

## NCERT Exemplar for Class 9 Science Chapter 6 Tissues

### Multiple Choice Questions

1. Which of the following tissues has dead cells?

- (a) Parenchyma
- (b) Sclerenchyma
- (c) Collenchyma
- (d) Epithelial tissue

**Soln:**

Answer is (b) Sclerenchyma

**Explanation:**

**Parenchyma**

Living tissues with thin cellwall with central vacuole and dense cytoplasm. Parenchyma cells are located in the soft parts of the plants such as pith and cortex.

**Sclerenchyma**

These are dead tissue which have thick cellwall due to deposition of lignin. They are generally located in the leaf veins, hard coverings of the seeds and can also be found surrounding the vascular bundle.

**Collenchyma**

Living tissues which have an elongated shape and thick cellwall in the corner. Collenchyma tissue can be located in the leaf stalks, below the epidermis etc.

**Epithelial tissues**

Epithelial tissues are the covering or protective tissues in the animal body. Allmost every organs and cavities are covered by Epithelium.

2. Find out incorrect sentence

- (a) Parenchymatous tissues have intercellular spaces
- (b) Collenchymatous tissues are irregularly thickened at corners
- (c) Apical and intercalary meristems are permanent tissues
- (d) Meristematic tissues, in its early stage, lack vacuoles

**Soln:**

Answer is (a) Parenchymatous tissues have intercellular spaces

**Explanation:**

Parenchymatous tissues have intercellular spaces is a wrong statement. Parenchyma act as a packing tissue in plants hence they do not have intercellular spaces. Collenchymatous tissues have intercellular spaces.

**3. Girth of stem increases due to**

- (a) apical meristem
- (b) lateral meristem
- (c) intercalary meristem
- (d) vertical meristem

**Soln**

Answer is (b) lateral meristem

**4. Which cell does not have perforated cell wall?**

- (a) Tracheids
- (b) Companion cells
- (c) Sieve tubes
- (d) Vessels

**Soln**

Answer is (a) Tracheids

**5. Intestine absorb the digested food materials. What type of epithelial cells are responsible for that?**

- (a) Stratified squamous epithelium
- (b) Columnar epithelium
- (c) Spindle fibres
- (d) Cuboidal epithelium

**Soln:**

Answer is (b) Columnar epithelium

**Explanation:**

Columnar epithelium are pillar like cells which have nuclei towards their base. Columnar epithelium forms the lining of stomach, small intestine and colon, forming the mucous membrane. They facilitate movement across the epithelial barrier. Their main function is absorption and secretion.

**6. 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

**Soln:**

Answer is (c) Ligament break

**Explanation:**

Dislocation of bones occurs when joints held by ligaments get separated.

Tendons joins skeletal muscle and they cause inflammation upon break.

Break of skeletal muscle cannot be the reason of bone dislocation as bones are joined by ligaments.

Areolar tissues are found around muscles, nerves and blood vessels hence they are not connected with bone dislocation.

**7. 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

**Soln:**

Answer is (d) Skeletal muscles contract and pull the tendon to move the bones

**Explanation:**

While doing work and running, you move your organs like hands, legs etc, skeletal muscles contract and they pull the tendon, connecting muscles to bones. This will make bones to move and they do not pull the ligament as that will cause a sprain or stretch.

**8. 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)

**Soln:**

Answer is (b) (ii) and (iii)

**Explanation:**

Skeletal muscles are voluntary muscles which are also striated muscles hence the answer should be cardiac muscles which are smooth muscles.

**9. Meristematic tissues in plants are**

- (a) localised and permanent
- (b) not limited to certain regions
- (c) localised and dividing cells
- (d) growing in volume

**Soln:**

Answer is (c) localised and dividing cells

**Explanation:**

Meristematic tissues in plants are the dividing cells which are responsible for plant growth in certain specific regions. Meristematic tissues are classified as apical, lateral and intercalary based on their location.

**10. Which is not a function of epidermis?**

- (a) Protection from adverse condition
- (b) Gaseous exchange
- (c) Conduction of water
- (d) Transpiration

**Soln:**

Answer is (c) Conduction of water

**Explanation:**

Conduction of water is a function of Xylem tissue whereas protection, gaseous exchange and transpiration are the functions of epidermis.

