

- (ii) The growth in plants is limited to certain regions while there is no such demarcation of dividing and non – dividing regions in animals.

Plant tissues

On the basis of dividing capacity plant tissues can be classified as :

1. Meristematic tissue

Growth of plants occurs only in regions where meristematic tissues are present. Depending on the region where they are present, they are classified as apical, lateral and intercalary meristem.

- (a) **Apical meristem** – It is present at the growing tips of stem and root and increases the length of the stem and root.
- (b) **Lateral meristem**– It increases the girth of stem or root. It is also called cambium.
- (c) **Intercalary meristem**– It is located at the base of leaves or internodes on twigs.

2. Permanent tissue

The cells formed by meristematic tissue acquire permanent shape, size and function and lose the ability to divide.

A. Simple permanent tissue –

- (i) **Parenchyma** – It consists of unspecialised cell with thin cell walls. The cells are loosely packed with large intercellular spaces. When it contains chlorophyll and performs photosynthesis it is called **chlorenchyma**. In aquatic plants, they have large air cavities and give buoyancy to the plants called **aerenchyma**.

Functions– (i) It provides support to the plants (ii) It stores food and water in stems and roots.

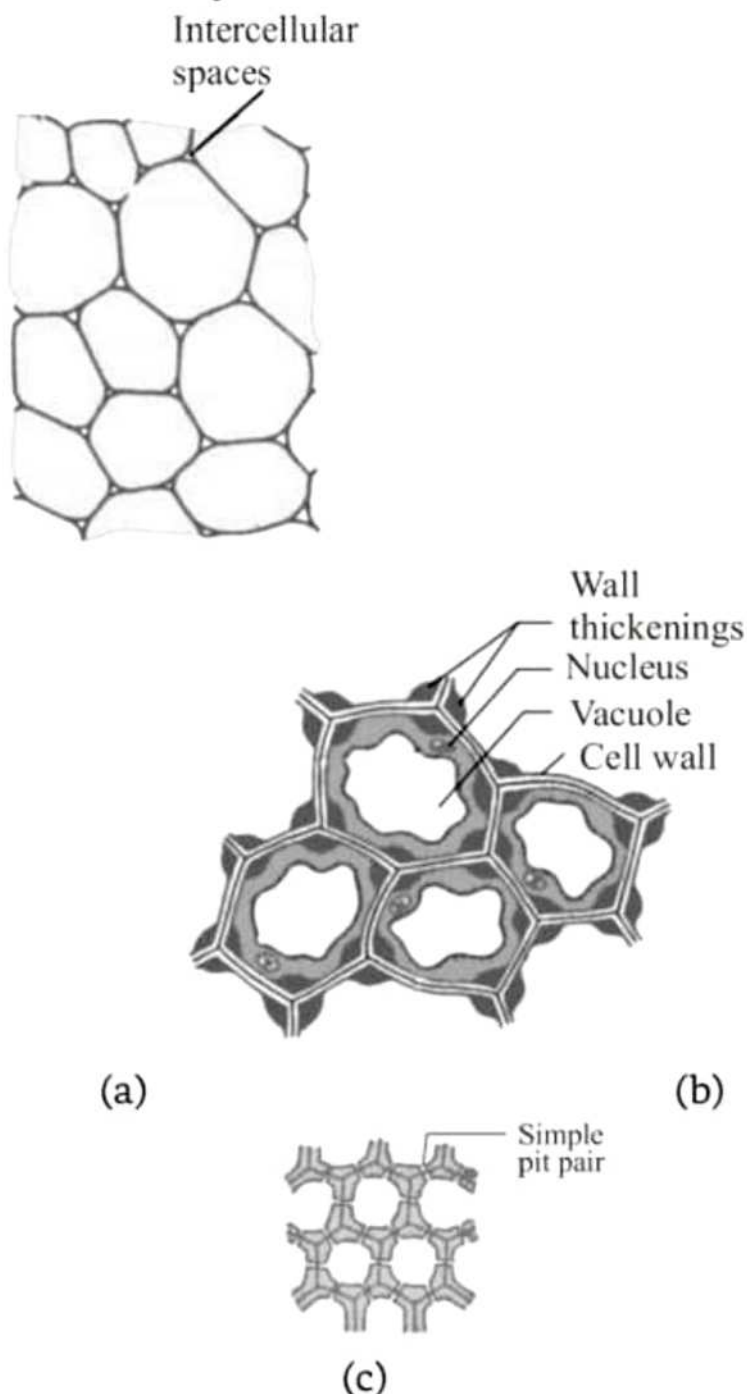
- (ii) **Collenchyma**– The cells are living, elongated and irregularly thickened at the corners. They have very little intercellular spaces.

Functions– (i) It provides flexibility to plant parts like leaf and stem. (ii) It provides mechanical support.

(iii) **Sclerenchyma**– The cells are dead. They are long and narrow. Walls are thickened due to deposition of lignin.

Functions – (i) It makes plant hard and stiff., *eg.* Coconut husk. (ii) It provides mechanical strength.

Various types of simple tissues (a) parenchyma, (b) collenchyma and (c) sclerenchyma as shown below :



B. **Complex permanent tissue**– It is made of more than one type of cells. All cells perform same function. It is of two types – xylem and phloem.

Xylem– It consists of tracheids, vessels, xylem parenchyma and xylem fibres. Cells are thick walled and mostly dead.

Functions : (i) Tracheids and vessels transport water and minerals vertically.

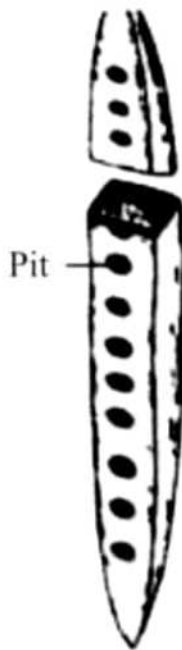
(ii) Fibres are supportive.

