

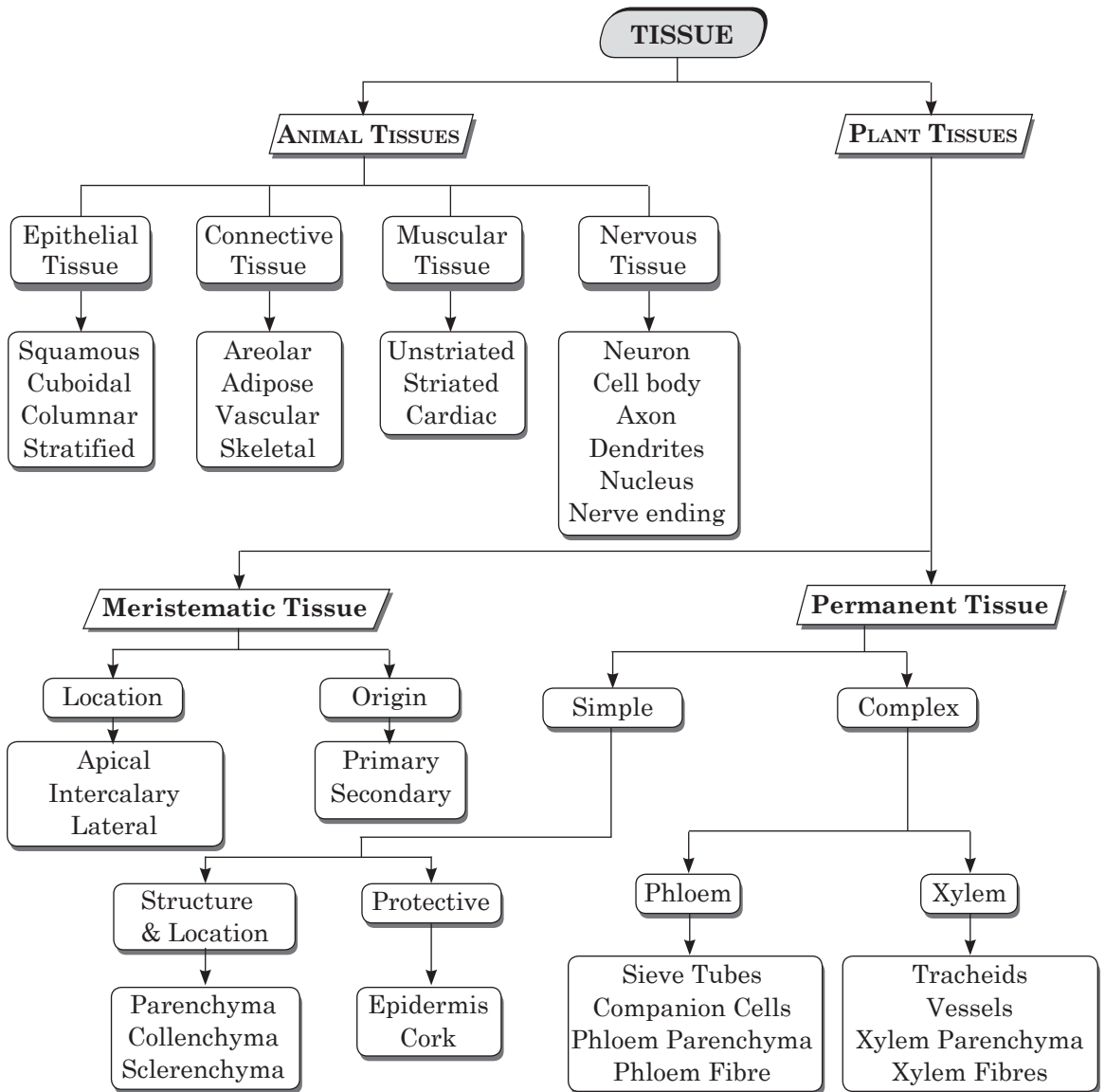
# 6

## Tissues

### TOPICS COVERED

- 6.1 Are Plants and Animals Made of Some Types of Tissues?
- 6.2 Animal Tissues

### CHAPTER MAP



## QUICK REVISION NOTES

- *Tissue* is a cluster of cells, arranged and designed so as to give the maximum efficiency in function. They work together to achieve a particular function.
  - Nerve cells are organised into nerve tissues and muscle cells to form muscle tissue.
  - Epithelial tissue forms protective covering for the structures beneath it.
  - Connective tissue supports and connects different tissues.
  - The vascular tissue of plants is made up of *Xylem* and *Phloem*.
  - Xylem transports water and minerals whereas phloem transports food.
  - *Ground tissue* forms the bulk of the tissue of a young plant. It helps in photosynthesis, food storage and physical support.
  - Epidermal cell of a plant with non-woody stem are organised into dermal tissue. This tissue forms outermost layer of the plant and protect it from the injury and drying out.
  - In plants most of the tissues are dead. Since dead cells can provide mechanical strength as easily as living ones and need less maintenance.
  - Animals consume more energy as they move around in search of food, mate and shelter. Most of the animal tissues are living.
  - The growth of a plant is limited to the certain regions whereas in animal there is overall growth.
  - Cell growth is more uniform in animals.
  - Plant tissue grows in the certain specific regions.
  - *Meristematic tissues* are further classified into *apical*, *intercalary*, *lateral* tissues based on location. They are also classified into primary and secondary tissues on the basis of their origin.
  - Some tissues in plants divide throughout their life. These are called growing or meristematic tissue.
  - *Apical meristem* is present at the growing tips of stems and roots. They increase the length of the stem and the root.
  - The girth of a stem or a root increases due to *lateral meristem* (cambium).
  - *Intercalary meristem* is present either at the base of the leaves or in internodes of the twigs.
  - *Permanent tissues* are derived from the meristematic tissue, once they lose their ability to divide. They are divided into simple and complex tissues.
  - Simple tissues are parenchyma, collenchyma and sclerenchyma. They are protective as well as supportive tissues.
  - Xylem and Phloem are the complex tissues. They are conducting or vascular tissues.
  - Epithelial tissue of the animals is further classified into squamous, cuboidal, columnar, ciliated and glandular depending on the shape and function.
  - Connective tissue in our body includes areolar tissue, adipose tissue, bone, tendon, ligament, cartilage and blood.
  - Striated, unstriated and cardiac are the three types of muscle tissues.
  - The connective tissue binds or connects other tissues together, e.g. muscle to bone (tendon), bone to bone (ligament) or various body parts (blood).
  - Nervous tissue is made up of neurons which receives and conduct impulses.
  - Blood is a connective tissue. Plasma is a fluid matrix of the blood.
  - Skeletal tissues are hard connective tissues that form the supportive frame work of the body.
  - Bone cells are embedded in a hard matrix.
  - Cartilage is an elastic and less hard than a bone.
  - Muscular tissues belong to skeletal muscle, cardiac muscle and smooth muscle.
  - Impulse is the electrical signal transmitted along the axon of a nerve cell.
-

# 1. ARE PLANTS AND ANIMALS MADE OF SAME TYPES OF TISSUES?

## Difference between plant tissue and animal tissue

Plant tissues	Animal tissues
They mostly have dead supportive tissues therefore plant do not move.	Most of the tissues are alive therefore animals move around in search of food, mate and shelter.
They need less energy.	They need more energy.
They have two types of tissues meristematic (dividing) and permanent (non-dividing).	They have mostly living (dividing) tissue.
They grow throughout their life due to dividing tissues.	In animals only reparative growth is present.
They have simple organisation of tissues.	They have complex organisation of tissues.
Tissue organisation is for their stationary (do not move) habit.	Tissue organisation is for moving habits of animals.

## Plant tissues

### Meristematic tissues:

- They are the simple living tissues which keep on dividing throughout their life.
- They have thin primary cell wall made up of cellulose.
- There are no intercellular space due to compact tissue structure.
- Mostly dense cytoplasm, prominent nuclei, or few or no vacuoles.
- Cell organelles are large in number.
- Their metabolic rate is active but do not have stored food.
- They are found in growing regions, e.g. root and shoot tips.
- They may be spherical, oval, rectangular or polygonal shaped.

Classification on the basis of origin

Primary (Promeristematic)	Secondary
They come from embryo.	They are formed by permanent tissues
Cells are derived from primary meristem.	Cells are derived from primary permanent tissues.
They lead to primary growth of plants.	They lead to secondary growth, i.e. the diameter of plants.

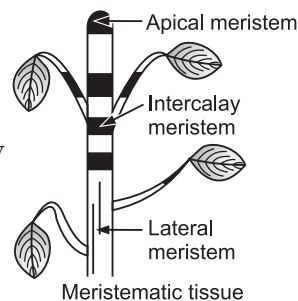
## Classification based on location

### Apical Meristem

- It is present at the growing tips of shoots and roots of the plants.
- Cell division leads to the elongation of stem and roots.
- They are involved in the primary growth of the plants.
- These are also found at the apices of leaves.

### Intercalary Meristem

- It is present at the base of the leaves and at internodes, e.g. axillary buds.
- It gives rise to new branches.
- It increases the length of a leaf.
- It occurs below the nodes.



## Lateral Meristem

- It is found beneath the bark called cork cambium.
- It is responsible for secondary growth, i.e. girth of stem increases.
- It gives rise to vascular bundles of dicot roots and stems. eg vascular cambium.
- **Cambium** is the region which is responsible for the growth in thickness.