**11. Select the incorrect sentence**

- (a) Blood has matrix containing proteins, salts and hormones
- (b) Two bones are connected with ligament
- (c) Tendons are non-fibrous tissue and fragile
- (d) Cartilage is a form of connective tissue

**Soln:**

Answer is Tendons are non-fibrous tissue and fragile

**Explanation:**

Tendons are fibrous tissues which are highly elastic and strong.

**12. Cartilage is not found in**

- (a) nose
- (b) ear
- (c) kidney
- (d) larynx

**Soln:**

Answer is (c) kidney

**Explanation**

Cartilage is a connective tissue which provide support and flexibility to various parts of our body. Cartilage is found in nose, ear, larynx but not in kidney.

Renal tubules and corpuscles in the kidney are formed by Cuboidal epithelium tissue.

**13. Fats are stored in human body as**

- (a) cuboidal epithelium
- (b) adipose tissue
- (c) bones
- (d) cartilage

**Soln:**

Answer is (b) adipose tissue

**Explanation:**

Adipose tissue present below the skin and between internal organs stores fat. Cells in these tissues are filled with fat globules. Fat storage acts as insulator.

**14. Bone matrix is rich in**

- (a) fluoride and calcium
- (b) calcium and phosphorus
- (c) calcium and potassium
- (d) phosphorus and potassium

**Soln:**

Answer is (b) calcium and phosphorus

**15. Contractile proteins are found in**

- (a) bones
- (b) blood
- (c) muscles
- (d) cartilage

**Soln:**

Answer is (c) muscles

**Explanation:**

Muscles cells has contractile proteins in them. These proteins are responsible for the contraction and relaxation of muscles.

**16. Voluntary muscles are found in**

- (a) alimentary canal
- (b) limbs
- (c) iris of the eye
- (d) bronchi of lungs

**Soln:**

Answer is (b) limbs

**Explanation:**

We can move some muscles by conscious will. Muscles present in our limbs can move at our will, and stop when we so decide. Such muscles are called voluntary muscles. On the other hand alimentary canal, iris of the eye and bronchi of lungs has involuntary muscles.

**17. Nervous tissue is not found in**

- (a) brain
- (b) spinal cord
- (c) tendons
- (d) nerves

**Soln:**

Answer is (c) tendons

**Explanation:**

Connective tissue which connects muscles to bones are tendons. They are fibrous in nature and gives strength and limkited flexibility.

**18. Nerve cell does not contain**

- (a) axon
- (b) nerve endings
- (c) tendons
- (d) dendrites

**Soln:**

Answer is(c) tendons

**Explanation:**

Neurons do not contain tendons as they are connective tissues that join skeletal muscles to bones.

**19. Which of the following helps in repair of tissue and fills up the space inside the organ?**

- (a) Tendon
- (b) Adipose tissue
- (c) Areolar
- (d) Cartilage

**Soln:**

Answer is (c) Areolar

**Explanation:**

Areolar connective tissue is found between the skin and muscles, around blood vessels and nerves and in the bone marrow. It fills the space inside the organs, supports internal organs and helps in repair of tissues.

Areolar tissue located between the skin and muscles, around blood vessels and nerves and in the bone marrow. Areolar tissue fills the space inside the organs and supports internal organs and helps in repair of tissue.

**20. The muscular tissue which function throughout the life continuously without fatigue is**

- (a) skeletal muscle
- (b) cardiac muscle
- (c) smooth muscle
- (d) voluntary muscle

**Soln:**

Answer is (b) cardiac muscle

**Explanation:**

Heart muscles are cylindrical, branched and uninucleate which show rhythmic contraction and relaxation throughout life. Skeletal muscle, smooth muscle and voluntary muscles work as and when required.

**21. Which of the following cells is found in the cartilaginous tissue of the body?**

- (a) Mast cells
- (b) Basophils
- (c) Osteocytes
- (d) Chondrocytes

**Soln:**

Answer is (d) Chondrocytes

**Explanation**

Mast cells are found in areolar tissue.

Basophils are found in blood

Osteocytes are found in bone.

22. The dead element present in the phloem is

- (a) companion cells
- (b) phloem fibres
- (c) phloem parenchyma
- (d) sieve tubes

**Soln:**

Answer is (b) phloem fibres

**Explanation:**

Phloem fibres possess narrow lumen and they are thick walled, elongated spindle shaped dead cells. They provides mechanical support to the tissue. Phloem parenchyma are thin walled-living cells of parenchyma. They have two functions, storage and lateral food conduction. Except phloem fibres, other phloem cells are living cells.