Phloem

It is made of sieve tubes, companion cells, phloem fibres, and phloem parenchyma. Except phloem fibres, phloem cells are living.

Function– (i) Transports food from leaves to other parts of the plant.

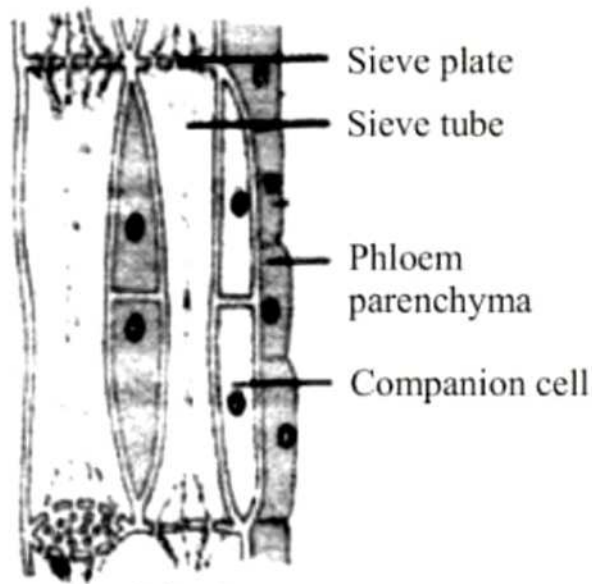
Various type of complex tissues : (a) Xylem
(i) Tracheid (ii) Vessel (b) Phloem as shown below



(a) (i) Tracheid



(a) (ii) Vessel



(b) Phloem

Animals Tissues

On the basis of functions performed, animal tissues are divided as :-

Epithelial tissue, connective tissue, muscular tissue and nervous tissue.

1. **Epithelial tissue**

It forms protective covering in the animal body, covers organs and separates different body systems. Different types of epithelial tissues on the basis of functions are-

- (i) **Simple squamous epithelium** - Cells are extremely thin, flat and form delicate lining. Oesophagus, lining of mouth are made of it.
- (ii) **Stratified squamous epithelium**- In the skin epithelial cells are arranged in many layers to prevent wear and tear.
- (iii) **Columnar epithelium** - It is present in the inner lining of intestine, pillar like tall cells. In respiratory tract the epithelial cells have hair-like projections called cilia on the outer surface.
- (iv) **Cuboidal epithelium** - It is made of cube-shaped cells. It forms lining of kidney tubules and ducts of salivary glands.
- (v) **Glandular epithelium**- In glands, a portion of the epithelium tissue folds inwards.

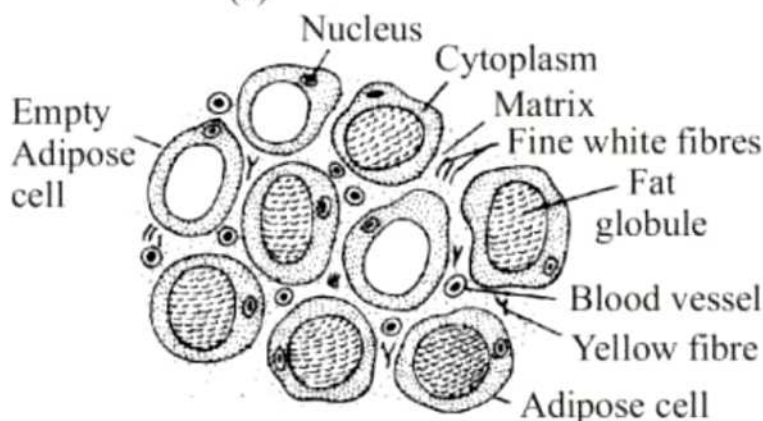
2. **Connective tissue**

The cells are loosely packed and embedded in intercellular matrix. It is of following types :-

- (i) **Areolar tissue** – It is found between skin and muscles, around blood vessels, nerves and bone marrow. It fills space inside organs, helps in repair of tissues.
- (ii) **Adipose tissue** – It is fat storing, found below the skin and between internal organs.
- (iii) **Bone** – It forms framework to support the body. Bone cells lie embedded in hard matrix composed of calcium and phosphorous.
- (iv) **Ligament** – connects two bones.
- (v) **Tendons** – connect muscles to bones.
- (vi) **Cartilage** – It has widely spaced cells. It is present in nose, ear, trachea, larynx.
- (vii) **Blood** – It is a fluid connective tissue. Fluid matrix is called **plasma** that contains red blood cells (RBCs), white blood cells (WBCs) and platelets unit.



(a)



(b)

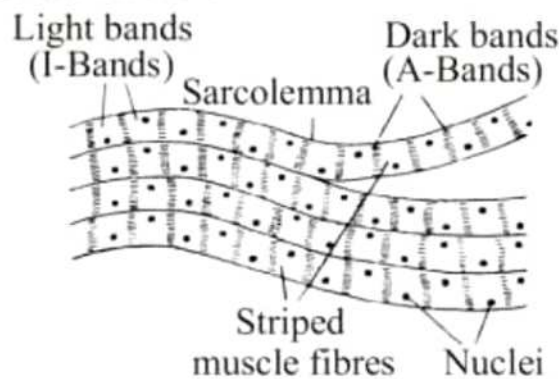
Connective tissues : (a) areolar tissues and (b) adipose tissue shown above