## Permanent tissues

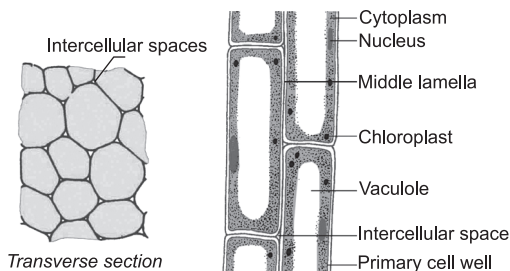
- The division of meristematic tissues give rise to permanent tissues when they lose their ability to divide.
- They provide protection, support, conduction, photosynthesis, storage etc.
- It consists of those cells which are not dividing.
- They have specific shape, size and thickness.
- They may be dead or living.
- **Differentiation:** It is a process of development in which cell derived from meristematic tissues take permanent shape, size and thickness.

## Classification based on structure and composition

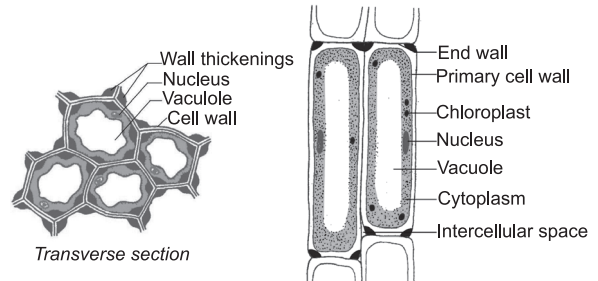
These are made up of same type of cells which have similar structure and function.

### Parenchyma

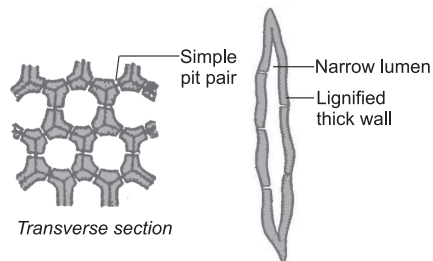
- It has few layers of cells which form basic packing tissue.
- It forms the bulk of a plant body and is a fundamental tissue.
- They have thin walls and unspecialised living cells.
- Large intercellular spaces are found in these tissues.
- Some parenchyma tissues contain chlorophyll for photosynthesis and are called chlorenchyma, e.g. mesophyll of leaves.
- In aquatic plant, large air cavities are present in parenchyma to give buoyancy to the plants to help them float. It is called **aerenchyma**.
- The parenchyma of stems and roots store food nutrients and water.



**Parenchyma tissue**



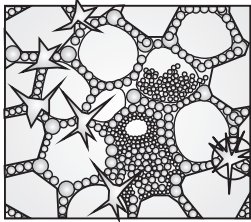
**Collenchyma Tissue**



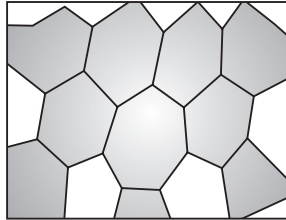
**Sclerenchyma Tissue**

## Collenchyma

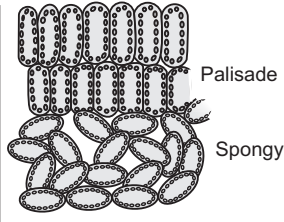
- It is a living tissue.
- It provides flexibility to plants, bending in various parts of plants without breaking in the leaf or a stem.
- It provides mechanical support and elasticity to plants by growing stems, e.g. herbaecous dicot plant.
- The cells are elongated and have thick corners.
- They may have few chloroplasts for photosynthesis.
- They have very little intercellular space.



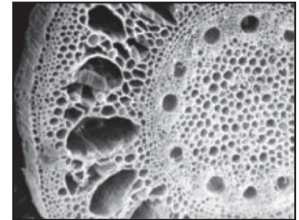
Sclereids



Parenchyma



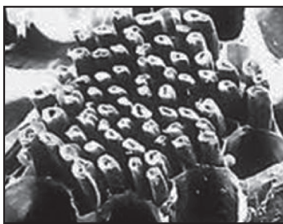
Chlorenchyma



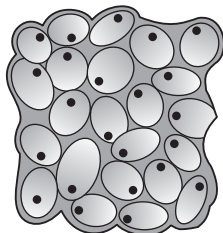
Aerenchyma

## Sclerenchyma:

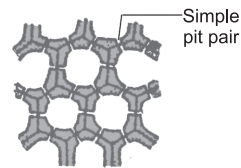
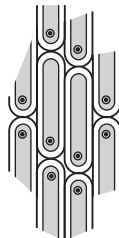
- Cells are dead, with no intercellular space.
- They are long and narrow as walls are thickened due to lignin. (a chemical substance which acts like a cement and hardens them)
- These are the strengthening tissues, hard, thick walled cells no e.g. husk of a coconut.
- These tissues are present in stems, around vascular bundles, in the veins of leaves and in hard covering of seeds and nuts.



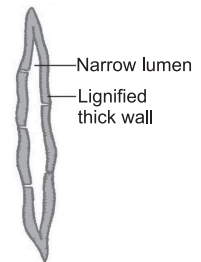
Sclerenchyma Fiber



Collenchyma



Simple pit pair



Narrow lumen  
Lignified thick wall

Sclerenchyma

### Differences between sclerenchyma fibres and sclereids

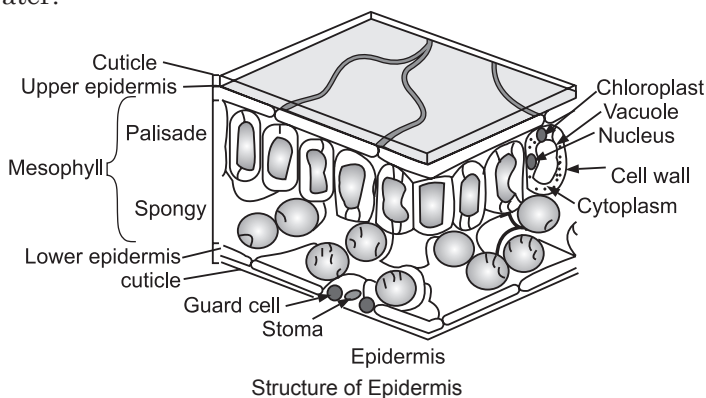
Sclerenchyma Fibres	Sclereids
Elongated, spindle shaped, thickwalled dead cells.	Broad thick walled round around also called or stone cells.
Thick bundle of fibres. Present in xylem and phloem.	Small cells, present in the fruits like mango, coconut, walnut, legume seeds.
Used in manufacture of ropes, mats, textile fibres, jute and coir	They are hard covering of nuts and seeds, provide stiffness or give grittyness to pulp.

## Classification based on protection

These tissues are mainly protective in function.

### **Epidermis**

- It is made up of single outermost layer of cells called epidermis.
- It is one cell thick outermost layer for the protection of leaves, flowers, stems and roots.
- It is covered with **cuticle** (water proof layer of waxy substance, cutin secreted by the epidermal cells). It protects the plant from mechanical injury, parasites, and fungi.
- In very dry habitats, epidermis may be thicker to prevent water loss.
- The cells form continuous layer without intercellular space.
- Mostly epidermal cells are flat, outer and side walls are thicker than the inner walls.
- Cuticle is thick in **Xerophytes** (plants living in dry habitats having less water).
- In epidermis of a leaf, there are small pores called **stomata** which are enclosed by the two kidney shaped cells called **guard cells**.
- Guard cells are the only epidermal cells which contain chloroplasts.
- Epidermal cells of the roots bear long hair like parts which increase surface area for the absorption of water.

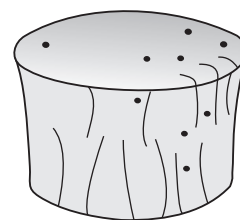


### **Functions**

- (i) Protection from infection, and injury.
- (ii) Cuticle cuts the rate of transpiration to prevent loss of water.
- (iii) Stomata allows gaseous exchange during photosynthesis and respiration.
- (iv) Stomata helps in transpiration.

### **Cork (Phellum)**

- In older roots and stems, tissues form several layer thick **cork** or bark of the tree is formed.
- Cells of cork are dead with no intercellular space, compactly arranged.
- They have a chemical called **suberin**, a waxy substance in their walls which allow water and gases to enter.
- They do not have protoplasm but are filled with resins or tannins.



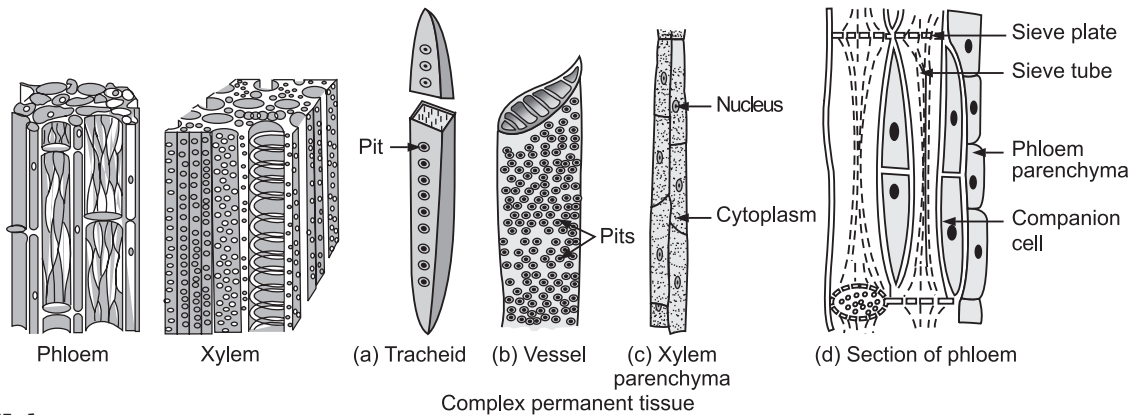
Cork (Phellum)

### **Functions**

- These are protective.
- These are commercially useful due to lightness, elasticity and toughness.
- Used for making sports goods, like cricket balls, shuttle cocks, etc.