23. Which of the following does not lose their nucleus at maturity?

- (a) Companion cells
- (b) Red blood cells
- (c) Vessel
- (d) Sieve tube cells

**Soln:**

Answer is (a) Companion cells

24. In desert plants, rate of water loss gets reduced due to the presence of

- (a) cuticle
- (b) stomata
- (c) lignin
- (d) suberin

**Soln:**

Answer is (a) cuticle

**Explanation:**

Cuticle is a protective layer covering epidermis of leaf. Young shoots and other aerial parts of a plant. It contains lipids and polymers impregnated with wax. This minimizes the effect of heat and reduces the loss of water.

25. A long tree has several branches. The tissue that helps in the side ways conduction of water in the branches is

- (a) collenchyma
- (b) xylem parenchyma
- (c) parenchyma
- (d) xylem vessels

**Soln:**

Answer is (d) xylem vessels



**Explanation:**

Collenchyma is an active tissue which has no role in conduction of water. Parenchyma is a supportive tissue. Xylem vessels which are also known as xylem trachea are responsible for conduction of water in plants.

**26. If the tip of sugarcane plant is removed from the field, even then it keeps on growing in length. It is due to the presence of**

- (a) cambium
- (b) apical meristem
- (c) lateral meristem
- (d) intercalary meristem

**Soln:**

Answer is (d) intercalary meristem

**Explanation:**

Stem located at the base of leaves or nodes and leads to the increase in the length of an organ such as leaves and internodes is intercalary meristem. They are responsible for the longitudinal growth of the plant hence length of the sugarcane keep on increasing.

**27. 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 (a) move downwards**

- (b) move upwards
- (c) remain at the same position
- (d) move sideways

**Soln:**

Answer is (c) remain at the same position

**Explanation:**

Longitudinal growth in the stem always takes place on the top hence apical meristem in the below region remains constant hence there will be no change in position of nail inserted in the trunk of tree.

**28. Parenchyma cells are**

- (a) relatively unspecified and thin walled
- (b) thick walled and specialised
- (c) lignified
- (d) none of these

**Soln:**

Answer is (a) relatively unspecified and thin walled

**Explanation:**

Parenchyma is the most common simple permanent tissue. It consists of relatively unspecialised cells with thin cell walls. They are living cells. They are usually loosely arranged, thus large spaces between cells (intercellular spaces) are found in this tissue.

**29. Flexibility in plants is due to**

- (a) collenchyma
- (b) sclerenchyma
- (c) parenchyma
- (d) chlorenchyma

**Soln:**

Answer is (d) collenchyma

The flexibility in plants is due to collenchyma. Collenchyma allows bending of various parts of a plant like tendrils and stems of climbers without breaking. It also provides mechanical support. Collenchyma is found in leaf stalks below the epidermis.

**30. Cork cells are made impervious to water and gases by the presence of**

- (a) cellulose
- (b) lipids
- (c) suberin
- (d) lignin

**Soln:**

Answer is (c) suberin

**31. Survival of plants in terrestrial environment has been made possible by the presence of**

- (a) intercalary meristem
- (b) conducting tissue
- (c) apical meristem
- (d) parenchymatous tissue

**Soln**

Answer is (b) conducting tissue

**Explanation:**

Conducting tissues called Xylem and Phloem are responsible for the survival of plants in terrestrial environment. Xylem conduct water from roots to all the parts of the plants and phloem transports foods and other nutrients from leaves to other parts of the plant.

**32. Choose the wrong statement**

- (a) The nature of matrix differs according to the function of the tissue
- (b) Fats are stored below the skin and in between the internal organs
- (c) Epithelial tissues have intercellular spaces between them
- (d) Cells of striated muscles are multinucleate and unbranched

**Soln:**

Answer is (c) Epithelial tissues have intercellular spaces between them

**Explanation:**

Epithelial tissues do not have intercellular spaces between them rather they are tightly bound together to make continuous sheet.

**33. The water conducting tissue generally present in gymnosperm is**

- (a) vessels
- (b) sieve tube
- (c) tracheids
- (d) xylem fibres

**Soln:**

Answer is (c) tracheids

**Explanation:**

Vessels are generally absent in Gymnosperms

Sieve tubes are present in phloem hence they have no role in conduction of water

Xylem fibres provide structural rigidity and they have no role in conduction of water.