3. Muscular tissue

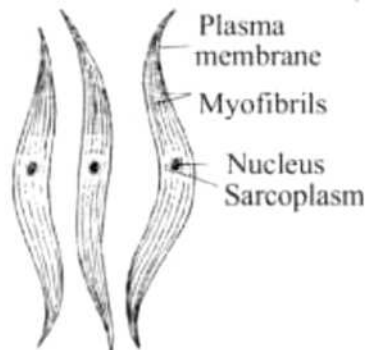
It consists of elongated cells called muscle fibres. They are responsible for movement in our body. The three types of muscles are :-

- (i) **Striated muscles** – They have alternate light and dark bands or striations. The cells are long, cylindrical, unbranched and multinucleate. They move according to our will so as called voluntary muscles. Eg. muscles of hands and legs.
- (ii) **Smooth muscles** – The cells are long with pointed ends and uninucleate. They are also called involuntary muscles eg. muscles found in iris of eye, ureters, bronchi of lungs, alimentary canal.
- (iii) **Cardiac muscles** – The muscle cells are cylindrical, branched and uninucleate. They are involuntary. E.g. the muscles of heart.

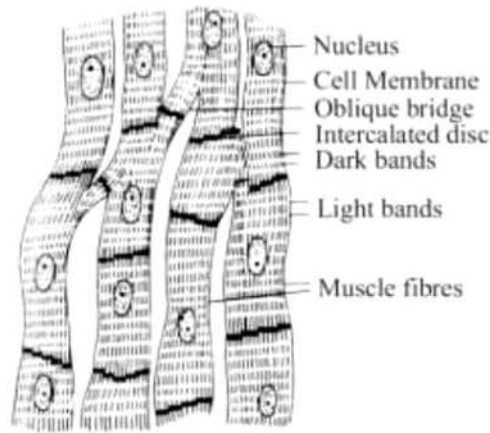
Various types of muscles fibres : (a) striated muscle, (b) smooth muscle and (c) cardiac muscle as shown below :



(a)



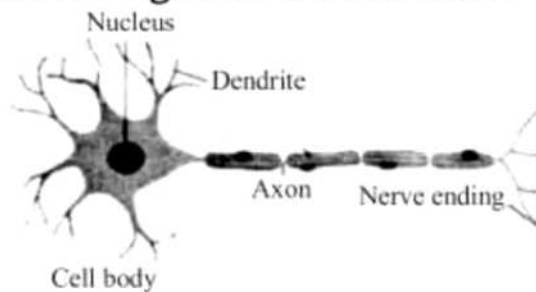
(b)



(c)

4. Nervous tissue

They are found in brain, spinal cord and nerves. They transmit the stimulus. A neuron consists of a cell body with a nucleus and cytoplasm. It has a long part called axon and many short, branched parts called dendrites. Many nerve fibres together form a nerve.



Neuron-unit of nervous tissue

| | |
|-----------------|--|
| Exercise | |
|-----------------|--|

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct.

1. Cell were first discovered by
 - (a) Robert Hooke
 - (b) Leeuwenhoek
 - (c) Purkinje
 - (d) Virchow
2. The plasma membrane is
 - (a) permeable
 - (b) impermeable
 - (c) selectively permeable
 - (d) both (a) and (b)
3. Nuclear material without cover is found in
 - (a) mycoplasma and green algae
 - (b) bacteria and fungi
 - (c) bacteria and blue green algae
 - (d) none of the above
4. The word 'prokaryote' means a cell
 - (a) with many nuclei
 - (b) with one nucleus
 - (c) with diffused nucleus
 - (d) without chloroplast
5. Minute structures on bacterial cell are called
 - (a) hair
 - (b) cilia
 - (c) flagella
 - (d) pili
6. Cell theory was proposed by
 - (a) Schleiden and Schwann
 - (b) Robert Brown
 - (c) Leeuwenhoek
 - (d) Purkinje
7. The undefined nuclear region in a bacteria is
 - (a) nucleoid
 - (b) nucleus
 - (c) chromosome
 - (d) nucleolus
8. Nucleus plays a crucial part in
 - (a) metabolism
 - (b) cellular reproduction

- (c) lipid synthesis
- (d) protein synthesis
- 9. Which of the following is not present in prokaryotes ?
 - (a) Ribosomes
 - (b) Cell wall
 - (c) Plasma membrane
 - (d) Nuclear membrane
- 10. Chemical nature of carrier molecules facilitating transport across plasma membrane is
 - (a) starchy
 - (b) sugary
 - (c) proteinaceous
 - (d) fatty acidic
- 11. ER remains associated with
 - (a) dictyosomes
 - (b) mitochondria
 - (c) karyotheca
 - (d) chloroplast
- 12. Vacuole is surrounded by
 - (a) plasmalemma
 - (b) cell wall
 - (c) tonoplast
 - (d) plasmodesmata
- 13. The organisms that lack membranes are
 - (a) Viruses
 - (b) Bacteria
 - (c) Protozoans
 - (d) Fungi
- 14. The organelle attached to the ER is
 - (a) ribosomes
 - (b) lysosomes
 - (c) golgi bodies
 - (d) proteins
- 15. Golgi bodies help in
 - (a) excretion of steroids
 - (b) storage and secretion
 - (c) translation
 - (d) transcription
- 16. According to fluid mosaic model plasma membrane is composed of
 - (a) phospholipids, extrinsic and intrinsic proteins