### **Complex Permanent Tissue**

- Complex tissues are made up of more than one type of cells.
- All these cells coordinate to perform a common function.
- Xylem and phloem are examples of complex tissues which are conductive tissues and constitute a vascular bundle. It helps plants to survive in terrestrial environment.



## Xylem

- It consists of tracheids, vessels and xylem parenchyma. Tracheids and vessels are conducting elements.
- It is called wood and is the vascular and mechanical tissue.
- It has thick walled cells in the form of tubular passage, where most of them are dead cells.
- It has unidirectional movement, transporting water and minerals from roots to leaves. Parenchyma is the only fine part. It stores food or help in lateral conduction of water.

### Tracheids

- These are the elongated angular dead cells involved in the conduction of water and minerals in all vascular plants.
- These are single celled and end wall is intact hence conduction occur slowly.
- Walls are thick with a narrow lumen.

### Vessels

- These are advanced elements found mainly in angiosperms (flowering plants).
- Vessels are cylindrical tube like structures made up of row of cells placed one above the other by end to end for efficient conduction of water.
- End walls get divided and get perforated.
- Walls are thick but have wider lumen.

### Xylem parenchyma

- It consists of living cells.
- It stores food.
- It helps in lateral conduction of water.

### Xylem fibres

- It consists of dead cells, with narrow and thick walls containing lignin for mechanical support.
- The annual rings present in the trunk of a tree form vascular cambium. They are xylem rings which help in finding the age of a tree.

## Phloem

- It is made up of sieve tubes, companion cells, phloem fibres and phloem parenchyma. Only fibres are dead and other three are livings. Sieve tubes are conducting elements. It has a bidirectional movement, from leaves to storage organs and during spring from storage organs to growing parts.

### Sieve tubes

- These are slender tubes like structures made up of elongated, thin walled cells which are placed from end to end.

- The end walls are perforated by many pores and are called sieve plates.
- Nucleus of sieve cell degenerates at maturity, but cytoplasm persists.
- It has protein which helps in growth and repair of sieve cells.

### **Companion cells**

- They have dense cytoplasm and a large elongated nuclei.
- They originate from the same mother cell, therefore, called sister cell.
- It connects to the sieve tube with numerous plasmodesmata (cylindrical, lined by plasma membrane of the adjacent cells).

### **Phloem parenchyma**

- These are thin walled living cells of parenchyma of phloem.
- They store food and help in radial conduction and slows down lateral conduction.

### **Phloem fibres**

- It gives mechanical support to sieve tubes.
- These are thick walled, dead cells which have narrow lumen.
- Bast fibres are obtained from jute, hemp, flax which has commercial value.
- In phloem, all elements are living except phloem fibres.

## **Exercise 6.1**

### **I. Very Short Answer Type Questions**

**(1 Mark)**

1. What is a tissue?

[NCERT]

2. Where is apical meristem found?

[CBSE 2015] [NCERT]

OR

Which meristem is present at growing tips of stems and roots.

3. Which tissue makes up the husk of a coconut?

[NCERT]

4. How are simple tissue different from complex tissue?

[NCERT]

5. Girth of stem increases due to which type of meristem?

[NCERT Exemplar]

6. Name the tissue derived directly from the meristem of an embryo.

[DOE]

7. What is the name given to a group of cells with similar structure organised to do a common function?

8. Which plant tissue always remains in active metabolic state?

[DOE]

9. In which tissue sieve tubes and companion cells are found?

10. What is the name given to the long, narrow dead cells having thick deposition of lignin in the cell wall?

11. What is cambium?

12. Which tissue is responsible for transport of water in plants?

13. How can we determine age of a tree?

[HOTS]

14. Which is the living element of xylem?

15. Which tissue in plants conducts food?

16. Where are intercalary meristems found?

17. What do you mean by turgidity?

18. What is function of the guard cells?

19. What is the role of suberin deposits in cork cambium?

20. How and where is carbon fixation takes place in plants?

[HOTS]

21. Which plant tissue provides buoyancy to aquatic plants? How?

22. Which is the water conducting tissue generally present in the gymnosperm?

23. If the tip of a sugarcane plant is removed from the field even then it keeps growing in length. Why?

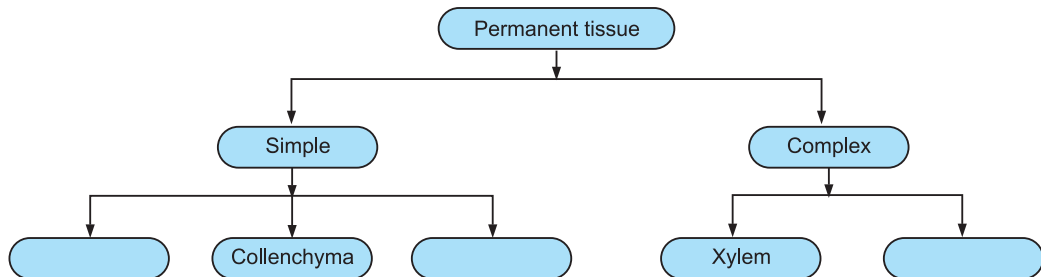


24. In desert plants, the rate of water loss gets reduced, how?
25. Which type of components in phloem, do not lose their nucleus at maturity?
26. Which tissue is responsible for survival of plants in terrestrial environment?
27. Name the simple tissue which has dead cells. [NCERT Exemplar]
28. Which plant tissue provides both mechanical strength as well as flexibility?
29. What is meant by differentiation?
30. Why does water hyacinth float on water surface?
31. Which component of phloem is absent in monocot stem?
32. Cell wall of meristematic tissue is made up of which chemical?
33. Name a non-living component of the phloem.
34. Can we give reason why meristematic cells would lack vacuoles?
35. Presence of which tissue in plants has made their survival possible in terrestrial environment?
36. Water hyacinth float on water surface. Explain.
37. Which structure protects the plant body against the invasion of parasites?

## II. Short Answer Type Questions-I

(2 Marks)

38. What are the functions of stomata? [NCERT]
39. How is water transported with the help of xylem?
40. How is food transported by Phloem?
41. Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall. [NCERT]
42. Give three features of parenchyma cells.
43. Complete the table: [NCERT]



44. (a) Name the plant tissue which is found in the husk of a coconut. Identify the chemical which is responsible for its stiffness.  
 (b) Give one way in which it differs from parenchymatous cells. [NCERT] [CBSE 2010]
45. What is the utility of tissues in a multicellular organism? [NCERT]
46. Name three types of simple tissues. [CBSE 2010] [NCERT]
47. What are the constituents of phloem? [CBSE 2015] [NCERT]
48. How many types of elements together make up a xylem tissue? Name them.
49. What happens to the cells formed by meristematic tissue?
50. Given below are some characteristic. Supply the name of plant tissue which possesses that characteristic.
  - (i) Thin walled, packing cells
  - (ii) Photosynthesis
  - (iii) Localized thickenings
  - (iv) Provides Buoyancy

### III. Short Answer Type Questions–II

(3 Marks)

51. Name the plant tissue which shows the following features?  
(i) present in the outermost layer of plant body such as leaves, flowers, stem and roots.  
(ii) protective tissue which has one type of cell with suberin deposits.  
(iii) made up of green coloured chloroplasts and have intercellular space
52. What is the location and function of companion cells?
53. Give six differences between the permanent tissue and meristematic tissue.
54. (a) Name the living component which is common in both the complex permanent tissue found in the plants. What is its function?  
(b) Give any two ways in which this tissue differs functionally from each other.

[CBSE 2010]

55. Give six differences between the plant and the animal tissues.
56. Mention the role of parenchyma, collenchyma and sclerenchyma.
57. How do multicellular organisms achieve highest possible efficiency in their functioning?

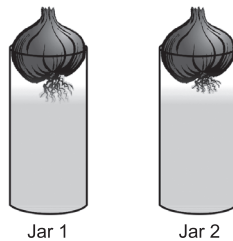
OR

Multi-cellular organisms show division of labour even tissue level. Comment.

OR

What is the utility of tissues in multi-cellular organisms?

58. Discuss the way plant tissues with ability to divide are classified on the basis of their location in the plant body. Support your answer by giving examples.
59. Growth of roots in onion bulbs



Growth of roots in onion bulbs

- (i) Take two glass jars and fill them with water.  
(ii) Now, take two onion bulbs and place one on each jar, as shown in Fig. 6.1.  
(iii) Observe the growth of roots in both the bulbs for a few days.  
(iv) Measure the length of roots on day 1, 2 and 3.  
(v) On day 4, cut the root tips of the onion bulb in jar 2 by about 1 cm.  
After this, observe the growth of roots in both the jars and measure their lengths each day for five more days  
From the above observations, answer the following questions:  
(a) Which of the two onions has longer roots? Why?  
(b) Do the roots continue growing even after we have removed their tips?  
(c) Why would the tips stop growing in jar 2 after we cut them?
60. Differentiate between sclerenchyma and parenchyma tissues. Draw well labelled diagram.
61. Why is epidermis important for the plants? Draw its diagram.
62. Name the different components of xylem and draw a living component?
63. Draw and identify different elements of phloem.
64. Why are xylem and phloem called complex tissues? How are they different from one other?

