8 Diversity in Living Organisms

Biology is a branch of science that deals with the living beings and their functions. There is a great diversity of living beings on this planet. The difference between living beings and non-living matter was perceived by early man. Diverse form of living organisms are found in different types of habitats like ocean, fresh water bodies, forests, cold mountains, deserts, hot water springs, etc. It is estimated that more than 5 million species are present on earth. Of these about 1.7 million species are known and described. Every year several new species are described and added to the list. Since study of all organisms is nearly impossible, they are classified into groups for the convenient study.

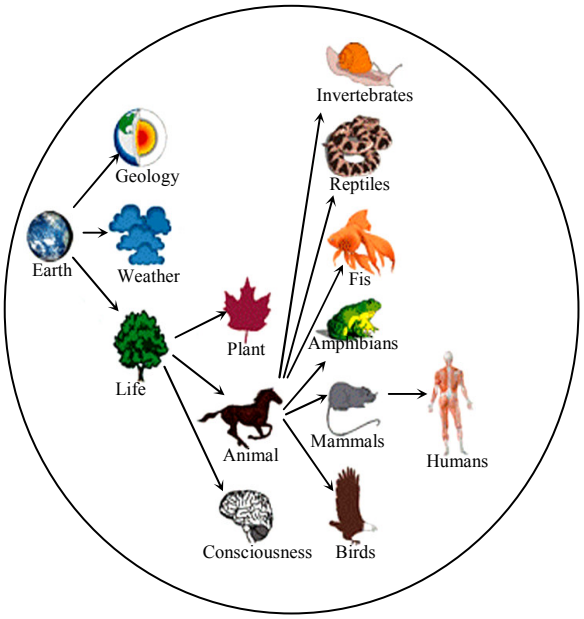


Figure: 8.1

Every organism whether plant or animals are unique in itself. There is a wide diversity in the flora (plants) and fauna (animals) in the world. The diversity we see today is the result of 3.5 billion years of organic evolution. During the course of this evolution several species vanished from the surface of the Earth and became extinct. It is estimated that more than fifty times the existing species have become extinct. With such a vast number of organisms – both living and extinct, it becomes impossible to study every one of them at individual level. This task of studying the diversity of living organisms can be made easier and more effective if the various organisms are arranged in an orderly manner.

Note

Living organisms are different from non-living things in the way that all living things share seven characteristics.

The seven characteristics are:

- Organisms reproduce
- Organisms grow
- Organisms feed
- Organisms respire
- Organisms excrete
- Organisms move
- Organisms are sensitive

Rules of Nomenclature

- **Each biological name has two words:** The first word represents genus and the second represents the specific epithet.
- The words of the name should be separately underlined when hand written and should be in italics when printed.
- The generic name should start with a capital letter and specific epithet should start with a small letter.
- The names should be either Latin or Latinised.
- Name of the author appears at the end of the scientific name in an abbreviated form. e.g.: Homo sapiens Linn.
- It indicates that this species is first described by Linnaeus.

Table: 8.1 Terminology used in Classification

Nomenclature	▪ Scientists have formulated certain procedures to assign scientific name to each organism. ▪ International Code for Botanical Nomenclature (ICBN) and International code for Zoological Nomenclature (ICZN) were evolved to assign scientific names for plants and animals respectively. ▪ The scientific name has two components- **Generic name** and the **specific epithet**. This system of naming is called binomial nomenclature. ▪ It was given by **Carolus Linnaeus** and is used by biologists all over the world.
Classification	It is the arrangement of organisms in specific groups or categories based on certain characters. These categories are called **taxa** (sing. taxon).
Taxonomy	It is the study of identification, nomenclature and classification of organisms based on external and internal structure with cell structure, development process and ecological information.
Systematic	It is the study of organisms with reference to identification, nomenclature, classification and evolutionary relationship.

Importance of Classification

- It makes the study of such a wide variety of organisms easy.
- It projects before us a good picture of all life forms at a glance.
- It helps us understand the interrelationship among different groups of organisms.
- It serves as a base for the development of other biological sciences such as biogeography, etc.

Classification can be Done on the Following Basis

- **Cells are prokaryotic or eukaryotic.** Organisms may be grouped into two broad categories on the basis whether they possess prokaryotic cells or eukaryotic cells. In case of prokaryotic cells the nuclei and other organelles are not clearly demarcated. The eukaryotic cells, on the other hand, have membrane-bound organelles, including a nucleus.
- **Cells occur singly or in clusters.** Many organisms are unicellular, i.e. made up of only one cell, e.g. Amoeba. Others are multi-cellular, i.e., cells group together to form single organism (e.g., insect). In case of multi-cellular organisms the different groups of cells carry out specialised functions.
- **Organism is photosynthetic or takes food from outside.** Green plants perform photosynthesis and synthesis their own food. Animals cannot perform photosynthesis. They get food from outside.
- **Organisation of different body parts.** Grouping of organisms may be done on the basis of body organisation. For example, plants possess stem, root and leaves. Similarly, the animals possess specialised organs to perform different function. The characteristic based on body design used for classification of plants is quite different when used for classifying animals