- (b) phospholipids and oligosaccharides
 - (c) phospholipids and hemicellulose
 - (d) phospholipids and integral glycoproteins
17. The presence of organelle is only revealed by electron microscope.
- (a) chloroplast
 - (b) mitochondria
 - (c) Golgi bodies
 - (d) lysosome
18. One of these is the smallest in size
- (a) Ribosome
 - (b) Lysosome
 - (c) Mitochondria
 - (d) Chloroplast
19. The SER helps in building the cell membrane. This process is called
- (a) protein synthesis
 - (b) membrane abiogenesis
 - (c) membrane biogenesis
 - (d) glycogenesis
20. Golgi apparatus is involved in the formation of:
- (a) lysosome
 - (b) vacuoles
 - (c) plastids
 - (d) mitochondria
21. DNA is a component of
- (a) mitochondria
 - (b) chloroplast
 - (c) cytoplasm
 - (d) (a) and (b) both
22. One of these is double membrane organelle
- (a) lysosome
 - (b) mitochondria
 - (c) nucleus
 - (d) endoplasmic reticulum
23. The cell organelle containing the flattened membrane bounded cisternae are located near the nucleus is
- (a) mitochondria
 - (b) Golgi
 - (c) centrioles
 - (d) nucleolus

24. The entry of mineral ions in a plant cell during absorption is by
 - (a) passive absorption
 - (b) active absorption
 - (c) osmosis
 - (d) endocytosis
25. The suicide bags of the cells are
 - (a) plastids
 - (b) mitochondria
 - (c) lysosomes
 - (d) ribosomes
26. The power houses of the cells are
 - (a) mitochondria
 - (b) plastids
 - (c) golgi complex
 - (d) ribosomes
27. Vesicles are essential for the normal functioning of the Golgi apparatus because
 - (a) they provide energy for chemical reactions.
 - (b) they move proteins and lipids between different parts of the organelle.
 - (c) they contribute to the structural integrity of the organelle.
 - (d) they produce the sugars that are added to proteins.
28. Amino acid chains built by the ribosomes then move to the
 - (a) golgi apparatus
 - (b) lysosome
 - (c) endoplasmic reticulum
 - (d) mitochondria
29. Simple tissues are
 - (a) parenchyma, xylem and collenchyma
 - (b) parenchyma, collenchyma and sclerenchyma
 - (c) parenchyma, xylem and sclerenchyma
 - (d) parenchyma, xylem and phloem
30. The living cells providing tensile strength are
 - (a) parenchyma
 - (b) collenchyma
 - (c) sclerenchyma
 - (d) sclerotic cells
31. The energy currency of the cell is

- (a) ADP
 - (b) ATP
 - (c) NADP
 - (d) FADP
32. The organelle that is present only in plant cells is
- (a) mitochondria
 - (b) endoplasmic reticulum
 - (c) ribosomes
 - (d) plastids
33. Quiescent centre is found in
- (a) root tip
 - (b) cambium
 - (c) shoot tip
 - (d) leaf tip
34. The conducting cells of xylem are
- (a) tracheary elements
 - (b) sieve elements
 - (c) companion cells
 - (d) all the above
35. The chief function of vessels in the plant body is
- (a) to translocate food material
 - (b) to conduct water and mineral salts
 - (c) to support living cells
 - (d) all the above
36. Inner surface of fallopian tubes, bronchi and bronchioles are lined by
- (a) squamous epithelium
 - (b) ciliated epithelium
 - (c) columnar epithelium
 - (d) cubical epithelium
37. The organelles that contain their own genetic material are
- (a) Mitochondria, Vacuoles
 - (b) Plastids, Golgi complex
 - (c) Mitochondria, Plastids
 - (d) Ribosomes, Nucleolus
38. The photosynthetic pigment is
- (a) chlorophyll
 - (b) chronophyll

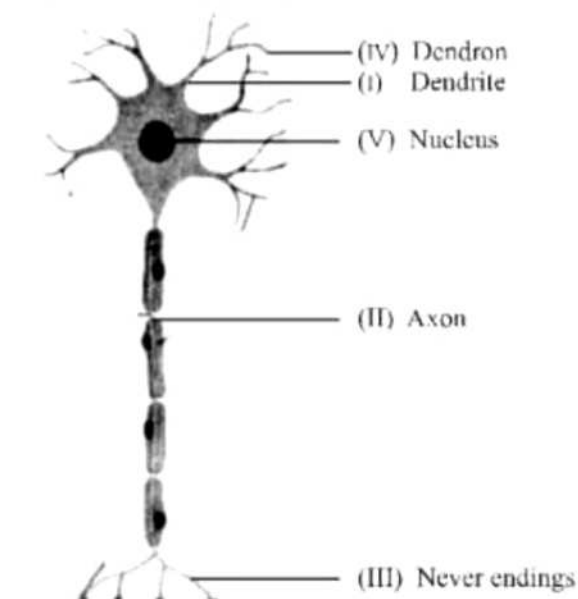
- (c) xanthophyll
 - (d) fucoxanthin
39. Average life span of human R.B.C. is
- (a) 100 days
 - (b) 90 days
 - (c) 120 days
 - (d) 80 days
40. Which set clearly identify striated muscles ?
- (a) Cylindrical, syncytial and unbranched
 - (b) Spindle, unbranched and uninucleated
 - (c) Cylindrical, striped and nucleated
 - (d) Cylindrical, striped and branched
41. Cardiac muscle cells are cylindrical branched
- (a) uninucleate and voluntary
 - (b) uninucleate and involuntary
 - (c) multinucleate and voluntary
 - (d) multinucleate and involuntary
42. Blood, phloem and muscle are
- (a) tissues
 - (b) organs
 - (c) cells
 - (d) organ system
43. Certain specific regions where growth takes place in plants is called
- (a) perisperm
 - (b) endosperm
 - (c) meristem
 - (d) stele
44. The fibrous tissue which connects the two bone is
- (a) connective tissue
 - (b) tendon
 - (c) ligament
 - (d) adipose tissue
45. Largest number of cell bodies of neuron in our body are found in
- (a) retina
 - (b) spinal cord
 - (c) brain
 - (d) tongue
46. Neurons are classified on the basis of