#### IV. Long Answer Type Questions

(5 Marks)

65. Do plants and animals have the same structure? Do they both perform similar functions?

OR

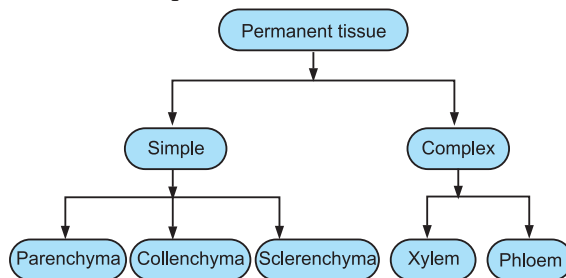
Compare animals and plants on the basis of

- (i) The different modes of life, particularly in their different feeding methods.
  - (ii) Their structure and functions
  - (iii) in the pattern of growth
  - (iv) the dividing capacity of the tissues
  - (v) Difference in organ system design
66. Give reasons for
- (i) Meristematic cells have a prominent nucleus and dense cytoplasm but they lack vacuole.
  - (ii) Intercellular spaces are absent in sclerenchymatous tissues.
  - (iii) We get a crunchy and granular feeling, when we chew pear fruit.
  - (iv) Branches of a tree move and bend freely in high wind velocity.
  - (v) It is difficult to pull out the husk of a coconut tree.
67. List the characteristics of cork. How are they formed? Mention their role.
68. Differentiate between meristematic and permanent tissues in plants

#### Answers 6.1

1. Tissue is a group of cells of same kind to perform a particular function.
  2. It is found at the apex of a shoot and tips of the root of angiosperms (flowering plants).
  3. Sclerenchymatous fibres.
  4. Simple tissues are made up of only one type of cells whereas complex tissues are made up of different types of cells.
  5. Lateral meristem.
  6. They are called primary meristem (promeristematic).
  7. Tissue
  8. Meristematic tissue.
  9. Phloem.
  10. Sclerenchyma
  11. Cambium is a region which is responsible for the thickness of a bark of a plant.
  12. Xylem.
  13. It can be determined by counting annual rings present in the trunk of tree call xylem rings.
  14. Xylem parenchyma.
  15. Phloem.
  16. These are found in the base of the leaves and on internodes.
  17. When a plant cell has enough water, the cell is firm and turgid.
  18. They control the opening and closing of the pores of stomata depending upon the need of a plant.
  19. It makes these cells impermeable to water (water proof) and gasses.
  20. It is done by photosynthesis in chlorenchyma.
  21. Aerenchyma. Due to large air spaces, present in it.
  22. Tracheids.
  23. It is due to presence of mesophyle of leaves.
  24. It is due to presence of thick cuticle.
  25. Companion cells.
  26. Parenchymatous tissues.
-

27. Sclerenchyma.
28. Collenchyma.
29. The process in which there is a loss of ability to divide and taking up a permanent shape, size, structure and function by newly formed cells.
30. It has sponge petioles which enclose a lot of air in its aerenchyma. Air makes the plant lighter than water to float.
31. Phloem parenchyma.
32. Cellulose.
33. Phloem fibres (bast fibres).
34. Vacuole represent storage product, whether wastes or food produced. Meristematic cell keep on dividing before they can accumulate any of them therefore they lack vacuole.
35. Conducting/vascular tissue.
36. Large air cavities are present in parenchyma to give buoyancy to the aquatic plant such as water hyacinth to help them float. Such a parenchyma type is called aerenchyma.
37. Epidermis having thick cuticle and waxy substances to prevent the invasion of parasites into the plant body.
38. (i) Exchange of gases with atmosphere.  
(ii) Transpiration (loss of excess of water) in form of water vapours.
39. Xylem vessels are made up of long dead cells with thick walls joined end to end like water pipes.
40. Phloem cells are usually located outside the xylem cells. Pores at the ends of each phloem cell allow the dissolved food to move through.
41. Parenchyma has thin cell wall, made up of cellulose.  
Collenchyma has localised thickening of cellulose.  
Sclerenchyma has very thick wall due to deposition of lignin.
42. (i) They are living cells.  
(ii) They are thin walled.  
(iii) They have large inter cellular space.
- 43.



44. (a) Sclerenchyma fibres, lignin is responsible for its stiffness.  
(b) Sclerenchyma are thick walled dead cells while parenchyma are thin walled living cells.
  45. Each specialised function is carried out by different tissues in a multicellular organism to increase efficiency, e.g. nerve tissues transmit electrical signals from sensory organs to brain and vice-versa.
  46. Parenchyma, Collenchyma, Sclerenchyma.
  47. (i) Sieve tubes (ii) Companion Cells (iii) Phloem parenchyma (iv) Phloem fibres.
  48. (i) Xylem parenchyma (ii) Vessels (iii) Xylem fibres.
  49. Cells of meristematic tissue take up a specific role and lose the ability to divide. As a result, they form a permanent tissue. Cells of meristematic tissue differentiate to form different types of permanent tissue. This process of taking up a permanent shape, size, and a function is called differentiation.
-

50. (i) Parenchymatous ground tissue (ii) Chlorenchyma  
(iii) Collenchyma (iv) Aerenchyma
51. (i) Epidermis (ii) Cork (iii) Parenchyma
52. They are found in sieve tube of flowering plants (angiosperms). It regulates the activity of adjacent sieve element and take part in loading and unloading of sugar into the sieve element.

53.

Permanent tissue	Meristematic tissue
It is unable to divide but is differentiated	It keeps on dividing through-out its life.
Its cells may be living or dead.	Its cells are living.
It can be a simple or a complex tissue.	It is simple tissue.
It provides protection, support, conduction, storage and photosynthesis.	It is responsible for growth in a plant.
It has a large central vacuole which occurs in the living permanent cells.	Cytoplasm is dense with little or no vacuoles.
Nucleus of regular size	Nucleus is large and prominent

54. (a) Parenchyma. It takes part in the storage of nutrients and slows down lateral conduction (water in xylem and nutrients in phloem).

(b)

Xylem	Phloem
Xylem conducts water and minerals.	Phloem conducts dissolved materials.
Conduction is unidirectional, upwardly from roots to stem tips and leaves.	It is bidirectional from leaves to storage parts and from storage parts to growing parts.

55.

Plant tissues	Animal tissues
(i) They mostly have dead supportive tissues therefore plant do not move.	(i) Most of the tissues are alive therefore animals move around in search of food, mate and shelter.
(ii) They need less energy.	(ii) They need more energy.
(iii) They have two types of tissues meristematic (dividing) and permanent (non-dividing).	(iii) They have most of living tissues.
(iv) They grow throughout their life due to dividing tissues.	(iv) In animals only reparative growth is present.
(v) They have simple organisation of tissues.	(v) They have complex organisation of tissues.
(vi) Tissue organisation is for their stationary (do not move) habit.	(vi) Tissue organisation is for moving habits of animals.

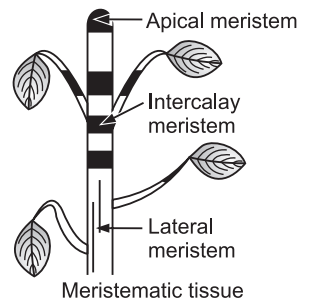
56. Parenchyma stores food and helps in photosynthesis.  
Collenchyma provides tensile strength and mechanical support to the plant.  
Sclerenchyma protects plant from stress, strain and mechanical stress. They also help in conduction and transport of materials.
57. In human beings, muscle cells contract and relax to cause movement, nerve cells carry messages, blood flows to transport oxygen, food, hormones and waste material and so on. In plants, vascular tissues conduct food and water from one part of the plant to other parts. Blood, phloem and muscle are all examples of tissues.
-

Cells specialising in one function are often grouped together in the body. This means that a particular function is carried out by a cluster of cells at a definite place in the body. This cluster of cells, called a tissue, is arranged and designed so as to give the highest possible efficiency of function.

58. They are meristematic tissue because of them the growth of plants occurs only in certain specific regions.

Depending on the region where they are present, meristematic tissues are classified as apical, lateral and intercalary.

- (i) Apical meristem is present at the growing tips of stems and roots and increases the length of the stem and the root.
- (ii) The girth of the stem or root increases due to lateral meristem (cambium).
- (iii) Lateral meristem is present at the base of the leaves or internodes (on either side of the node) on twigs.



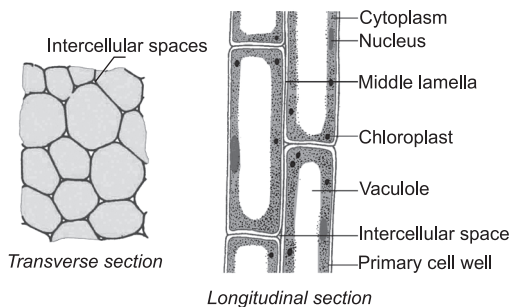
59. (a) Roots of onion of jar 1 will continue to grow as its apical meristem is intact.

(b) No because apical meristem is not there anymore.

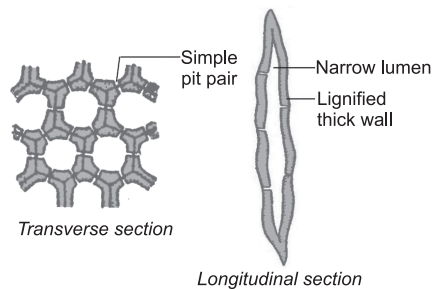
(c) Because root tips [meristematic tissue] of onions of jar 2 have been cut therefore they will stop growing.

Parenchyma	Sclerenchyma
Cells are thin walled and unspecialised	Cells are thick walled and lignified
These are living cells	Tissues are made up of dead cells
Cells are usually loosely packed with large intercellular space	No intercellular spaces between the cells are found
Stores nutrient and water in stem parts	Provides strength to the plant make leaves and roots hard and stiff
Some cells contain chlorophyll and perform photosynthesis called the chlorenchyma. The tissue called aerenchyma is present in the stem around vascular bundles have large air cavities which provide buoyancy to the hydrophytic plants	The cells are long narrow and hard, in covering of seeds and nuts and in cells of veins in plant

(Any three)



**Parenchyma tissue**

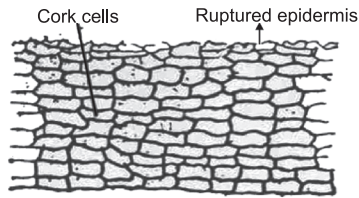


**Sclerenchyma Tissue**

61. Epidermis is important for plants as:

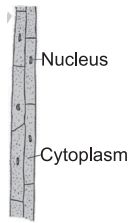
- (i) It gives protection
- (ii) Helps in gaseous exchange
- (iii) Checks water loss
- (iv) Root hairs arising from epidermis helps in absorption of water and minerals.