### Short Answer Questions

**34. Animals of colder regions and fishes of cold water have thicker layer of subcutaneous fat. Describe why?**

**Soln:**

Animals of colder regions and fishes of cold water have thicker layer of subcutaneous fat because fats acts as insulator and prevent escape of heat from their body. This will help the animals in resisting low temperature in cold climates.

35. Match the column (A) with the column (B)

- | (A)                                    | (B)                    |
|--|------------------------|
| (a) Fluid connective tissue            | (i) Subcutaneous layer |
| (b) Filling of space inside the organs | (ii) Cartilage         |
| (c) Striated muscle                    | (iii) Skeletal muscle  |
| (d) Adipose tissue                     | (iv) Areolar tissue    |
| (e) Surface of joints                  | (v) Blood              |
| (f) Stratified squamous epithelium     | (vi) Ski               |

**Soln:**

- | (A)                                    | (B)                    |
|--|------------------------|
| (a) Fluid connective tissue            | (v) Blood              |
| (b) Filling of space inside the organs | (iv) Areolar tissue    |
| (c) Striated muscle                    | (iii) Skeletal muscle  |
| (d) Adipose tissue                     | (i) Subcutaneous layer |
| (e) Surface of joints                  | (ii) Cartilage         |
| (f) Stratified squamous epithelium     | (vi) Ski               |

36. Match the column (A) with the column (B)

- | (A)                  | (B)                            |
|----------------------|--------------------------------|
| (a) Parenchyma       | (i) Thin walled, packing cells |
| (b) Photosynthesis   | (ii) Carbon fixation           |
| (c) Aerenchyma       | (iii) Localized thickenings    |
| (d) Collenchyma      | (iv) Buoyancy                  |
| (e) Permanent tissue | (v) Sclerenchyma               |

**Soln:**

- | (A)                  | (B)                            |
|----------------------|--------------------------------|
| (a) Parenchyma       | (i) Thin walled, packing cells |
| (b) Photosynthesis   | (ii) Carbon fixation           |
| (c) Aerenchyma       | (iv) Buoyancy                  |
| (d) Collenchyma      | (iii) Localized thickenings    |
| (e) Permanent tissue | (v) Sclerenchyma               |

37. If a potted plant is covered with a glass jar, water vapours appear on the wall of glass jar. Explain why?

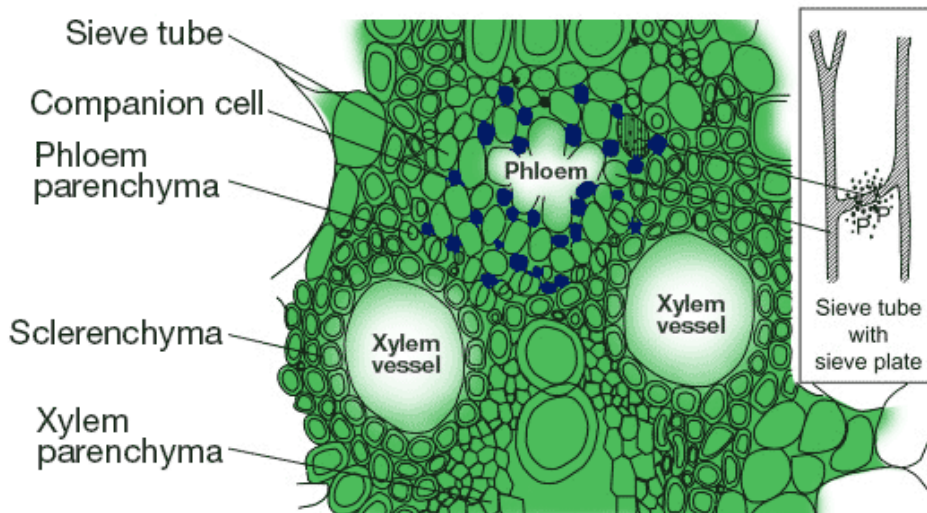
**Soln:**

Because of a process called as transpiration vapours appear on the glass jar if a potted plant is covered with glass jar.