- (a) number of nucleus present
 - (b) number of processes arising from the cell body
 - (c) number of dendrites present
 - (d) number of axons present
47. The girth of the stem or root increases due to
- (a) apical meristem
 - (b) intercalary meristem
 - (c) lateral meristem
 - (d) None
48. The process of formation of permanent tissue in plants is called
- (a) scalarification
 - (b) differentiation
 - (c) cell thickening
 - (d) specialisation
49. Tissues that have long and narrow cells are called
- (a) cuboidal epithelium
 - (b) squamous epithelium
 - (c) germinal epithelium
 - (d) columnar epithelium
50. The vascular tissues of the plant function in
- (a) support
 - (2) support and transport of materials
 - (c) secretion of plant hormones
 - (d) All of the above
51. Which tissue lacks blood supply and heals slowly?
- (a) Nervous
 - (b) Muscle
 - (c) Cartilage
 - (d) Bone
52. The basic packing tissue is
- (a) sclerenchyma
 - (b) collenchyma
 - (c) xylem
 - (d) parenchyma
53. The tissue in leafstalks below the epidermis is made up of

- (a) collenchyma
 - (b) sclerenchyma
 - (c) parenchyma
 - (d) xylem
54. The thickening of the walls of the sclerenchyma tissues is due to
- (a) suberin
 - (b) magnesium
 - (c) lignin
 - (d) calcium
55. The waxy, water resistant layer in the xerophytic plants is secreted by
- (a) endodermis
 - (b) cortex
 - (c) phloem
 - (d) epidermis
56. Which of these options are not a function of Ribosomes ?
- (i) It helps in manufacture of protein molecules.
 - (ii) It helps in manufacture of enzymes.
 - (iii) It helps in manufacture of hormones.
 - (iv) It helps in manufacture of starch molecules.
- (a) (i) and (ii)
 - (b) (ii) and (iii)
 - (c) (iii) and (iv)
 - (d) (iv) and (i)
57. A person met with an accident in which two long bones of hand were dislocated. Which among the following may be the possible reason ?
- (a) Tendon break
 - (b) Break of skeletal muscle
 - (c) Ligament break
 - (d) Areolar tissue break
58. While doing work and running, you move your organs like hands, legs etc. Which among the following is correct ?
- (a) Smooth muscles contract and pull the ligament to move the bones.

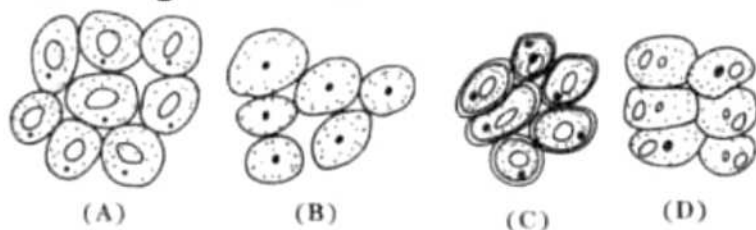
- (b) Smooth muscles contract and pull the tendons to move the bones.
 - (c) Skeletal muscles contract and pull the ligament to move the bones.
 - (d) Skeletal muscles contract and pull the tendon to move the bones.
59. The two kidney shaped cells of the stomata are called
- (a) epidermis
 - (b) guard cells
 - (c) stoma
 - (d) phloem
60. Xylem and Phloem are
- (a) parenchyma
 - (b) simple tissues
 - (c) simple permanent tissues
 - (d) complex permanent tissues
61. The only living tissue in the xylem is
- (a) tracheids
 - (b) vessels
 - (c) xylem parenchyma
 - (d) xylem fibres
62. In Phloem the materials can move in
- (a) upward direction
 - (b) downward direction
 - (c) both the directions
 - (d) None
63. Which muscles act involuntarily ?
- (i) Striated muscles
 - (ii) Smooth muscles
 - (iii) Cardiac muscles
 - (iv) Skeletal muscles
- (a) (i) and (ii)
 - (b) (ii) and (iii)
 - (c) (iii) and (iv)
 - (d) (i) and (iv)

64. A nail is inserted in the trunk of a tree at a height of 1 metre from the ground level. After 3 years the nail will
- move downwards
 - move upwards
 - remain at the same position
 - move sideways
65. Geeta was asked to prepare a temporary mount of onion peel and list the steps. While writing, she wrote the following steps which may not be in proper sequence. The correct sequence would be
- Add a few drops of safranin stain and transfer to a slide.
 - Cover it with a cover slip.
 - Add a drop of glycerine.
 - Take out onion peel.
 - Keep the peel in water in a petridish.
- i, ii, iii, iv, v
 - iv, v, iii, ii, i
 - iv, v, i, iii, ii
 - v, iv, i, iii, ii
66. Anuradha observed a slide of nerve cell and drew its diagram. Choose the correct labelling.



- I, II, III, IV, V are correct.
- V, II, III are correct.
- IV, V, II, III are correct.

- (d) Only I and IV are correct.
67. The lining of the kidney tubules is formed by
- squamous epithelium
 - cuboidal epithelium
 - columnar epithelium
 - simple squamous epithelium
68. The hard matrix of the bone consists of
- calcium & sodium
 - magnesium & sodium
 - phosphorous & magnesium
 - calcium & phosphorous
69. Four students observed a thin transverse section of plant stem and sketched the parenchyma tissue as given below.