(Any three)



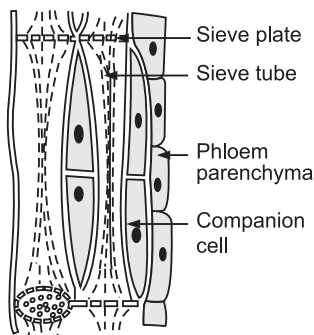
Protective tissue

62. Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.



Xylem parenchyma

63. Sieve tubes, companion cells, phloem fibres and phloem parenchyma



Section of phloem

64. Both xylem and phloem consist of more than one type of cells, which coordinate to perform a function.

Xylem	Phloem
Consists of tracheids, vessels, xylem parenchyma, and xylem fibres	Consist of sieve tubes, companion cell, phloem parenchyma and phloem fibres
They transport water and minerals vertically from soil to aerial parts of the plant	They transport food from leaves to other parts of the plant
Most of the cells except xylem parenchyma are dead cells common function	Most of the cells except phloem fibres are living cells

65.

Plants	Animals
They are stationary or fixed. They don't move, a sedentary existence.	They move around in search of food, mates and shelter. Adapted for and active locomotion.

Most of the tissues they have are supportive, which provides them with structural strength.	Different kinds of tissues perform different types of functions.
Most of these tissues are dead and need less energy and maintenance.	Most of the tissues are living that consume more energy and more maintenance
The growth in plants is limited to certain regions as it occurs due to special tissues localised in there certain regions that divide throughout their life.	Cell growth in animals is more uniform. So, there is no such demarcation of dividing and non-dividing regions in animals.
The structural organisation of organs and organ systems is simpler even in very complex plants.	The structural organisation of organs and organ systems is more specialised in complex animals

66. (i) Meristematic cells divide continuously therefore nucleus has DNA doubling up all the time. Cytoplasm has large amount of substances being synthesized that are required for cell division hence dense. There is no need of storage the waste or food hence no vacuole.
- (ii) Because they have thick lignified wall.
- (iii) Pulp of pear has sclerenchymatous stone cells in them which being hard gives a gritty texture to it.
- (iv) Presence of Collenchyma gives them flexibility to bend freely.
- (v) it has hard fibers that are Sclerenchymatous in nature.
67. Characteristics of cork are:
- (i) Cells of cork are dead at maturity
- (ii) These cells are compactly arranged
- (iii) Cells do not possess inter cellular spaces.
- (iv) Cells possess a chemical substances suberin in their walls
- (v) They are several layers thick.
- (a) As plants grow older, a strip of secondary meristem replaces the epidermis of the stem. Cells cut on the outer side by this meristem are called cork.
- (b) They are protective in function for older stem/twigs/branches.  
They are impervious to gases and water.

68. Meristematic	Permanent
Cells of this tissue divide throughout their life.	They lose the ability to divide to take up specific function.
They are located at specific regions of the plant viz: apical lateral, intercalary	They are distributed throughout the plant body.
Cells of this tissue are very active, have dense cytoplasm, thin walls and prominent nuclei. They lack vacuoles	They are vacuolated, vary in shape and size. Their cell wall may be thick.
Cell wall is cellulosic.	Cell wall is made up of cellulose/lignin/suberin.

## 2. ANIMAL TISSUES

They are mainly of four types: (i) Epithelial (ii) Connective (iii) Muscular (iv) Nervous.



## Epithelial Tissues

- The covering or protective tissues in animal body are called epithelial tissues.
- It always grow on some types of tissues.
- It keeps the different body system separate.
- It consists of single layer of cells.
- The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are made up epithelial tissues.
- It has only small amount of cementing material and almost no intercellular space.
- It regulates exchange of materials between the body and the external environment as well as between parts of body.
- All epithelium is separated from the underlying tissue by the fibrous basement membranes.

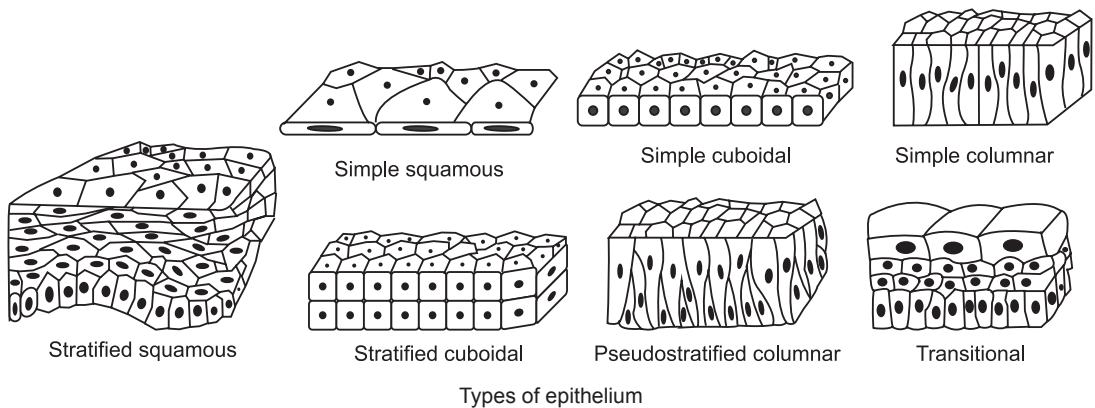
### Types of Epithelium Tissue

#### Squamous epithelium

- It is also called pavement epithelium.
- Cells are arranged end to end like tiles on the floor.
- Cells are polygonal in surface view.
- It is very thin and flat and forms delicate lining, e.g. oesophagus and the lining of mouth, skin of body (epithelial cells are arranged in many layers to protect from wear and tear). This pattern is **stratified squamous epithelium**.

#### Cubical epithelium

- Cells are cube like, closely packed, look like squares in section but free surface appear hexagonal.
- It is found in kidney tubules, thyroid vesicles, in salivary and sweat glands.
- It forms germinal epithelium in testes and ovaries(gonads).
- It is involved in absorption, excretion, secretion and provides mechanical support.



#### Columnar epithelium

- It is a pillar like epithelium. It forms the lining of stomach, small intestine and colon, forming mucous membrane.
- It increases absorption efficiency in small intestine.

#### Ciliated epithelium

- It has cilia which are hair like projection on the outer surface of epithelial cells.
  - In respiratory tract, cilia moves and its movement pushes the mucus forward to clear it.
  - It helps in the movement of ova in the fallopian tube.
-

## Grandular epithelium

- Epithelial cells often acquire additional specialization in gland cells which secretes hormones or enzymes.
- Sometimes epithelial tissue folds inward and a multicellular gland is formed.

## Connective Tissues

- Cells are widely spaced and embedded in an intercellular matrix.
- The matrix may be jelly like fluid, dense or rigid which depends upon the function of connecting tissue. Cells may be of different types.
- White and yellow fibres are present in matrix.
- They provide support to different organs and keep them in place.

## Types of Connective Tissue

### Vascular or Fluid tissues

*Blood* is a connective tissue.

- Fluid matrix of the blood is plasma having floating cells called corpuscles.
- Blood helps in the transport of oxygen, nutritive substances, hormones and excretory products.
- It is composed of the following parts:

*Plasma:*

- Plasma is a fluid matrix of the blood. It is a pale yellow liquid with 95% of water.
- It contains RBC, WBC and platelets.
- It also contains proteins, salts and hormones.
- *Corpuscles or Blood cells:* They form 45% of the blood.

*RBC:*

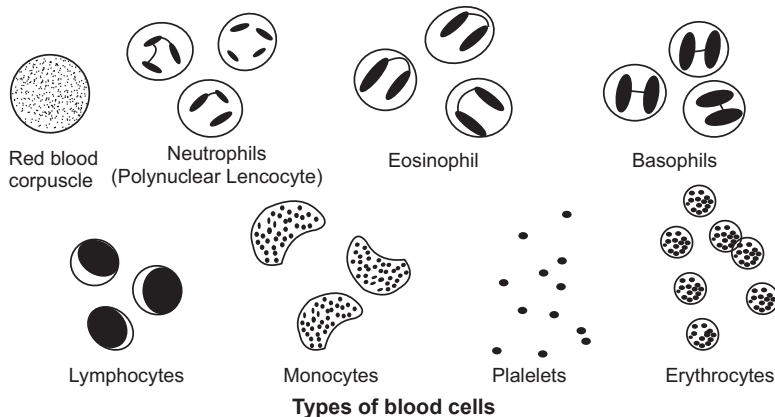
- They are also called erythrocytes. They are oval shaped, nucleated, biconvex for most of the vertebrates but for mammals they are circular, biconcave, disc like and lack nuclei.
- They are large in number having haemoglobin containing iron which acts as an oxygen carrier.

*WBC:*

- They are called leucocytes (soldiers of human body)
- They are of five types: **monocyte, lymphocytes, basophils, neutrophils** and **eosinophils**.
- Some are irregular, amoeboid, phagocyte which protect our body from infections.

*Blood platelets (Thermocytes):*

- They are spindle shaped which help in clotting of blood.
- These are fragments of large cells structures carrying blood clotting factor (megakaryocytes).
- **Lymph** is a colourless fluid that is filtered out of the blood capillaries.
- It is a part of the blood which contains a type of WBC (–) lymphocytes.