38. Name the different components of xylem and draw a living component?

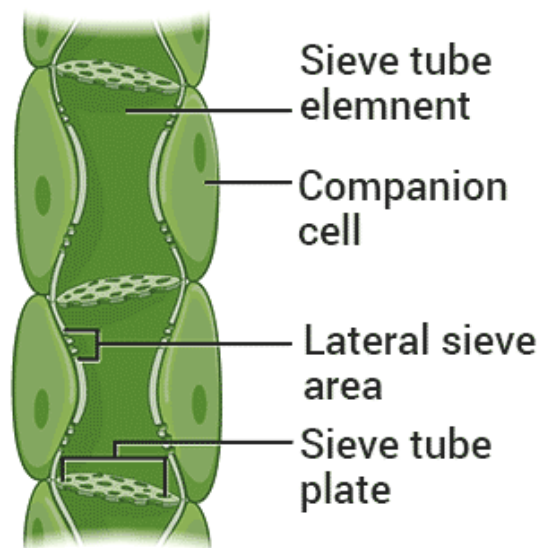
Soln:

Xylem comprises of tracheids, vessels, xylem parenchyma and xylem fibres. The only living component of xylem is xylem parenchyma.



39. Draw and identify different elements of phloem.

Soln:



**40. Write true (T) or false (F)**

- (a) Epithelial tissue is protective tissue in animal body.
- (b) The lining of blood vessels, lung alveoli and kidney tubules are all made up of epithelial tissue.
- (c) Epithelial cells have a lot of intercellular spaces.
- (d) Epithelial layer is permeable layer.
- (e) Epithelial layer does not allow regulation of materials between body and external environment.

**Soln:**

- a) True
- b) True
- c) Epithelial cells have a lot of intercellular spaces.
- d) True
- e) False

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

**Soln:**

<b>Voluntary muscles</b>	<b>Involuntary muscles</b>
They are also called striated muscles since they show stripes or striations	They are also called non-striated muscles since they lack striations.
Their cells are long and cylindrical	Their cells are small and spindle shaped.
They have multinucleate cells	They have uninucleate cells
They are under our will or control.	They are not under our will or control.
They get tired and need rest at intervals.	They can work continuously without getting tired
Ex: Limb muscles	Ex: Cardiac muscles

**42. Differentiate the following activities on the basis of voluntary (V) or involuntary (I V) muscles.**

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

**Soln:**

a-v, b-iv, c-v, d-iv

- (a) Jumping of frog – is an activity of voluntary muscles
- (b) Pumping of the heart- is a function of involuntary muscles
- (c) Writing with hand- is a function of voluntary muscles
- (d) Movement of chocolate in your intestine- is a function of involuntary muscles

**43. Fill in the blanks**

- (a) Lining of blood vessels is made up of——.
- (b) Lining of small intestine is made up of ——.
- (c) Lining of kidney tubules is made up of——.
- (d) Epithelial cells with cilia are found in——of our body

**Soln:**

- (a) Lining of blood vessels is made up of **squamous epithelium**
- (b) Lining of small intestine is made up of **columnar epithelium**
- (c) Lining of kidney tubules is made up of **cuboidal epithelium**
- (d) Epithelial cells with cilia are found in **respiratory tract** of our body

**44. Water hyacinth float on water surface. Explain.****Soln:**

Water hyacinth float on water surface because of the presence of the air cavities present in the parenchyma tissue.

**45. Which structure protects the plant body against the invasion of parasites?****Soln:**

Epidermis is the structure that protects the plant body against the invasion of parasites. It has thick cuticle and dermal tissue which help in preventing attack from parasites.

**46. Fill in the blanks**

- (a) Cork cells possesses——on their walls that makes it impervious to gases and water.
- (b) —— have tubular cells with perforated walls and are living in nature.
- (c) Bone possesses a hard matrix composed of——and ——.

**Soln:**

- (a) Cork cells possesses **Suberin** on their walls that makes it impervious to gases and water.
- (b) **Sieve tubes** have tubular cells with perforated walls and are living in nature.
- (c) Bone possesses a hard matrix composed of **calcium** and **Phosphorus**.

**47. Why is epidermis important for the plants?****Soln:**

Epidermis is important for it gives protection against water loss. Epidermal cell present on the aerial parts of the plant often secrete a waxy, water resistant layer on their outer surface. This provides protection against loss of water, mechanical injury and invasion by parasitic fungi. Epidermal tissue forms a continuous layer which helps to avoid mechanical stress.