The correct diagram is

- A
- B
- C
- D

Hints & SOLUTIONS —

Exercise 1

1. (a) Robert Hooke observed a thin slice of cork under the microscope. He observed small box like structures which he named as cells.
2. (c) The plasma membrane allows the entry and exit of some of the materials in and out of the cell. It also prevents movement of some other materials. Some substances like carbon-dioxide or oxygen move across the cell membrane by a process called diffusion. On the other hand, substances like water moves across the cell membrane through the process called osmosis. Therefore, the cell membrane is called a selectively permeable membrane.
3. (c)
4. (c)
5. (d)
6. (a)
7. (1) In prokaryotes, the nucleoid is an irregularly shaped region within the cell where the genetic material is localised.
8. (b) Cell division is a process by which a cell, called the parent cell, divides into two cells, called daughter cells. In meiosis however, a cell is permanently transformed and cannot divide again. Cell division takes from 3 minutes to 6 hours to complete. The primary concern of cell division is the maintenance of the original cell's genome. Before division can occur, the genomic information which is stored in chromosomes must be replicated, and the duplicated genome separated cleanly between cells.
9. (d)
10. (c)
11. (c)
12. (3)
13. (a) A virus is a sub-microscopic particle (ranging in size from 20 - 300 nm) that can infect the cells of a biological organism. Viruses can replicate themselves only by infecting a host cell.
14. (a) The surface of the rough endoplasmic reticulum is studded with protein-manufacturing ribo-

somes giving it a "rough" appearance. The ribosomes only bind to the ER once it begins to synthesize a protein destined for sorting. The membrane of the rough endoplasmic reticulum is continuous with the outer layer of the nuclear envelope.

15. (b)
16. (a)
17. (d)
18. (a) A ribosome (20 nm) is generally considered the smallest cellular organelle.
19. (c) The smooth endoplasmic reticulum has functions in several metabolic processes, including synthesis of lipids, metabolism of carbohydrates and calcium concentration, drug detoxification, and attachment of receptors on cell membrane proteins.
20. (a) The Golgi apparatus is integral in modifying, sorting, and packaging the substances for cell secretion or for use within the cell. It primarily modifies proteins delivered from the rough endoplasmic reticulum, but is also involved in the transport of lipids around the cell, and the creation of lysosomes.
21. (d) Chloroplast and mitochondria are double membrane bound organelles. They both have circular DNA.
22. (b)
23. (b)
24. (b)
25. (c) Lysosomes are organelles that contain digestive enzymes (acid hydrolases). They digest excess or worn out organelles, food particles, and engulfed viruses or bacteria. The membrane surrounding a lysosome prevents the digestive enzymes inside from destroying the cell.
26. (a) In cell biology, a mitochondrion is a membrane-enclosed organelle, found in most eukaryotic cells. Mitochondria are sometimes described as "cellular power plants," because they generate most of the cell's supply of ATP, used as a source of chemical energy.
27. (b)
28. (c) A polypeptide built by the ribosome is translocated into the lumen of the ER for the post

translational modification & then it moves to lysosomes for sorting process.

- 29. (b)
- 30. (b)
- 31. (b) Adenosine 5'-triphosphate (ATP) is a multifunctional nucleotide that is most important as a "molecular currency" of intracellular energy transfer. ATP transports chemical energy within cells for metabolism. It is produced as an energy source during the processes of photosynthesis and cellular respiration and consumed by many enzymes and a multitude of cellular processes including biosynthetic reactions, motility and cell division.
- 32. (d) Plastids are major organelles found in plants and algae. Plastids are responsible for photosynthesis, storage of products like starch and for the synthesis of many classes of molecules such as fatty acids and terpenes which are needed as cellular building blocks and/or for the function of the plant.
- 33. (a)
- 34. (a)
- 35. (b)
- 36. (b)
- 37. (c) Although most of a cell's DNA is contained in the cell nucleus, mitochondria have their own independent genomes. As mitochondria contain ribosomes and DNA, and are only formed by the division of other mitochondria, it is generally accepted that they were originally derived from endosymbiotic prokaryotes. Plastid DNA exists as large protein-DNA complexes associated with the inner envelope membrane and called 'plastid nucleoids'. Each nucleoid particle may contain more than 10 copies of the plastid DNA.
- 38. (a) Chlorophyll is a green pigment found in most plants, algae, and cyanobacteria. Chlorophyll absorbs most strongly in the blue and red but poorly in the green portions of the electromagnetic spectrum, hence the green color of chlorophyll-containing tissues like plant leaves. Chlorophyll is vital for photosynthesis, which helps plants obtain energy from light.

39. (c)
40. (a)
41. (b)
42. (a) Muscle tissue is separated into three distinct categories: visceral or smooth muscle, which is found in the inner linings of organs; skeletal muscle, which is found attached to bone in order for mobility to take place; and cardiac muscle which is found in the heart. Vascular tissue is a complex tissue found in vascular plants, meaning that it is composed of more than one cell type. The primary components of vascular tissue are the xylem and phloem. Connective tissue - It holds everything together. Blood is a connective tissue.
43. (c) A meristem is a tissue in plants consisting of undifferentiated cells (meristematic cells) and found in zones of the plant where growth can take place.
44. (c)
45. (c)
46. (b)
47. (b) The intercalary meristem increases the girth of the stem or root. The intercalary meristems occur only in monocot stems between mature tissues. They are cylindrical meristems located around the nodes and are an adaptation to grazing herbivores and landmowers.
48. (b) Differentiated plant cells generally cannot divide or produce cells of a different type. Therefore, cell division in the meristem is required to provide new cells for expansion and differentiation of tissues and initiation of new organs, providing the basic structure of the plant body.
49. (d)
50. (b)
51. (c)
52. (d) Parenchyma cells are thin-walled cells of the ground tissue that make up the bulk of most non-woody structures, although sometimes their cell walls can be lignified. Parenchyma cells in between the epidermis and pericycle in a root or shoot constitute the cortex, and are used for storage of food.