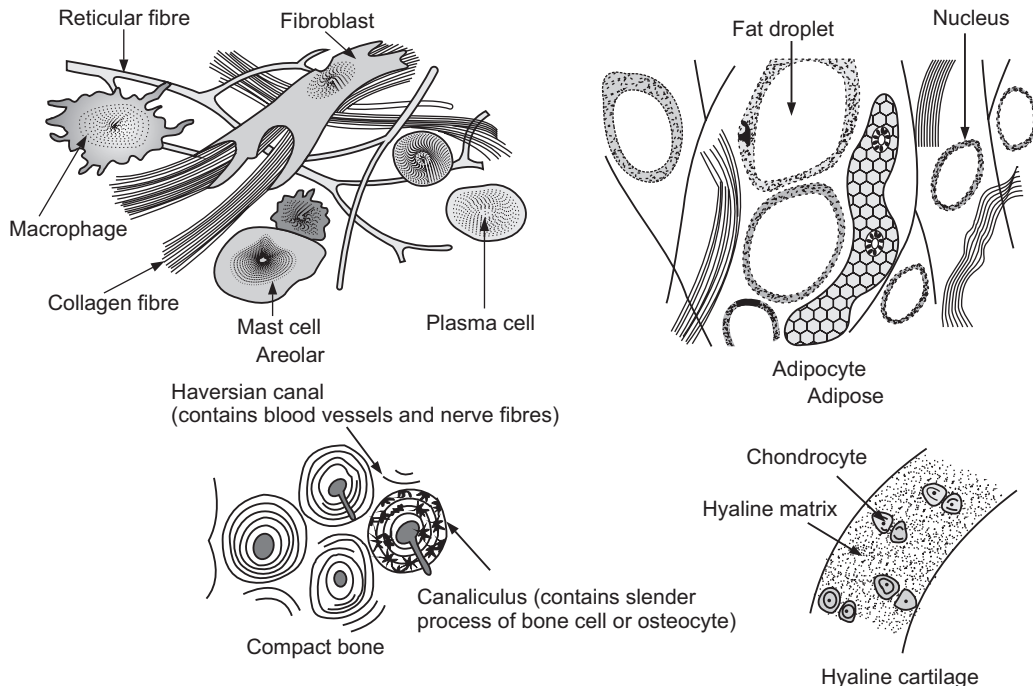


## Skeletal tissue

- It is a hard connective tissue.
- It forms a supportive frame work of the body.

### *Bone:*

- It anchors the muscles and supports the main parts of the body. It is porous and contains blood vessels.
- It is a strong and inflexible tissue.
- Bone cells are embedded in the hard matrix made up of calcium, phosphorus compounds, protein ossein and calcium carbonate.



### Types of skeleton tissue

- The long bones are usually hollow from inside and contains a cavity called marrow cavity. It is full of bone marrow.

### *Cartilage:*

- It is elastic, less hard and flexible. It has great tensile strength.
- It is non-porous.
- It does not contain blood vessels.
- Its Matrix is made up of protein and reinforced by fibres. In the matrix there are cells which are widely spaced called as chondrocytes.
- It is found in joints of bones, nose, ear, trachea and larynx.
- It smoothens the bone surfaces at joints, e.g. we can fold the cartilage of the ears but we cannot bend bones in our arms.

### *Ligament:*

- It connects two bones to each other.
  - It is yellow fibrous connective tissue.
  - It is very elastic and has considerable strength.
  - It contains very little matrix.
-

### *Tendons:*

- It attaches the muscles to a bone.
- It is a white fibrous connective tissue.
- A tendon has great strength but limited flexibility.
- It has very little matrix containing abundant of white fibres forming layers.

### **Areolar tissue:**

- It is formed between skin and muscle beneath, around blood vessels and nerves and in the bone marrow.
- It fills the space inside the organ.
- It supports internal organs and helps to repair tissues.
- It is the most abundant connective tissue in the body.

### **Adipose tissue:**

- It is an oval shaped and round cells, filled with fat globules.
- It stores fats.
- It is formed below the skin and between the internal organs.
- It acts as an insulator and protects the delicate organ like heart from strokes.
- It also controls heat loss from the body.

### **Muscular tissue**

- These tissue helps in the movement of our body.
- It is a long fibre (elongated) like cell called muscle fibre.
- It is capable of contraction or relaxation due to contractile proteins.
- Skeletal muscles are the voluntary muscles which are attached to bones and help in the body movement.

### **Types of Muscular Tissue**

#### **Striated or skeletal muscle:**

- They are voluntary muscles.
- Muscle fibres or cells are unbranched and multi-nucleated.
- Each fibre is enclosed by a thin membrane, sarcolemma.
- Cytoplasm is called sacroplasm.
- These muscles may get tired and need rest.

#### **Non-striated/smooth muscles:**

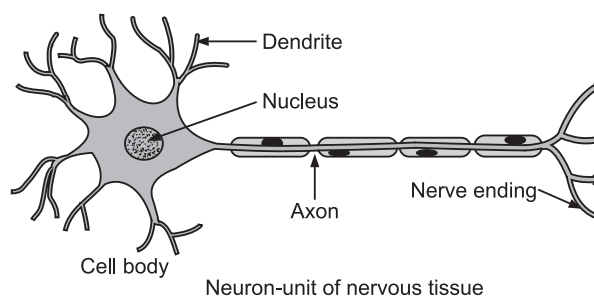
- These are involuntary muscles and also called smooth muscles, e.g. movement of food in a alimentary canal is brought about by these muscles.
- These are found in iris of eyes, in ureters, in bronchi of the lungs, stomach and intestine.
- These cells are spindle shaped (long with pointed ends) and have single nuclei (uninucleated). many fibres are joined together in bundles.

#### **Cardiac muscles:**

- The muscles of the heart are called cardiac muscles.
- Heart beats due to rhythmic contraction and relaxation of these muscles throughout the life.
- These are involuntary muscles.
- These are cylindrical, branched and uninucleate muscle. Branches are united by intercalated disc.

### **Nervous tissues**

- These tissues have ability to respond to stimuli.
  - These are highly specialized tissue for being stimulated and then transmitting the stimulus very rapidly from one place to another.
  - The brain, spinal cord and nerves are all composed of nerve tissue.
  - The cells of nervous tissue are called **neurons**.
-



- Neuron consist of a cell body with a nucleus and cytoplasm from which long thin hair like parts arise.
- Each neuron has single long part called the **axon**.
- It has many short branches called **dendrites**.
- Many nerve fibres bound together by a connective tissue to make up a nerve.
- Short hair like extensions rising from a cyton and the dendrons are further divided into dendrites.
- Axon is a long, tail like cylindrical projection with fine branches at the end. It is covered by a sheath.
- Axon of one neuron is very closely placed to the dendron of another neuron to carry the impulses. This junction is called a **synapse**.

## Exercise 6.2

### I. Very Short Answer Type Questions

(1 Mark)

1. Which type of muscles work voluntarily?
2. Which tissue fills the space inside the organ?
3. What type of tissue is the blood?
4. What type of muscle is the skeletal muscle?
5. Where is cartilage found?
6. What type of epithelium is present in the skin?
7. Name the muscular tissue whose efficiency does not decrease with aging.
8. Osteocytes are present in which type of tissue in the body?
9. Where do we find nervous tissue?
10. Which tissue covers the external surface of the animal body?
11. A person met with an accident in which two long bones of hand were dislocated. According to you what could be the reason? [HOTS]
12. What is name of the branch of science linked with the study of bones?
13. What type of muscle fibres which are spindle shaped, non-striated, involuntary present in the internal organs like urinary bladder?
14. What is name of a small, branched part of a nerve cell?
15. What are the roles of epidermis tissue in plants? [NCERT]
16. How does the cork act as a protective tissue? [NCERT] [CBSE 2013]
17. What is the specific function of the cardiac muscle? [NCERT]
18. Which tissue pushes out the dust particle trapped in a respiratory tract?
19. Which type of tissue forms glands?
20. Epithelial tissue has inner surface cemented to connected connective tissue by a thin non-cellular structure. Name the structure.
21. Which type of epithelium are present in the nasal and the genital tract?
22. Which tissue is found in the area of regular wear and tear?

23. Which is the most abundant animal tissue?
24. What are dense connective tissues?
25. Which tissue connects a bone to a bone?
26. Which connective tissue connects a bone with the muscles?
27. Matrix of cartilage is made up which substance?
28. Name the largest blood cell.
29. What is plasma?
30. What is single long part of neuron covered with sheath is called?
31. What is synapse?
32. Name the protein found in a white and yellow fibre.
33. State the function of microvilli.
34. Which tissue is present between the blood and tissue cells?
35. What is function of medullary sheath?
36. What is function of plasma?
37. Animals of cold er regions and fishes of cold water have thicker layer of subcutaneous fat. Describe why?

## II. Short Answer Type Questions–I

(2 Marks)

38. Give three characteristics of the cardiac muscles? [NCERT]
39. Name the regions in which the parenchyma tissue is present. [NCERT]
40. Identify the type of epithelia in Lining of following organs
 

(a) Blood vessels	(b) Small intestine
(c) Kidney tubules	(d) Bronchioles/respiratory tract
41. Differentiate the following activities on the basis of voluntary (V) or involuntary (IV) muscles.
 