48. Fill in the blanks (a) \_\_\_\_\_ are forms of complex tissue. (b) \_\_\_\_\_ have guard cells. (c) Cells of cork contain a chemical called \_\_\_\_\_ (d) Husk of coconut is made of \_\_\_\_\_ tissue. (e) \_\_\_\_\_ gives flexibility in plants. (f) \_\_\_\_\_ and \_\_\_\_\_ are both conducting tissues. (g) Xylem transports \_\_\_\_\_ and \_\_\_\_\_ from soil. (h) Phloem transport \_\_\_\_\_ from \_\_\_\_\_ to other parts of the plant

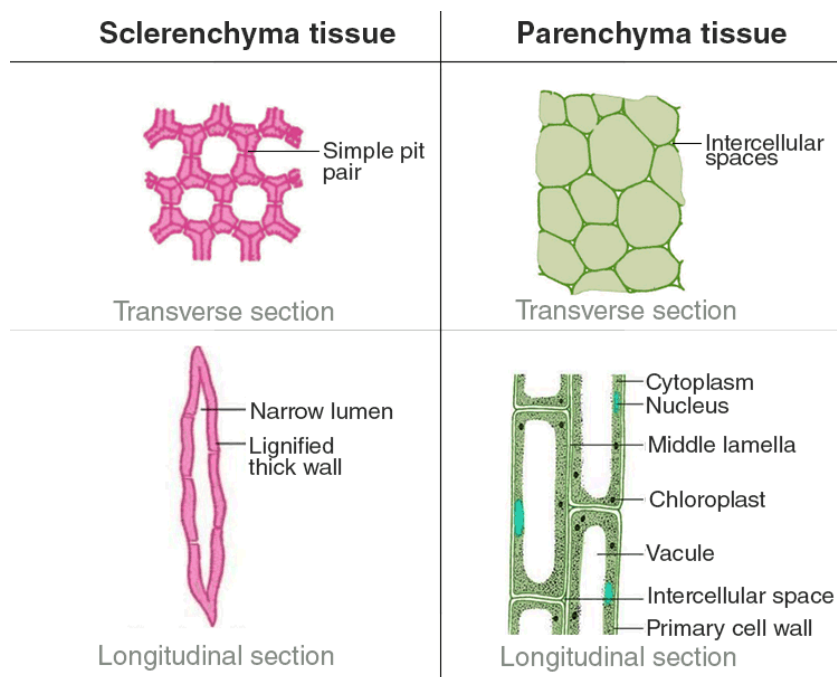
Soln:

- (a) Xylem and Phloem
- (b) Stomata
- (c) Suberin
- (d) Sclerenchyma
- (e) Collenchyma
- (f) Xylem; Phloem
- (g) Water and minerals
- (h) Food, leaf

Long Answer Questions

49. Differentiate between sclerenchyma and parenchyma tissues. Draw well labelled diagram.

Parenchyma	Sclerenchyma
Consists of living cells	Consists of dead cells
Consists of thin walled cell	Consists of uniformly thickened cellwalls
Cellwall is made up of cellulose	Cellwall is made up of complex lignin
Serves as packing tissue	Serves as mechanical tissue
Stores food and perform photosynthesis	Gives strength, rigidity and protects from parasites.





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

Epithelial cells are the thin protective coverings that line most organs and cavities within the body. It also forms a barrier to keep different body systems separate. The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue. Epithelial tissue cells are tightly packed and form a continuous sheet.

They have only a small amount of cementing material between them and almost no intercellular spaces. Obviously, anything entering or leaving the body must cross at least one layer of epithelium. As a result, 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. Regardless of the type, all epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.

Epithelial cells are the protective coverings that line most organs and cavities of our body. Epithelial cells form a barrier that keeps different body systems separate. Skin, lining of blood vessels, alveoli of lung, kidney tubules etc are made of epithelial tissue. Cells in the epithelial tissue are tightly packed and form a continuous sheet.

Epithelial tissue have only a small amount of cementing material between them and almost no intercellular spaces. It is obvious that anything entering or leaving the body must cross at least one layer of epithelium. This results in the permeability of the cells of various epithelia to play an important role in regulating the exchange of materials between the body and the external environment and between different parts of the body.

Epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.

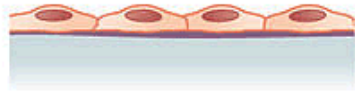
Depending on the shape and function, epithelial cells are classified into a) Squamous epithelial tissue b) Stratified squamous epithelial tissue c) Cuboidal epithelial tissue d) Columnar( Ciliated) epithelial tissue.