- 53. (c)** The tissue between the upper and lower epidermis is called the mesophyll which is made up of parenchyma. Parenchyma may be spherical, oval round, polygonal or elongated in shape. They perform various functions like photosynthesis, storage and secretion.
- 54. (c)** Sclerenchyma is a supporting tissue. Two groups of sclerenchyma cells exist: fibres and sclereids. Their walls consist of cellulose and/or lignin. Sclerenchyma fibres are of great economical importance, since they constitute the source material for many fabrics flax, hemp, jute, ramie.
- 55. (d)** A xerophyte or xerophytic organism is an organism, which is able to survive in an ecosystem with little to no water or moisture; usually in environments where heat accounts for a similar amount of water loss to that of transpiration.
- 56. (c).**
- 57. (c).**
- 58. (d)**
- 59. (b)** A stoma is a tiny opening or pore, found mostly on the underside of a plant leaf, and used for gas exchange. The pore is formed by a pair of specialized sclerenchyma cells known as guard cells which are responsible for regulating the size of the opening.
- 60. (d)** Vascular tissue is a complex tissue found in vascular plants, meaning that it is composed of more than one cell type. The primary components of vascular tissue are the xylem and phloem. These two tissues transport fluid and nutrients internally.
- 61. (c)** Xylem parenchyma is the only living tissue of the xylem while the tracheids, vessels and the fibres are all dead tissues.
- 62. (c)** In the xylem, the substances move only in the upward direction but in the phloem substances move in both the directions.
- 63. (b).**
- 64. (c).**
- 65. (c).**
- 66. (b)**

- 67. (b)** Cuboidal cells have a shape similar to a cube, meaning its width is the same size as its height. The nuclei of these cells are usually located in the center. The lining of the kidney tubules is formed by it.
- 68. (d)** The matrix comprises the other major constituent of bone. It has inorganic and organic parts. The inorganic is mainly crystalline mineral salts and calcium, which is present in the form of hydroxyapatite. The matrix is initially laid down as unmineralized osteoid. Mineralisation involves osteoblasts secreting vesicles containing alkaline phosphatase. This cleaves the phosphate groups and acts as the foci for calcium and phosphate deposition.
- 72. (a)** The cells of parenchyma tissue are thin walled, isodiametric, nucleated and have dense cytoplasm.

Chapter 2

Biological Classification & Mode of Reproduction

CLASSIFICATION OF ORGANISM

- Life has evolved on planet Earth over millions of years ago.
- Different kinds of life forms exist on Earth which ranges from microscopic bacteria of few micrometre to red wood trees of 100 metres and blue whale of 30 metres in size.
- For our convenience, we put them into different classes, groups and sub groups on the basis of similarities and differences among them.
- The process of reproduction ensures continuing of life on earth.
- **Reproduction** gives rise to more organisms with the same basic characteristics as their parents.

Basis of Classification

Aristotle classified animals on the basis of their habitat - land and water. Later on organisms were divided into groups and sub groups on the basis of particular characteristics like form and function. A whole hierarchy of mutually related characteristics is used for classification

Some Important characteristics are :

- (i) Presence and absence of nucleus in the cell.
- (ii) Body composed of single cell or group of cells.
- (iii) Autotrophs (producing own food) and heterotrophs (getting food from outside).
- (iv) Development and organisation of different body parts.

Classification and Evolution

- The life forms that we see today have arisen by accumulation of changes in the body design that help the organisms to survive in a better way *i.e.* through evolution.

- Older organisms are simpler while younger organisms are complex. The complexity in design comes during evolution.
- Charles Darwin was a British scientist who gave the **Theory of Evolution**. He wrote the famous book "**The Origin of Species**".

The Hierarchy of Classification – Groups

Ernst Haeckel (1894), **Robert Whittaker** (1959) and **Carl Woese** (1977) classified organisms into kingdoms. **Whittaker** divided them into 5 kingdoms, **Monera**, **Protista**, **Fungi**, **Plantae** and **Animalia** on the basis of their cell structure, mode and source of nutrition and body organisation.

- Various levels of classification are –
Kingdom → Phylum (animals)/ Division (plants) → Class → Order → Family → Genus → Species.
- Species is the basic unit of classification.