Examples for taxonomic categories

- **Human (Homo sapiens)**
  Kingdom: Animalia
  Phylum: Chordata
  Class: Mammalia
  Order: Primates
  Family: Hominidae
  Genus: Homo
  Species: sapiens
- **Coconut (Cocos nucifera)**
  Kingdom: Plantae
  Phylum: Angiospermae
  Class: Monocotyledonae
  Order: Principes
  Family: Arecaceae
  Genus: Cocos
  Species: nucifera

Taxonomic Hierarchy

- **Kingdom:** Kingdom comprises of various phyla of animals and various divisions of plants.
- **Phylum/Division:** Phylum in animals and Division in plants includes related classes.
- **Class:** Several related orders are included in a class.
- **Order:** The order includes several related families.
- **Family:** Family is a group of related genera.
- **Genus:** Genus is a group of related species which have co-related characters.

Species: It is the basic unit in classification. The members of a species are closely related, derived from a common ancestor and can interbreed to produce fertile offsprings.

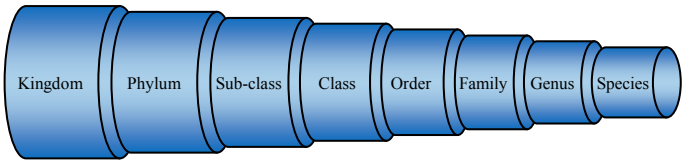


Figure: 8.2 Sequence of Taxonomic Hierarchy

Systems of Classification: R. H. Whittaker in 1969 suggested five kingdom classifications on the basis of *presence or absence of a nucleus*, *unicellular or multi-cellular* and *mode of nutrition*.

He proposed five kingdoms: **Monera, Protista, Fungi, Plantae** and **Animalia.**

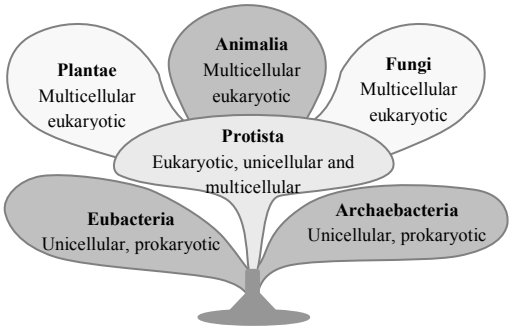
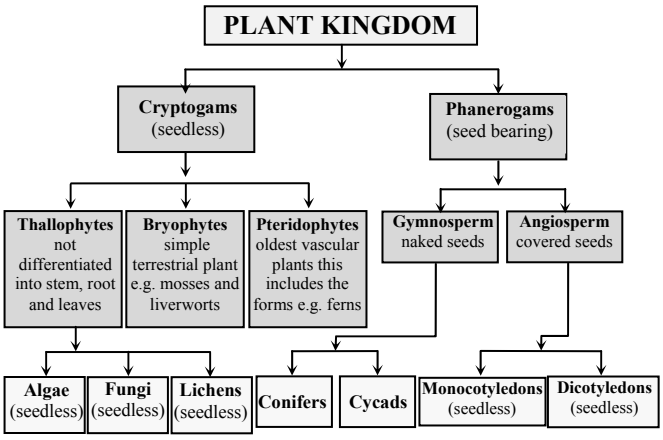


Figure: 8.3 Classification of Kingdom

Characteristics Features of Kingdom Plantae

- They made of eukaryotic cells.
- They are multicellular.
- The cells have wall made of cellulose.

- They store carbohydrates such as starch.
- Some cells (except in some parasites) contain chloroplast.
- The organisms feed by photosynthesis.



Algae: They generally include aquatic plants. Some 20,000species of algae are known. Study of algae is called *phycology*. The main characteristics are as under:

- They are generally chorophyllous thallophytes in which vascular tissues are absent.
- The plant body is thalloid i.e., cannot be differentiated into root, stem and leaves.
- They are found in fresh water resources as well as in sea water.
- They are autotrophic because of the presence of chlorophyll in leaves. The reserve food is generally a carbohydrate.
- The cell wall is double layered. The outer layer is made of pectin and inner layer is made cellulose.
- They may be unicellular as well as multicellular.
- A few members such as chlamydomonas are motile.
- They reproduce by vegetative, asexual as well as sexual methods. The sex organs are unisexual and lack a sterile covering around them.
  Example: *Oedogonium, Chara, Sargassum, Ectocarpus, Chlamydomonas, Ulothrix*, etc.

Fungi: It is a large group of over 90,000 species. They show the following characteristics:

- They are achlorophyllous and nonvascular plants.
- The plant body may be unicelled or vthalloid, made of branched or unbranched filamentous structures, the hyphae.
- The network of hypae is called mycelium.
- The hyphae may be aseptate or sepate and each cell may be uni or multinucleate.
- The cell wall is made of chitin or fungal cellulose.
- They show heterotrophic mode of nutrition.
- The reserved food is in the form of glycogen and oil globules.
- They reproduce by asexual or sexual methods.
- The sex organs are unicelled and lack a sterile covering around them. The higher forms lack distinct sex organs.
  Example: *Rhizopus*, Yeast, *Agaricus* (Mushroom), etc.