**a) Squamous epithelial tissue**

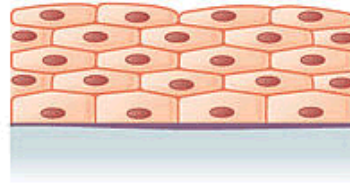
In cells lining blood vessels or lung alveoli transportation of substances occurs through a selectively permeable surface, this epithelium is a flat kind of epithelium. This is called the simple squamous epithelium Simple squamous epithelial cells are extremely thin and flat and form a delicate lining. The oesophagus and the lining of the mouth are also covered with squamous epithelium. The skin, which protects the body, is also made of squamous epithelium. Skin epithelial cells are arranged in many layers to prevent wear and tear. Since they are arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.

- b) **Stratified squamous epithelium:** Skin epithelial cells are arranged in many layers to prevent wear and tear. Since, they are arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.
- c) **Columnar epithelium:** Where absorption and secretion occur, as in the inner lining of the intestine, these tall epithelial cells are present. This columnar epithelial facilitates movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue also has cilia, which are hair-like projections on the outer surfaces of epithelial cells. These cilia can move and their movement pushes the mucus forward to clear it. This type of epithelium is thus ciliated columnar epithelium.

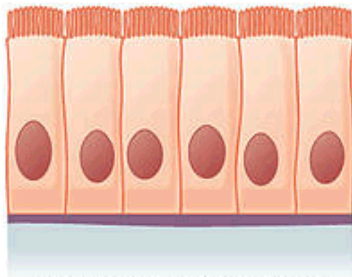
- d) **Cuboidal epithelium:** These form the lining of the kidney tubules and ducts of salivary glands where these provide mechanical support. Sometimes, a portion of the epithelial tissue folds inward and a multicellular gland is formed. This is glandular epithelium.



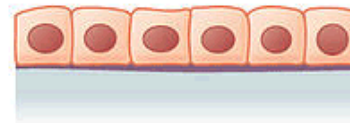
Simple squamous epithelium



Stratified squamous epithelium



Columnar epithelium

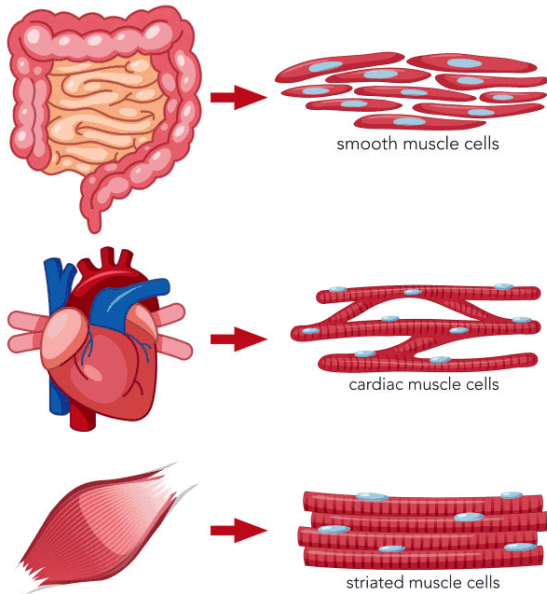


Cuboidal epithelium

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

Soln:

**TYPES OF MUSCLES IN HUMAN BODY**



52. Give reasons for

- (a) Meristematic cells have a prominent nucleus and dense cytoplasm but they lack vacuole.
- (b) Intercellular spaces are absent in sclerenchymatous tissues.
- (c) We get a crunchy and granular feeling, when we chew pear fruit.
- (d) Branches of a tree move and bend freely in high wind velocity.
- (e) It is difficult to pull out the husk of a coconut tree.

Soln:

- a) Meristematic tissue cells are continuously dividing and they have prominent nucleus and a dense cytoplasm. Since they are dividing rigorously they need not store food or waste products hence they lack vacuoles.
- b) Cellwall of sclerenchyma are lignified and are packed densely to protect the plant and to give mechanical strength hence intercellular spaces are absent in sclerenchymatous tissues.
- c) In pear fruit sclerenchyma cells are called stone cells. They are small, thick and hard. Because of this We get a crunchy and granular feeling, when we chew pear fruit.
- d) Junction of the tree branch composed of collenchyma cells which provide rigidity and flexibility to the branches. Hence Branches of a tree move and bend freely in high wind velocity.