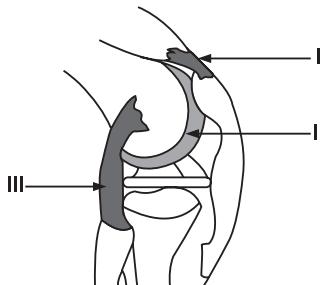
(a) Jumping of frog	(b) Pumping of the heart
(c) Writing with and	(d) Movement of chocolate in your intestine

## III. Short Answer Type Questions–II

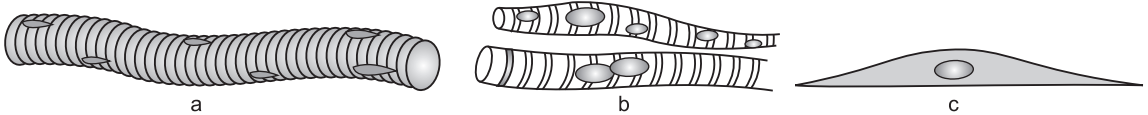
(3 Marks)

42. Write six functions of the epithelial tissues. [CBSE 2016]
43. Draw a labelled diagram of a neuron. [NCERT]
44. Name the following:
 

(a) Tissue that forms the inner lining of our mouth.	(d) Tissue that stores fat in our body.
(b) Tissue that connects a muscle to a bone in humans.	
(c) Tissue that transports food in plants.	(f) Tissue present in the brain. [NCERT]
(e) Connective tissue with a fluid matrix.	
45. Diagrammatically show the difference between the three types of muscle fibres. [NCERT]
46. Identify I, II, III in the given diagram of a given joint.



47. Identify the types of muscles shown in fig. a, b, c.



48. What is significance of meristematic tissues in plants?

49. Draw a neat diagram of the section of phloem and label its four parts. [DOE]

50. (a) State the features of the cardiac muscle which makes it unique. [DOE]

(b) The tissue is under the control of a will. What is this type of tissue called? Name it.

(c) What are ligament? What do you expect to feel if they are over stretched?

51. Draw well labelled diagrams of various types of muscles found in human body.

52. Differentiate between voluntary and involuntary muscles. Give one example of each type.

53. Name the tissues present in

(a) Fluid connective tissue

(b) Filling of space inside the organs

(c) Subcutaneous layer

(d) muscle in limbs

(e) Surface of joints

(f) Skin

#### IV. Long Answer Type Questions

(5 Marks)

54. Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule and vascular bundle. [NCERT]

55. Differentiate between the striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body. [NCERT]

56. Describe the structure and function of different types of epithelial tissues. Draw diagram of each type of epithelial tissue.

### Answers 6.2

1. Striated and skeletal muscle work voluntarily.
2. Aerolar tissue.
3. Fluid connective tissue.
4. Striated muscle.
5. It is found on the surface of joints.
6. Stratified squamous epithelium.
7. Cardiac muscles.
8. Bone.
9. They are found in brain, spinal cord and nerves.
10. Epithelial tissues.
11. Ligament damage.
12. Osteology
13. Smooth muscle fibres.
14. Dendrites.
15.
  - It is a protective tissue of angiospermic (flowering) plant.
  - It provides protection to the underlying tissues.
  - It forms the outer covering of roots, stems, leaves and flowers.
  - It helps in the absorption, secretion, excretion, exchange of gases and transpiration.
  - It prevent entry of micro-organism.
16.
  - Cork has dead cells and do not have intercellular space.
  - The cell walls are coated with suberin.
  - Suberin makes the cells impermeable to water and the gases.
  - It has a protective function and prevents plant a from infection and injury.
17. Cardiac muscle helps the heart to beat throughout the life with its own contraction and relaxation and involuntary nature.
18. Ciliated eipthelium.
19. Glandular epithelial tissue.
20. Basement membrane
21. Cuboidal epithelial.

22. Stratified squamous epithelium

24. Tendons and ligaments.

26. Tendon

28. Monocytes

30. Axon

31. A synapse is a junction between the axon of one neuron with the dentrite of the another neuron.

32. Collagen protein is present in white fibre whereas elastin protein is found in yellow fibres.

33. (i) They increase the absorpition surface area of intestinal cell.

(ii) They increase the surface area for bio chemical reactions.

34. Lymph

35. It insulates nerve fibre, and the axon. It also prevents leakage of ions.

36. It transports (i) digested food (ii) waste materials such as CO<sub>2</sub> and urea (iii) hormones and minerals salts.

37. Because fat acts as subcutaneous insulation of body for thermoregulation.

38. (i) Branched (ii) Striated (iii) involuntary

39. It is a permanent tissue of the plants.

It is present in cortex, pith of the stem, roots and mesophyll of leaves.

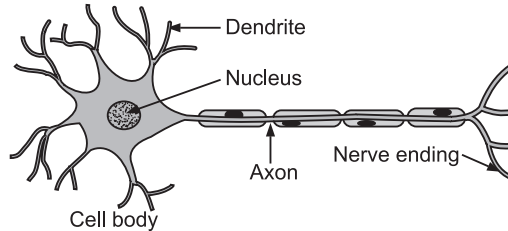
40. (a) squamous epithelium (b) columnar epithelium (c) cuboidal epithelium (d) ciliated epithelium

41. (a) V, (b) IV, (c) V, (d) IV

42. (i) Intercellular support (ii) Protection (iii) Prevent wear and tear (iv) Absorption

(v) Extrusive movement (pushing material forward) (vi) Secretion.

43.



44. (a) Squamous ephthelium

(c) Phloem

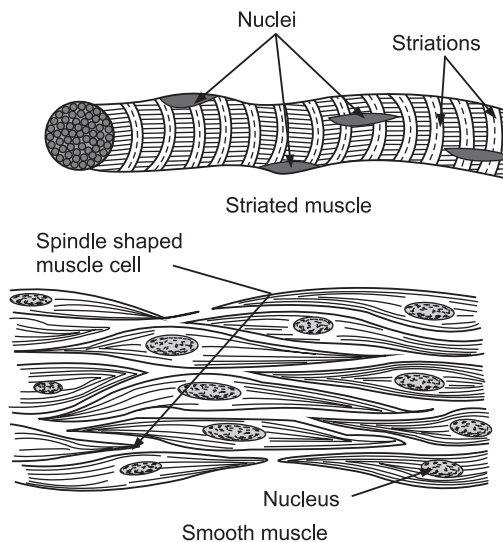
(e) Blood/Lymph

(b) Tendon

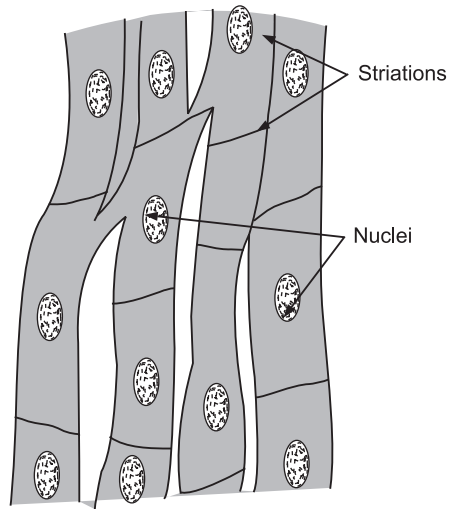
(d) Adipose tissue

(f) Nervous tissue

45.



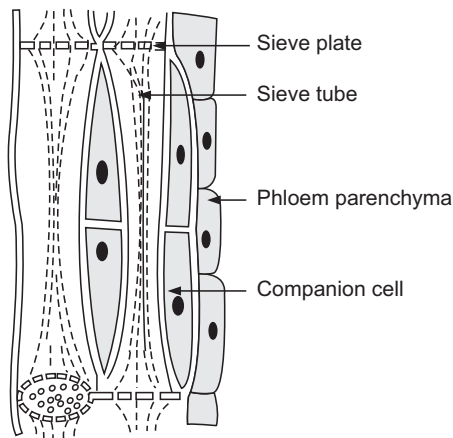




Cardiac muscle

46. I is tendon, II is cartilage, III is ligament.  
 47. A is skeletal muscle, B is cardiac muscle, C is smooth muscle  
 48. (i) These are responsible for growth and elongation of plant roots and shoots.  
 (ii) They also increase the growth of the stem and the root by secondary growth.  
 (iii) They are the living cells and grows faster.

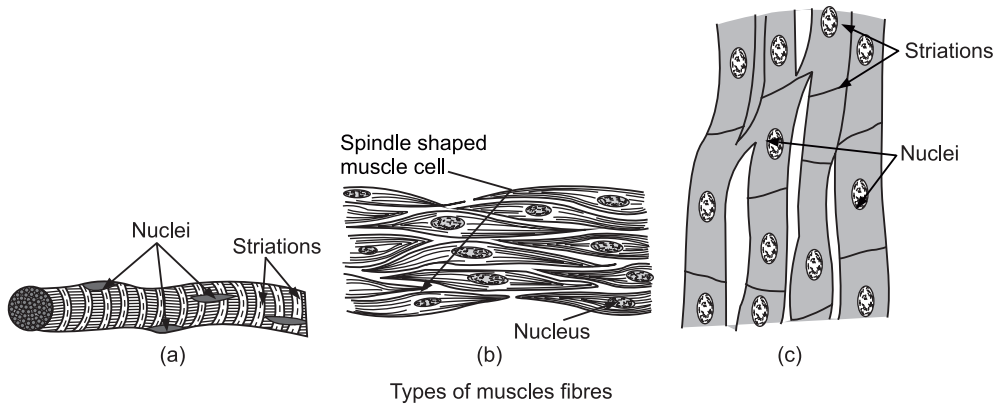
49.



Section of phloem

50. (a) Cardiac muscles are involuntary, striated and do not get tired through out their life. They are located in the heart and is responsible for the beating of heart by contraction and relaxation. The cells are uninucleate, small and cylindrical with broad ends.  
 (b) It is a striated or a skeletal muscle tissue. These are voluntary muscles tissue.  
 (c) Ligaments are the dense yellow fibrous connective tissue which joins a bone with another bone. They have considerable strength and high elasticity due to which we can bend and rotate around joints. When ligament are overstretched we feel pain and tired.