Lichens

- They represent a symbiotic association of a fungus and alga in which two organisms are so closely associated with each other as to form a single plant.
- They are show growing long lived plants. The commonly grow on leaves, tree trunks, old logs, soils and rocks.
- Some lichens occur in extreme conditions of cold, humidity and drought.
- In these plants the algal part prepares the food and the fungal part shows reproduction. Thus, their association is mutualistic.

Bryophyta: They have over 25,000 species.

- They live in damp and sandy habitats hence they are called amphibians of the plant kingdom. They are often found to grow during rainy season forming green carpets or mats on damp soil, rocks, walls, tree trunks, etc.
- The vascular tissues are absent. The roots are absent and instead rhizoids are present. They may be unicellular or multicellular.
- The reproduction takes place by vegetative or sexual methods.
- The vegetative reproduction is quite common through fragmentation tubes, buds, adventitious branches, etc.
- They show distinct alternation of generation.
  Example: *Riccia, Marchantia, Funaria* (Moss).

Pteridophyta: These are the oldest vascular plants this includes the forms. The important characteristics are.

- The plant body is differentiated into roots, stem, and leaves.
- The dominant phase or plant body is a sporophyte.
- They are seedless vascular plants and hence called vascular cryptogams.
- The gametophyte is small or unconscious.
- The sex organs are multicellular.
- The fertilisation requires water medium results in the formation of zygote.
- They show distinct alternation of generation.
  Example: *Selaginella, Adiantum, Dryopteris*.

Gymnosperms

- They have well developed vascular tissues but lack vessels.

The 'flowers' compose two types of sporophylls i.e., microsporophylls and megasporohylls.

- The pollination is anemophilous and the fertilization does not require water medium. There is formation of pollen tube. (Siphonogamous)
- The zygote develops into an embryo.
- Since the ovules are not covered by cattel there is no fruit formation. They are naked.

Example: Cycas, Pinus and Ephedra, etc.

Angiosperm: The word is made from two Greek words: angeion means vessel, covered and *sperma* means seed. The seeds develop inside an organ which is modified to become a fruit. These are also called flowering plants. They are most abundant and conspicuous plants with about 2,00,000 species. The general characteristics are:

- They are usually terrestrial plants. The plant body is sporophytic.
- The plants may be herbaceous or woody. They may be annual, biennial or perennial.
- A well developed vascular system is present in them. The xylem has vessels.
- The angiosperms are characterised by the presence of the double fertilisation forming a zygote and the primary endosperm, the nutritive tissue.
- During fertilisation the non-flagellate male gametes are carried by a pollen tube (siphonogamous).
- Fertilised ovules ripen into seed thus the ovary is converted into a fruit.

  Example: *Brassica campestris* (Mustard), *Pisum sativum* (pea), etc.

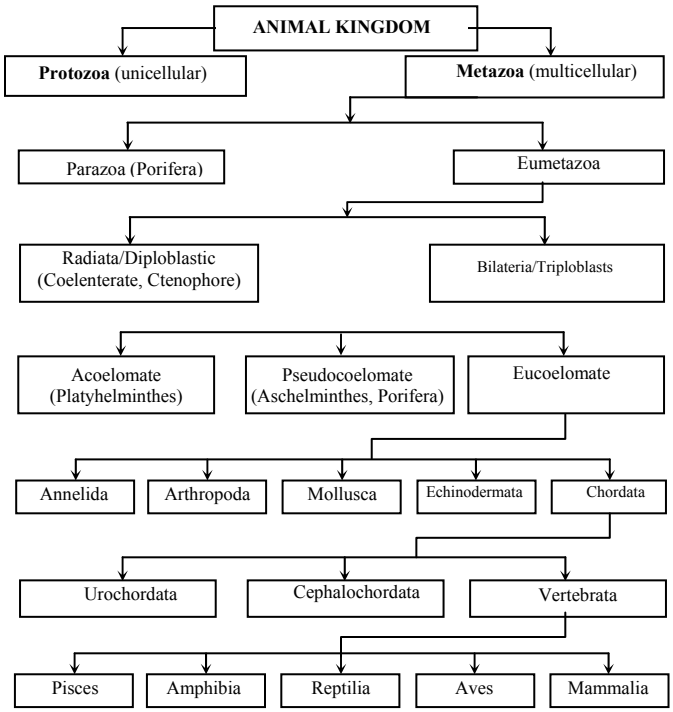
Angiosperms are divided into:

Monocot, bear seeds which have a single cotyledon or seed leaf. The veins on their leave are parallel to each other. Their vascular bundles are arranged in a complex manner, *e.g.,* palms, bamboos, sugarcane, rice, etc.

Dicot, the seeds of dicot have two cotyledons. The veins on their leaves are like a network. Their vascular bundles are arranged in a ring. Their root system consists of a man tap root with smaller branches.

Characteristics Features of Kingdom Animalae:

- The organisms are made up of eukaryotic cells.
- The body of animals is multicellular.
- The cells do not contain cell wall, but contain only cell membrane.
- They do not perform photosynthesis but have heterotrophic nutrition.
- They have the power of locomotion.
- They show increased sensitivity through the nervous system.
- **Basis of animal classification:** There are many features used for distinguishing broad categories of animals. These features include organisation, symmetry, body cavity, number of embryonic cell layers and presence of absence of notochord.



