v) They bear flowers , which act as a reproductive organ.

### *Textual Questions*

**Q1) Which division among plants has the simplest organisms?**

**Ans:** Division Thalophyta.

**Q2) How are pteridophytes different from phanerogames?**

**Ans:** Pteriophytes differ from Phanerogames in different ways. The two remarkable differences between them are as:

- 1) In Phanerogames, seed formation takes place, while as no seed formation occurs in pteridophytes.
- 2) Pteridophytes posses a primitive vascular system, while as in comparision, phanerogames posses a well developed vascular system.

**Q3) How do gymnosperms and Angiosperms differ from each other .**

**Ans:** The Angiosperms and Gymnosperms differ in many ways, like;

- i) Angiosperms are normally seed bearing plants, where the seeds are contained in an ovary , which is inside a fruit. While as the Gymnosperms are those seed plants which have exposed seeds(not closed in an ovule).
- ii) The leaves of Angiosperms are flat, while as the leaves of Gymnosperms are cone bearing or needle like.
- iii) Gymnosperms are only pollinated by the agency of wind , while as the Angiosperms are pollinated by means of different agencies like wind, water, insects, birds, etc.
- iv) The xylem and phloem of Gymnosperms lack vessels and companion cells, while as no such absence of vessels and companion cells is found in the xylem and phloem of Angiosperms.