51.



Types of muscles fibres

52. Voluntary muscles can be moved by conscious will when we want them to move. For example, muscles of limbs or skeletal muscles. Involuntary muscles function on their own. We cannot start or stop them from working by our desire. For example: cardiac muscles and smooth muscles.

53. (a) Fluid connective tissue — Blood/lymph  
 (b) Filling of space inside the organs — Areolar tissue  
 (c) Sub cutaneous layer — Adipose tissue  
 (d) Muscle in limbs — Skeletal/Striated muscle  
 (e) Surface of joints — Cartilage  
 (f) Skin — Stratified squamous epithelium

54. **Skin:** Epithelial tissue (squamous epithelium)

**Bark of tree:** Cork (protective tissue)

**Bone:** Skeletal tissue (connective tissue)

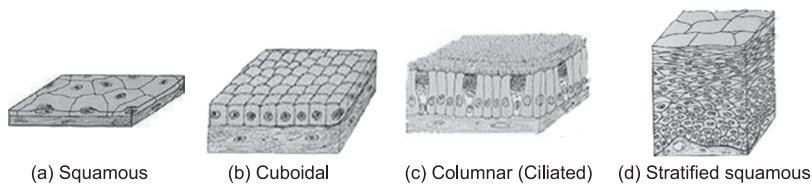
**Lining of kidney tubules:** Cuboidal epithelial tissue

**Vascular bundle:** Complex permanent tissue—Xylem and Phloem.

55.	Striated muscles	Unstriated muscles	Cardiac muscles
	They have long, cylindrical unbranched, multi-nucleated muscle fibre.	They are long, spindle shaped, un-nucleated muscle fibre.	They are cylindrical, branched and un-nucleated muscle fibre.
	They join the bones with the limbs.	These are present in alimentary canal, blood vessels, iris of eye, ureter and bronchi.	They are present in heart.
	These are voluntary muscles.	These are involuntary muscles.	These are involuntary muscles.

56. (i) Epithelial tissues are the covering or protective tissues in the animal body.  
 (ii) Epithelium covers most organs and cavities within the body and keep different body systems separate.  
 (iii) The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue.  
 (iv) Epithelial tissue cells are tightly packed and form a continuous sheet.  
 (v) They have only a small amount of cementing material between them and almost no intercellular spaces.

- (vi) The permeability of the cells of various epithelia play an important role in regulating the exchange of materials between the body and the external environment and also between different parts of the body.
- (vii) Regardless of the type, all epithelia are usually separated from the underlying tissue by an extracellular fibrous basement membrane.



Different types of epithelial tissues

Epithelial tissues are of four types:

- (i) Simple squamous epithelium                      (ii) Stratified squamous epithelium  
 (iii) Columnar epithelium                              (iv) Cuboidal epithelium

These tissues differ in structure that correlate with their unique functions. For example, in cells lining blood vessels or lung alveoli, where transportation of substances occurs through a selectively permeable, surface-the simple squamous epithelium is present. Where absorption and secretion occur, tall epithelial cells are present called columnar epithelium. Cuboidal epithelium forms the glands, where it provides mechanical support too. Sometimes additional specialisation as gland, which can secrete substances. Sometimes portion of the epithelial tissue folds inwards and a multicellular gland forms.

## VALUE BASED QUESTIONS

- Suman met with an accident in the school. She was having a lot of pain in her hand. Mr. Ashish, physical education teacher straighten her hand, puts a scale, used a crape bandage and took her to the doctor. She had a fracture. She was given proper treatment by the doctor.
  - What values are associated with Mr. Ashish?
  - Which type of tissue may have been affected in Suman's hand?
  - What should we do to make our bone strong?
- Mr. Amitav Guha got a heart attack. He was having a severe chest pain, breathlessness and sweating. Mr. Vinay Jain called the ambulance and took him to the hospital. His arteries were blocked and angioplasty was done. He is now feeling better.
  - What values are associated with Mr. Vinay Jain?
  - What is the cause of heart attack?
  - Why do doctors give an aspirin to the heart patient?

## Answers

- He is kind a hearted, helpful and responsible person.
  - Bone, cartilage muscles.
  - We should take milk and milk products which are rich in calcium.
- Mr. Vinay jain is a kind hearted and a helpful person.
  - A plaque gets deposited in the arteries which prevents the oxygenated blood not to reach heart and causes heart attack.
  - Aspirin acts as a blood thinner and prevents blood clotting which may cause heart attack.

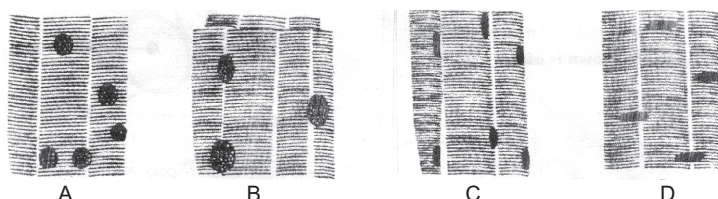
## PRACTICAL BASED QUESTIONS

**EXPERIMENT 8:** To identify parenchyma, collenchyma and sclerenchyma tissues in plants, striped, smooth and cardiac muscle fibres and nerve cells in animals, from prepared slides and to draw their labelled diagrams.

**Q1.** While observing a slide of animal tissue under a microscope, Heena observed light and dark bands. The slide is of which type of muscles? (OBSERVATION SKILLS)

**Ans.** These are the characteristics of voluntary muscles which are striated muscles, i.e. have light and dark bands.

**Q2.** Observe the location and shape of the nuclei in the four drawings of the striated muscle fibres given below. The drawing that most resembles the slide of striated muscle fibre under the microscope is at: (OBSERVATION SKILLS)



**Ans.** (C) is correct because nuclei are at periphery.

**Q3.** Aditi observed the slide of striated muscle fibre. What will be her observations? (OBSERVATION SKILLS)

**Ans.** (i) Cells are long and cylindrical.

(ii) Light and dark bands are present giving striated appearance.

**Q4.** Give four characteristics of collenchyma cell. (CONCEPTUAL SKILLS)

**Ans.** (i) The cells are living, elongated, irregularly thickened at the corners.

(ii) It occurs below the epidermis in the leaf stalks, leaf mid-rib and in herbaceous dicot stems.

(iii) They give flexibility of plant part. (iv) They generally contain chloroplast.

(v) They appear to be circular, oval or polygonal in cross-section. Intercellular space is absent.

**Q5.** State four characteristics of cardiac muscles. (CONCEPTUAL SKILLS)

**Ans.** (i) It is present in the heart.

(ii) Its ends are flat and zig-zag called intercalated discs.

(iii) The cells of this tissue are uninucleated, cylindrical and branched.

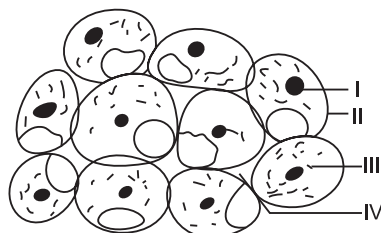
(iv) Its striations are faint.

**Q6.** Give four characteristics of smooth muscles. (CONCEPTUAL SKILLS)

**Ans.** (i) They are spindle shaped. (ii) They are unbranched.

(iii) They are unstriated. (iv) They are uninucleated and involuntary.

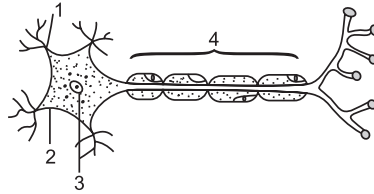
**Q7.** Identify the cell and label its part correctly. (IDENTIFICATION SKILLS)



**Ans.** I. Nucleus II. Thin cell wall. III. Vacuole. IV. Intercellular space. It is a parenchyma cell.

**Q8.** Correct sequence of labelling of neuron (A) is:

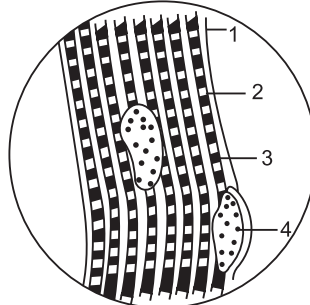
(IDENTIFICATION SKILLS)



**Ans.** 1. Dendrite. 2. Cyton. 3. Nucleus. 4. Axon.

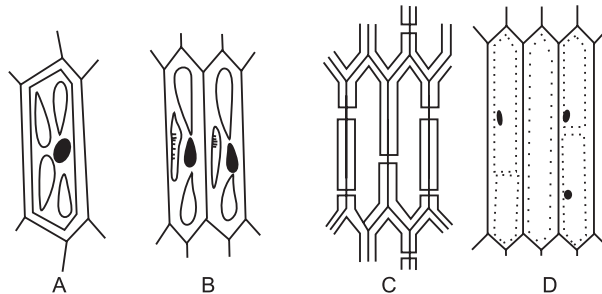
**Q9.** Correct sequence of labelling of striped muscles by Shashank is:

(IDENTIFICATION SKILLS) [CBSE 2010]



**Ans.** Sarcolemma. 2. Dark band. 3. Light band. 4. Nucleus.

**Q10.** While observing a thin section of a plant stem, four students sketched sclerenchyma as given below. Which is the correct diagram? Why? (INTERPRETATION SKILLS)



**Ans.** (C) is a correct diagram. There are pits, Non-nucleus cells with uniform thick walls.

**Q11.** A student observed slides first under low power and then under high power of compound microscope and noticed that certain simple permanent tissues do not have nucleus. Identify the tissue giving reason. (REASONING SKILLS) [CBSE 2016]

**Ans.** The tissue is sclerenchyma.

**Reason:** It is simple permanent tissue without nucleus and cytoplasm. These are dead, long and narrow cells with tapered ends.

## REVISION CHART