Porifera: *Porous* = pore, *ferre* = to bear

They are commonly called sponges and are mainly found in marine habitats. These are non-motile animals attached to some solid support. They have holes all over the body. These animals are covered with a hard outside layer or skeleton. **Example**: *Euplectella; Sycon* etc.

The body of sponge is organised in such a manner as to form a complex system of pores and canals. Several pores connected the outside to a central chamber (**spongocoel**).

Numerous minute pores (**ostia;** sing **ostium**) present on the body lead into canals lined by flagellated coller cells (**choanocytes**). Terminal point of the body is called **osculum.**

Coelenterata: *koilos* = hollow, *enteron* = intestine

These are aquatic animals. The body is made of two layers of cell (**diploblastic**); one makes up cells on the outside **ectoderm** and the other makes the inner living body of the body, **endoderm**. They have a gut cavity with a single opening for food and waste material. Digestion is extracellular as well

as multicellular. No respiratory, circulatory or excretory organs are found. They have two forms **polyp,** reproduce asexually by budding and **medusa,** liberate gametes into water during sexual reproduction.
Example: *Hydra*, Jellyfish.

Plathelminthes: *platy* = flat, *helminth* = worm
These are generally called flatworms they do not have a body cavity. The body is bilaterally symmetrical. Some of them are free, living in water and soil, but most are parasites. There are three layers of cells in them and thus are called **triploblastic**.
They range from a few millimeters to a few centimetres in size. Reproduction is mostly sexual. Flatworms have specialised cells called **flame cells,** for excretion and osmoregulation. Example: Planarians, Liver flukes.

Aschelminthes: *nema* = thread, *aska* = cavity, *helmith* = worm
They are mostly parasites having bilaterally symmetrical, triploblastic, unsegmented, elongated bodies. Excretory system includes glandular organs or canals or both. Flame cells are absent. These cause diseases such as elephantiasis. Example: *Ascarislumbricoides, Ancylostoma*.

Annelida: *annellus* = little ring, *eidos* = form
Annnelids are eucoelomates, triploblastic animals. There is extensive organ differentiation. Segmented internally, separated by *septa.* Each segment possesses a similar pattern of organs. The coelome is filled with coelomic fluid, which acts as **hydraulic skeleton** and help in locomotion. Closed vascular system, respiration through gills or body surface and excretion is by metamerically repeated, special coiled, ectodermal tubes called **nephridia.**
Example: Earthworms, Leeches.
Arthropoda: *Artho* = jointed, *pod* = foot.
These are triploblastic coelomates, metamerically segmented. They have an open circulatory system.
Respiration through gills (Crustaceans), tracheal system (insects) and book lungs (spiders). The coelomic cavity is blood-filled.
They possess a hard exoskeleton. Sexes are usually separate.
Malpighian tubules for excretion in insect and green glands in crustaceans. Many changes form or undergo **metamorphosis** during growth.
Example: Prawns, Butterflies, Mites, Crabs.
Mollusca: *mollis* or *mollusk* = soft
The mollusca are animals with a coelomate triploblastic body, bilateral symmetry. They have an open circulatory system and kidney like organs for excretion. The body is often protected by a shell. They have a muscular foot to move. Sexes are separate or united. Rasping, tongue-like **radula** for feeding, digestive organ called **hepatopancreas.**
Example: Snails, Mussels.

Echinodermata: *Echinos* = spines and *derma* = skin.
They are exclusively free-living marine animals. They are triploblastic and have a coelomic cavity. They have water vascular system consisting of fluid-containing canals, bladder and tube feet for locomotion. Peculiar features of regeneration of lost parts. Sexes are separate the development includes a free swimming **dipleurula larva**. This larva undergoes a very complex metamorphosis into a young radial adult.
Example: Starfish and Sea urchin.

Chordata: These are bilaterally symmetrical, triploblastic coelomate. They have notochord**,** nerve cord, gill slits or pharyngeal clefts. They possess a post anal tail and closed blood vascular system.
Vertebrata: These animals have a true vertebral column and internal skeleton vertebrates are bilaterally symmetrical, triploblastic, coelomic and segmented, with complex differentiated of body tissues and organs. Notochord is present during the embryonic period and replaced by vertebral column in adult. Nervous system includes brain enclosed in cranium.

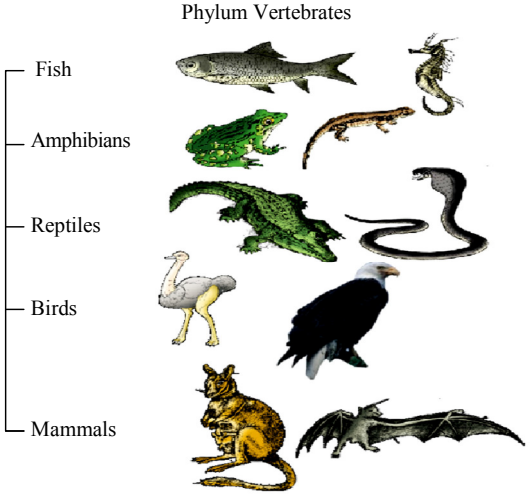


Table: 8.2

Pisces	**Chondrichthyes** (**cartilaginous fishes**); placoid scales, fleshy fins gills without operculum, 2 chambered heart cold blooded, unisexual and internal fertilisation.
	Osteichthyes (bony fishes); ctenoid scales, membranous fins, gills covered with operculum, 2 chambered heart, cold blooded and fertilisation external.