The 5 kingdoms of Whittaker are –

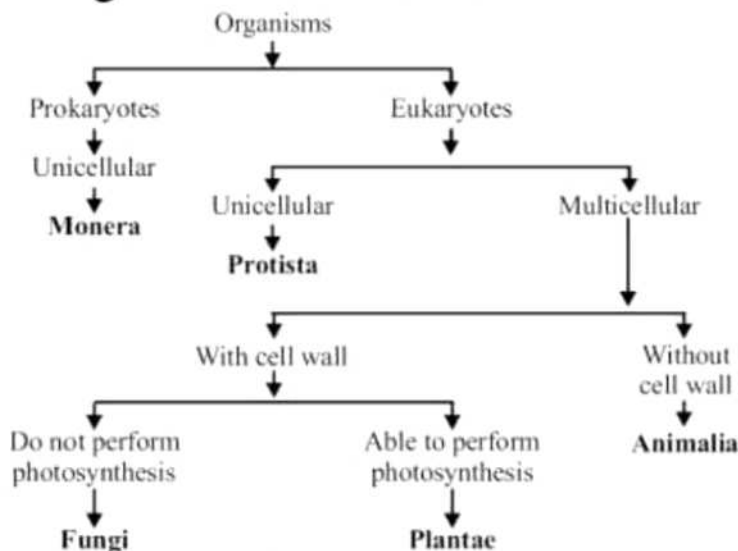


Fig. The five kingdom classification

Monera

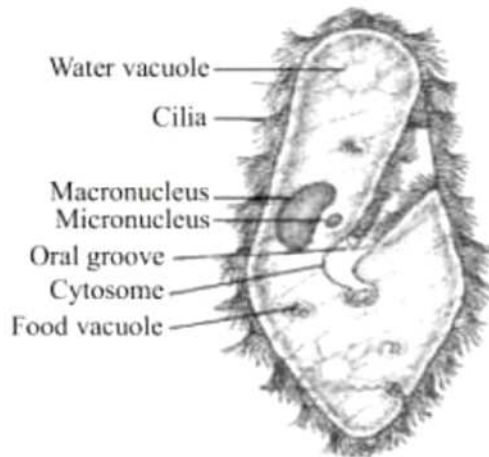
They are usually unicellular, do not have well defined nucleus and organelles. Cell wall may be present or absent. Mode of nutrition is autotrophic or heterotrophic. *E.g.* Bacteria, Blue-green algae, Mycoplasma.



Bacteria

Protista

They are unicellular, eukaryotic organisms. Cilia or flagella help in movement. They have autotrophic or heterotrophic mode of nutrition. *E.g.* Algae, Diatoms, Protozoans.



Paramecium

Fungi

They are heterotrophic, eukaryotic organisms. They are saprophytes that use decaying organic material as food. Cell wall is made of chitin. The symbiotic relation with blue green algae forms lichens. *E.g.* Yeast, Mushrooms.



Aspergillus

PLANTAE

They are multicellular eukaryotes with cell walls. They have autotrophic mode of nutrition. All

plants are included in this group. **Plants are divided into following 5 groups –**

- (i) **Thallophyta** – Plant body is like a thallus, not differentiated in root, stem and leaves. Commonly called algae. eg. *Spirogyra*, *Ulothrix*, *Chara*.



Ulothrix

- (ii) **Bryophyta** – It is also called amphibians of the plants kingdom. Body is differentiated to form stem and leaf. e.g. *Funaria*, *Marchantia*.



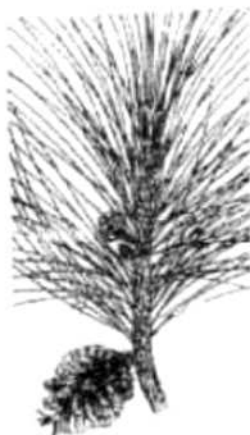
Marchantia

- (iii) **Pteridophyta** – Plant body is differentiated into root, stem and leaves. Specialised water conducting tissues present. E. g. Ferns, *Marsilea*.



Fern

- (iv) **Gymnosperms** – They bear naked seeds, and are usually perennial, and woody. Eg. Pines, Deodar.



Pinus

- (v) **Angiosperms** – They are flowering plants in which seeds are enclosed within fruit. **Angiosperms are of two types :**
Monocots – Seeds with single cotyledon.
Dicots – Seeds with two cotyledons.

ANIMALIA

They are eukaryotic, multicellular and heterotrophic organisms that do not have cell wall. **On the basis of extent and type of body design, they are classified as–**

- (i) **Porifera** – It includes non-motile animals. Holes or pores are present all over the body. They are commonly called sponges. *E.g. Spongilla, Sycon.*
- (ii) **Coelenterata** – Also called cnidaria. They have more differentiated body organisation. They are water animals with coelenteron (body cavity). *E.g. jelly fish, Sea anemone, etc.*
- (iii) **Platyhelminthes** – Body is dorsiventrally flat so they are called flatworms. Body is bilaterally symmetrical and triploblastic. *E.g. Planaria, Tapeworms.*
- (iv) **Nematoda** – Body is triploblastic, bilaterally symmetrical, and has tissue level of organisation, Pseudocoel is present. *E.g. Ascaris, Wuchereria.*
- (v) **Annelida** – Body is bilaterally symmetrical and triploblastic. True body coelom is present. True organs are present. *Eg. Earthworms, Leeches etc.*

- (vi) **Arthropoda** – Body is bilaterally symmetrical and segmented. They have open circulatory system, jointed legs are present. *E.g.* Prawns, Butterflies. etc.
- (vii) **Mollusca** – Body is bilaterally symmetrical with little segmentation. Coelom is reduced. They have open circulatory system. Foot, kidney like organs are present. *E.g.* Snails, Mussels etc.
- (viii) **Echinodermata** – They are spiny skinned animals. Body is triploblastic. They have tube system for movement of body. *E.g.* Starfish, Sea urchins.
- (ix) **Protochordata** – Body is bilaterally symmetrical, triploblastic with a coelom. Notochord is a long rod like structure running along the back of animal. *E.g.* *Balanoglossus*, *Herdmania*.
- (x) **Vertebrata** – Animals have vertebral column and skeleton. Body is bilaterally symmetrical, triploblastic, coelomic and segmented.

IMPORTANT FEATURES OF VERTEBRATES :

- (i) Presence of notochord
- (ii) Presence of dorsal nerve cord
- (iii) Triploblastic
- (iv) Presence of paired gill pouches
- (v) Coelomic body

Vertebrates are divided into 5 classes

- (i) **Pisces** – Include fishes which are aquatic. Skin is covered with scales or plates. Gills are present. *E.g.* Shark, Rohu.
- (ii) **Amphibia** – They have mucus glands in skin. Respiration is through gills or lungs. Animals are found both in water and on land. They have 3- chambered heart. *E.g.* Toads, Frogs, Salamander.
- (iii) **Reptilia** – They are cold blooded animals with scales and breathe through lungs. They have 3 – chambered heart. They lay