- e) Husk of coconut tree is sclerenchyma which is hard. Hence it is difficult to pull out the husk of a coconut tree.

**53. List the characteristics of cork. How are they formed? Mention their role.**

**Soln:**

- Cork cells are mature and dead
- They are compactly arranged
- They do not have intercellular spaces
- They are thick and have several layers.

Outer protective tissue of the plant undergoes changes with age. Epidermis of the stem is replaced by a secondary meristem called phellogen or cork cambium. It is a simple tissue which consists of rectangular cells whose protoplasts are vacuolated. Cork cells contain tanins and chloroplasts.

Cork cambium forms cork on the outer side and secondary cortex on the inner side by giving off new cells on both its sides. The layer of cells which is cut by cork cambium on the outer side ultimately becomes several layered thick cork (bark) of trees.

Cork cells are compactly arranged dead cells and they lack intercellular spaces. Walls of cork cells are thickened with suberin which is fat. Because of suberin these cells are impermeable to water and gases.

**Role of cork**

Cork provides protection to plant and it prevents loss of water from plant body. Cork protects the plants from infection and mechanical injury. Cork is light in weight and it cannot catch fire. Because of this property it is used as insulators. Cork is hard in nature hence it is used to make sports goods.

**54. Why are xylem and phloem called complex tissues? How are they different from one another?**

**Soln**

A complex tissue is the one which has more than one type of cells having a common origin which coordinate to perform a common function.

Xylem and phloem are made of different types of cells hence they are called complex tissues. Xylem is made up of four different types of cells (elements), namely

(i) tracheids- Tracheids are elongated cells in the xylem of vascular plants that serve in the transport of water and mineral salts.

(ii) vessels- A vessel element (trachea) is one of the cell types found in xylem, the water conducting tissue of plants. Vessel elements are found in flowering plants

(iii) xylem parenchyma- xylem parenchyma. live plant cells that are short, lignified and generally thin walled.

They surround conducting elements and assist directly or indirectly in the conduction of water upwards through vessels and tracheids, and also serve for food storage.

(iv) xylem sclerenchyma (or fibre)- Xylem fibres are mainly supportive in function.

Phloem is also made of four different types of elements

(i) sieve tubes- Sieve tube, in flowering plants, elongated living cells (sieve-tube elements) of the phloem, the nuclei of which have fragmented and disappeared and the transverse end walls of which are pierced by sievelike groups of pores (sieve plates). They are the channels of food (mostly sugar) transport.

(ii) companion cells- companion cell A type of cell found within the phloem of flowering plants. Companion cell are usually closely associated with a sieve element. Its function is uncertain, though it appears to regulate the activity of the adjacent sieve element and to take part in loading and unloading sugar into the sieve element.

(iii) phloem parenchyma

(iv) phloem fibre

**55. Differentiate between meristematic and permanent tissues in plants (b) Define the process of differentiation ( Name any two simple and two complex permanent tissues in plants**

**Soln:**

The basic differences between meristematic and permanent tissues of plants are tabulated below

	<b>Meristematic tissue</b>	<b>Permanent tissue</b>
1	Its component cells are living, small, spherical or polygonal and un-differentiated	Its components cells may be living or dead. They are large, differentiated with different shapes.
2	Cytoplasm is dense and vacuoles are nearly absent as they are metabolically active.	Large central vacuole occurs in living permanent cells as, they are less metabolically active.
3	Intercellular spaces are absent.	Intercellular spaces are often present.
4	Cell wall of its cells is thin and elastic.	Cell wall of its cells may either thin or thick.
5	Nucleus of each cell of this tissue is large and prominent.	Nucleus is less conspicuous.
6	Its cells grow and divide regularly.	Its cells do not normally divide.
7	It is a simple tissue.	It can be simple, complex or specialized,
8	Cell organelles of its cells are simple	Cell organelles of its cells are well developed.
9	Cell contain crystals and other inclusions.	Cells crystals and other inclusions
10	It provides growth to the plant.	It provides protection. Support, conduction photosynthesis, storage, etc.

(b) Cells derived from the division of meristematic tissues take up specific roles and gradually lose their ability to divide. Thus, they form permanent tissue. Differentiation is a process by which the cells divide meristematically to take a permanent shape, size and function

(c) Parenchyma and collenchyma are two simple permanent tissues whereas xylem and phloem are two complex permanent tissues.