Amphibians	'***Amphi***' 'double' and '***bios'*** 'life'. They are partly adapted to live on land, and partly in water. Most amphibians lay their eggs in water. Amphibians have three-chambered hearts. Example: Frogs, Toads and Salamanders etc.
Reptiles	These animals can lively solely on land and are very less dependent on water. These are cold blooded, have scales and breathe through lungs. These have three-chambered heart (except crocodiles). They lay eggs covered with waterproof shells. Their skin is waterproof and is covered with waterproof horny scales. Example: Lizards, Snakes, Crocodiles, and Dinosaurs.
Aves	'AVES' means birds evolved from reptiles and have many similarities with them. These are warm-blooded and have a four-chambered heart. They lay eggs. Birds are distinguished because their bodies are covered with feathers, and two forelimbs modified for flight. They breathe through lungs. Examples: Cuckoo, Crow, Sparrow, etc.
Mammalia	Mammals are warm-blooded animals with four-chambered hearts. They have mammary glands for the production of milk to nourish their young. Their skin has hairs as well as sweet and oil glands. Most mammals give birth to their young their ones. Sexes are separate. Example: Man, Tiger, Cows, etc.

Definitions

- **Species:** It is the basic unit in classification. The members of a species are closely related, derived from a common ancestor and can interbreed to produce fertile offsprings.
- **Genus:** Genus is a group of related species which have co-related characters.
- **Family:** Family is a group of related genera.
- **Order:** The order includes several related families.
- **Class:** Several related orders are included in a class.
- **Phylum/Division:** Phylum in animals and Division in plants includes related classes.
- **Kingdom:** Kingdom comprises of various phyla of animals and various divisions of plants.
- **Coelom:** Body cavity of triploblastic animals lying within the mesoderm and lined by it.
- **Ctenoid Scale:** Hard dermal exoskeletal structures of fishes having rough or comb like edge.
- **Placoid Scale:** Minute plate-like dermal exoskeletal structures of cartilaginous fishes.
- **Cold-blooded (exothermic):** Condition in which the internal temperature of an animal is dependent upon the temperature of its environment.
- **Warm blooded (endothermic):** Condition in which the internal temperature of an animal is dependent upon its metabolic processes and is held at a relatively high and constant level.
- **Detritus:** Dead organic material in solid or particulate form.
- **Oviparous:** Egg-laying animals.
- **Viviparous:** Female animal whose gives birth to young.

Multiple Choice Questions

1. The two super kingdoms created on the basis of cell structure are
a. Monera and Protista
b. Plantae and Animalia
c. Prokaryota and Eukaryota
d. Protista and Non-protista

2. Which one of the following is vascular plant?
a. Mosses **b.** Ferns
c. Hornworts **d.** Liverworts

3. Liverworts are closely
a. Thallophytes **b.** Ferns
c. Conifers **d.** Mosses

4. Which one of the following is known as Hornwort?
a. *Riccia* **b.** *Anthoceros*
c. *Funaria* **d.** *Pteris*

5. Gymnosperms are
a. Naked seed **b.** Non-vascular plants
c. Flowering plants **d.** Seedless plants

6. Algae belongs to
a. Bryophytes **b.** Pteridophytes
c. Thallophytes **d.** None of these

7. Algae are characterised by
a. Pyrenoids **b.** Aquatic habit
c. Unicellular sex organ **d.** All of the above

8. Pyrenoid is found in one of the following organs on Spirogyra
a. Nucleolus **b.** Cytoplasm
c. Vacuole **d.** Chloroplast

9. Study of algae is called
a. Phycology **b.** Mycology
c. Dendrology **d.** Ecology

10. Bacteria lack
a. ER **b.** DNA
c. Cell wall **d.** Cytoplasm

11. The basal cell of *Ulothrix* is devoid of
a. Chloroplasts **b.** Pyrenoid
c. Chlorophyll **d.** Nucleus

12. Eye spot or stigma is present in
a. *Spirogyra* **b.** *Ulothrix*
c. *Chlamydomonas* **d.** *Nostoc*

13. Which of the following is the principal pigment of Phaeophyceae?
a. Fucoxanthin **b.** Phycocyanin
c. Phycoerythrin **d.** Chlorophyll

14. Which group of algae store polysaccharide laminarian their cells?
a. Green algae **b.** Blue-green algae
c. Red algae **d.** Brown algae

15. Phycoerythrin is present in
a. *Polysiphonia* **b.** *Chlamydomonas*
c. *Fucus* **d.** *Euglena*

16. Red algae is differ from green algae and brown algae in having
a. No flagellated stages in their life cycles
b. Leghemoglobin within their cells
c. No chlorophyll 'a'
d. No differentiated cells

17. Which of the following algae is being used in space research?
a. *Cladophora* **b.** *Hydrodictyon*
c. *Chlorella* **d.** *Chlamydomonas*

18. Which one of the following is a parasitic algae?
a. *Cephaleuros* **b.** *Ulothrix*
c. *Oedogonium* **d.** *Sargassum*

19. Which one of the following is a flagellated algae?
a. *Chlamydomonas* **b.** *Ulothrix*
c. *Spirogyra* **d.** *Acetabularia*

20. Alginic acid is a product of
a. Red algae **b.** Green algae
c. Blue-green algae **d.** Brown algae

21. First land inhabiting organisms are
a. Bryophytes **b.** Pteridophytes
c. Gymnosperms **d.** Angiosperms

22. Bryophytes do not have
a. Gametophytes **b.** Xylem, Phloem
c. Sporophytes **d.** Cuticle

23. Main body of bryophyte plant is always
a. Sporophytic **b.** Hormogonium
c. Autoecious **d.** Gametophytic

24. Conducting tissue in *Funaria*
a. Parenchyma **b.** Collenchyma
c. Sclerenchyma **d.** Xylem and Phloem

25. Moss capsule represents
a. Gametophyte **b.** Gametophores
c. Sporophyte **d.** Part of sorus

26. Which one of the following plant group is the most abundant on earth?
a. Mosses **b.** Ferns
c. Hornworts **d.** Liverworts

27. Pteridophytes are also called
a. Cryptogams **b.** Vascular cryptogams
c. Phanerogams **d.** Embryophytes

28. Pteridophytes differ from bryophytes in possessing
a. Archegonia **b.** Spores
c. Tracheids **d.** Vascular tissue

29. Which one of the following also called *Horsetail?*
a. *Equisetum* **b.** *Lycopodium*
c. *Marsilea* **d.** *Selaginella*

30. Which one of the following also called *Club moss?*
a. *Pteris* **b.** *Equisetum*
c. *Lycopodium* **d.** *Marsilea*

31. The fern usually found
a. Near marshy places **b.** Shady, cool, moist places
c. Dry climate **d.** None of these

32. Fern rhizome is
a. Stem **b.** Rhizophore
c. Rhizoid **d.** Root

33. In fern rhizome
a. Sieve tubes are absent **b.** Vessels are absent
c. Tracheids are absent **d.** None of these

34. Which of the following plants contributed to supply of coal?
a. Bryophytes **b.** Angiosperms
c. Conifers **d.** Seedless vascular plants

35. The largest group of Gymnosperms is
a. Conifers **b.** Cycads
c. Gnetinae **d.** Cycadofilicales

36. Most of gymnosperms have
a. Only antheridia
b. Only archegonia
c. Both antheridia and archegonia
d. None of these

37. Largest tree in plant kingdom is
a. Sequoia **b.** Pinus
c. Metasequoia **d.** Cedrus

38. Fruits are not formed in gymnosperms because of
a. They are not pollinated **b.** They are seedless
c. No fertilisation occurs **d.** They have no ovaries

39. Which of the following does not require external water for fertilisation?
a. Cycads **b.** Ferns
c. Algae **d.** Bryophytes

40. Sulphar shower is related to
a. Pinus **b.** Cycus
c. Both **d.** None of these

41. Simple polyembryony is found in
a. Cycus only **b.** Pinus only
c. Both (**a.**) and (**b.**) **d.** None

42. Red wood tree is
a. *Sequoia* **b.** *Pinus*
c. *Gnetum* **d.** *Equisetum*

43. Which one of the following is used as Christmas tree?
a. *Pinus* sp. **b.** *Abies* sp.
c. *Araucaria* sp. **d.** All of the above

44. *Cedrus deodara* is mainly used for making
a. Railway sleeper **b.** Match sticks
c. Pencils **d.** Furniture

45. Which of the following is not monocot?
a. Rose **b.** Orchids
c. Palms **d.** Banana

46. The aquatic birds have
a. Webbed feet **b.** Long legs
c. Sharp claws **d.** Oily feathers

47. Birds have
a. One left aortic arch
b. One right aortic arch
c. One is fully developed and other is poorly developed
d. Both are fully developed

48. The wishbone of birds is derived from
a. Hind limbs **b.** Pelvic gridle
c. Pectoral girdle **d.** Skull

49. Which of these birds cannot fly?
a. Peacock **b.** Duck **c.** Stork **d.** Emu

50. The zoological name of Indian peacock is
a. *Pavo cristatus* **b.** *Passer domesticus*
c. *Psittacula eupatria* **d.** *Columba livia*

51. Choanocytes are unique to
a. Protozoa **b.** Porifera
c. Mollusca **d.** Echinodermata

52. Molluscs are
a. Unsegmented
b. Annulated
c. Metamerically segmented
d. None of these

53. All mollusces share the following except
a. Muscular foot **b.** Visceral mass
c. Mantle **d.** Open circulatory system

54. Molluscs are
a. Diploblastic and coelomate
b. Triploblastic and acoelomate
c. Triploblastic and pseudocoelomate
d. Triploblastic and coelomate

55. Which molluscs is the largest invertebrate
a. Giant clam **b.** Giant squid
c. Giant snail **d.** Giant octopus

56. Pearl oyster belongs to class
a. Mollusca **b.** Bivalvia
c. Scaphopoda **d.** Gastropoda

57. Foot is modified into arms or tentacles attached to the head in
a. Cephalopoda **b.** Gastropoda
c. Pelecypoda **d.** None of these

58. Mesoglea is characteristics of
a. Platyhelminthes **b.** Aschelminthes
c. Cnidaria **d.** Mollusca

59. The biggest phylum in regard to the number of species
a. Protozoa **b.** Platyhelminthes
c. Chordate **d.** Arthropoda

60. The presence or absence of mandibles can be used to distinguish between
a. Insect and spiders **b.** Insects and millipedes
c. Insects and centipedes **d.** Insects and crustaceans

61. Mouthparts of mosquitoes are of
a. Siphoning type
b. Sponging type
c. Piercing and sucking type
d. Cutting and chewing type

62. A distinct thorax does not occur in
a. Cockroach **b.** Whale
c. Silkworm **d.** Centipede

63. Common character of spider, cockroach and centipede is
a. Compound eyes **b.** Book lungs
c. Jointed legs **d.** Green glands

64. The insect, which lays egg in water
a. Dragonfly **b.** Butterfly
c. Housefly **d.** Sandfly

65. Complete metamorphosis occurs in
a. Bug **b.** Silverfish
c. Butterfly **d.** Grasshopper

66. Mature larva of housefly is
a. Maggot **b.** Grub
c. Caterpillar **d.** Wriggler

67. Green glands are found in
a. Scorpion **b.** Moth
c. Spider **d.** Cray fish

68. Silk is produce by
a. Cocoon **b.** Adult moth
c. Larva **d.** Both (**b.**) and (**c.**)

69. The worker honey bee normally lives for about
a. 30 days **b.** 90 days **c.** 10 days **d.** 20 days

70. Bladder worm is a stage in
a. Liver fluke **b.** Planaria
c. Roundworm **d.** Tapeworm

71. Schistosoma is known as
a. Blood fluke **b.** Chinese liver fluke
c. Dog tapeworm **d.** Lung fluke

72. The first phylum with complete digestive system was
a. Cnidaria **b.** Nematode
c. Arthropoda **d.** Echinodermata

73. Sexual diamorphism is found in
a. *Hydra* **b.** Earthworm
c. *Ascaris* **d.** *Fasciola*

74. Male *Ascaris* is
a. Smaller than female **b.** Larger than female
c. Equal in size **d.** Too small than female

75. Female *Ascaris* can be distinguished from male *Ascaris* by
a. Pineal setae
b. Cloaca
c. Both (**a.**) and (**b.**)
d. Straight posterior part

76. Excretory organs of *Ascaris* are
a. Single excretory cell **b.** Flame cell
c. Nephridia **d.** Kidney

77. Filariasis is caused by a type of
a. Earthworm **b.** Round worm
c. Tape worm **d.** Insect

78. Earthworm belongs to the class
a. Oligochaeta **b.** Polychaeta
c. Archiannelida **d.** Nematoda

79. Excretory organs of Annelida are
a. Archeocytes **b.** Nephridia
c. Statocysts **d.** None of these

80. In locomotion earthworm is helped by
a. Setae **b.** Coelomic fluid
c. Body wall musculature **d.** All of the above

81. Blood vascular system if earthworm is
a. Open type **b.** Closed type
c. Portal type **d.** None of these

82. Excretory organs in platyhelminthes are
a. Green glands **b.** Flame cell
c. Nephridia **d.** Malpighian tubules

83. An organ in earthworm analogous to our kidney is
a. Nephridium **b.** Testis
c. Clitellum **d.** Ovary

84. Echinoderms are
a. Smooth skin and radial symmetry
b. Spiny skin and bilateral symmetry
c. Spiny skin and radial symmetry
d. Spiny skin and asymmetry

85. Which of these phyla is found only in seawater?
a. Protozoa **b.** Porifera
c. Coelenterate **d.** Echinodermata

86. Starfish belongs to
a. Asteroidea **b.** Elasmobranchii
c. Teleostomi **d.** None of these

87. Benign malaria is caused by
a. *Plasmodium ovale* **b.** *Plasmodium falciparum*
c. *Plasmodium vivax* **d.** *Plasmodium malariae*

88. Which class of protozoa is totally parasitic?
a. Sporozoa **b.** Flagellate
c. Rhizopoda **d.** Ciliate

89. In which of the following organelle of Amoeba systole and diastole take place
a. Pseudopodia **b.** Plasmalemma
c. Contractile vacuole **d.** Food vacuole

90. *Trypanosoma* is transmitted by
a. Inoculation **b.** Contamination
c. Kissing **d.** Contact

91. Nerve cell are not found in
a. Sponges **b.** Nematodes
c. Coelenterates **d.** Platyhelminthes

92. Zoological name of common bath sponge is
a. Hyalonema **b.** Euspongia
c. Euplectella **d.** Spongilla

93. *Venus' flower basket* is the dried skeleton of
a. *Euspongia* **b.** *Euplectella*
c. *Spongia* **d.** *Leucosolenia*

94. Nematocytes occurs in
a. Cnidocytes **b.** Endosarc
c. Ectosarc **d.** Epitheliomuscular cells

95. Nutritional hydra is
a. Saprophytic **b.** Insectivorous
c. Herbivorous **d.** Carnivorous

96. Which of these class of phylum Chordata to which, bat belongs?
a. Mammalian **b.** Prototheria
c. Chiroptera **d.** Aves

97. To which of the taxonomic group does whale belongs?
a. Fishes **b.** Reptilian
c. Mammalian **d.** Arthropoda

98. Which of the following is an egg-laying mammal?
a. Kangaroo **b.** Spiny anteater
c. Bat **d.** Hedgehog

99. Egg burying mammals are found in
a. Australia **b.** India **c.** Africa **d.** None

100. The similar between giraffe, rabbit, camel, bat and whale is that all of them have
a. Nucleated RBC
b. Four chambered stomach
c. Seven cervical vertebrae
d. Enucleated RBC

101. A plant body which is not stem, roots, etc, is called
a. Thallus **b.** mycelium
c. Frond **d.** substratum

102. In which of the following, the cells are not organised into tissues?
a. Cnidarians **b.** Sponges
c. Flatworms **d.** Roundworms

103. In which of the following does not have a poison apparatus?
a. Scorpion **b.** Centipede **c.** Spider **d.** Crab

104. Arthropods use different organs for respiration. Which of the following correctly lists the organs with the organism which use them?
a. Gills (insects), tracheal system (spiders), lungs (centipedes)
b. Gills (scorpions), book lungs (prawns), tracheal system (spinders)
c. Gills (crustaceans), tracheal system (insects), book lungs (spiders)
d. Gills (crustaceans), tracheal system (millipedes), book lungs (insects)

105. Which of the following are diploblastic?
a. Cnidarians **b.** Flatworms
c. Roundworms **d.** Earthworms

106. The excretory system in annelids consists of coiled tubes called:
a. Flame cells **b.** Metanepridia
c. Nephridia **d.** Protonephridia

107. Annelids are:
a. Flatworms **b.** Roundworms
c. 6-legged invertebrates **d.** Segmented worms

108. Common India bull frog is:
a. *Rana tigrina* **b.** *Rana esculenta*
c. *Rana silva* **d.** *Rana cyanophlyctis*

109. Heart of crocodile is:
a. three-chambered **b.** two-chambered
c. single-chambered **d.** four-chambered

110. Which one is an oviparous animal -
a. Pigeon **b.** Whale **c.** Bat **d.** Amoeba

111. The branch of science dealing with the study of birds is:
a. Herpetology **b.** Ornithology
c. Oncology **d.** Anthropology

112. Heart of mammal is:
a. 1-chambered **b.** 3-chambered
c. 2-chambered **d.** 4-chambered

113. Representative of hemichordate is:
a. *Scoliodon* **b.** *Myxine*
c. *Balanoglossus* **d.** Petromyzon

114. Which of the following is a true fish?
a. Silverfish **b.** Jellyfish **c.** Starfish **d.** Dogfish

115. Characters of which group are present in all chordates in some stage or the other of their life cycle?

a. Gill clefts, vertebral column and notochord

b. Mammary glands, hairs and gill clefts

c. Notochord, scales and dorsal tubular nervous system

d. Notochord, gill clefts and dorsal tubular central nervous system

ANSWERS

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
c	b	d	b	a	c	d	d	a	a
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
d	c	a	d	a	b	c	a	a	d
21.	**22.**	**23.**	**24.**	**25.**	**26.**	**27.**	**28.**	**29.**	**30.**
a	b	d	a	c	a	b	d	a	c

31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
b	d	a	d	a	b	a	d	a	a
41.	**42.**	**43.**	**44.**	**45.**	**46.**	**47.**	**48.**	**49.**	**50.**
c	a	d	a	a	a	b	c	d	a
51.	**52.**	**53.**	**54.**	**55.**	**56.**	**57.**	**58.**	**59.**	**60.**
b	a	d	d	b	b	a	c	d	a
61.	**62.**	**63.**	**64.**	**65.**	**66.**	**67.**	**68.**	**69.**	**70.**
c	d	c	a	c	a	d	a	a	d
71.	**72.**	**73.**	**74.**	**75.**	**76.**	**77.**	**78.**	**79.**	**80.**
a	b	c	a	d	a	b	a	b	d
81.	**82.**	**83.**	**84.**	**85.**	**86.**	**87.**	**88.**	**89.**	**90.**
a	b	a	c	d	a	d	a	c	a
91.	**92.**	**93.**	**94.**	**95.**	**96.**	**97.**	**98.**	**99.**	**100.**
a	c	b	a	d	a	c	b	a	c
101.	**102.**	**103.**	**104.**	**105.**	**106.**	**107.**	**108.**	**109.**	**110.**
a	b	d	c	a	c	d	a	d	A
111.	**112.**	**113.**	**114.**	**115.**					
b	d	c	d	a					

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