

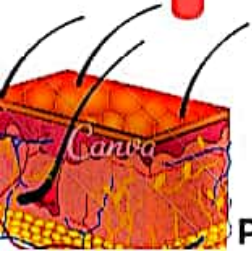
KRISHNAGAR ACADEMY



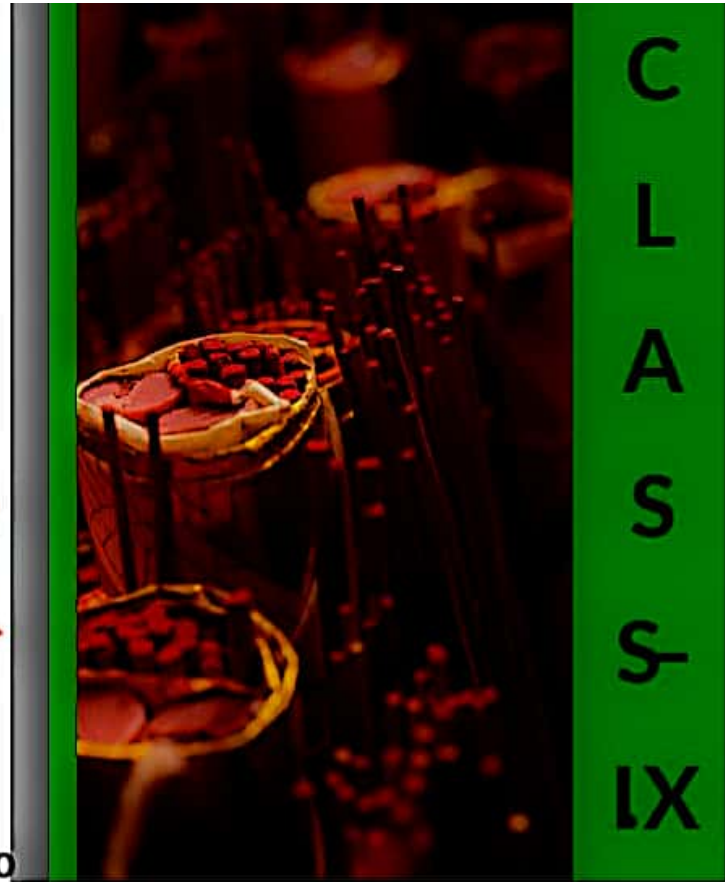
BIOLOGY

Chapter – 2

TISSUE



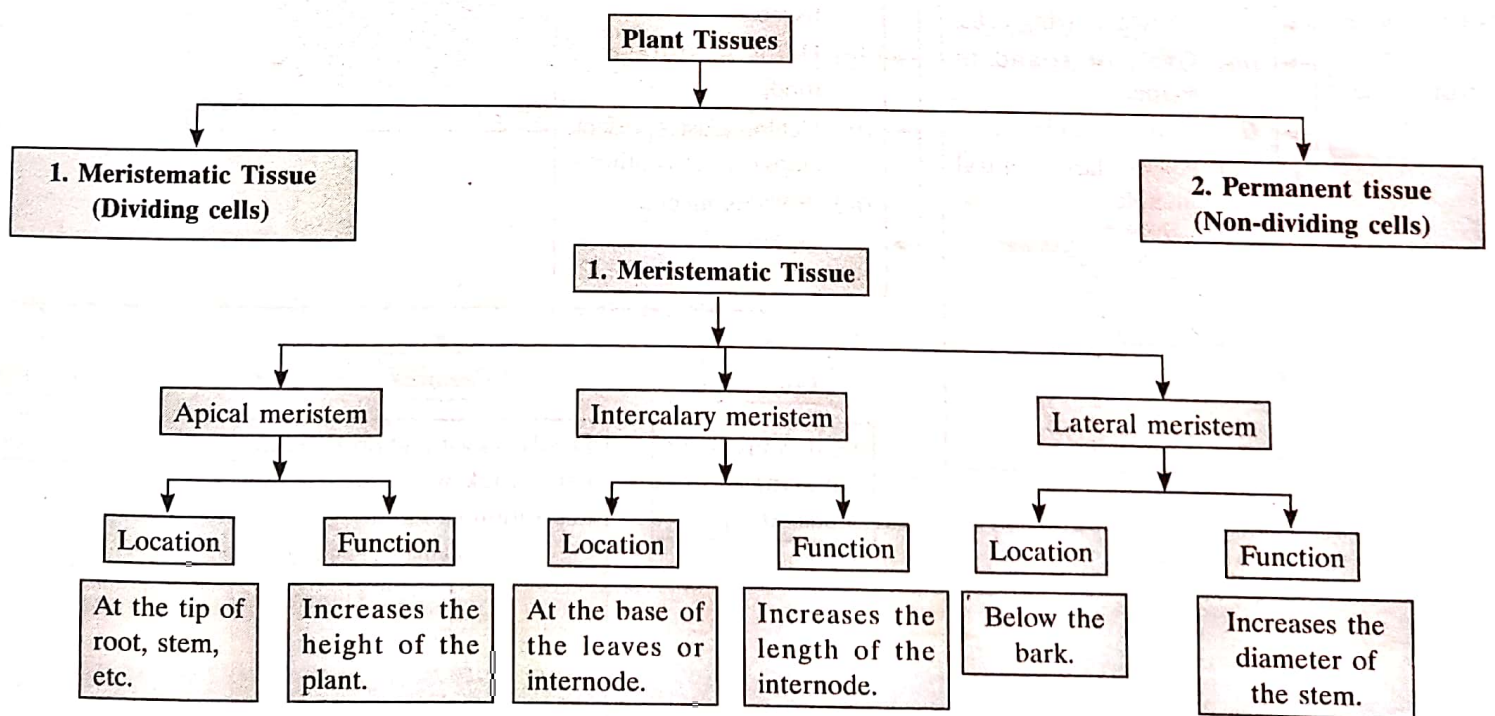
PUBLICATION DATE - 19.05.20



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TISSUE

The term 'tissue' was introduced by a French surgeon, **M.F.X. Bichat** in 1801. *Tissue is a group of similar cells having identical origin and structure, which perform a specific function.*



2. Permanent tissue (Non-dividing cells)

(a) Simple protective tissue

(b) Simple supporting tissue

(c) Complex conducting tissue

(a) Simple protective tissue

(b) Simple supporting tissue

Location

Surface of roots, stems and leaves, e.g. Epidermis is covered with cuticle.

Feature

One cell thick

Parenchyma

Collenchyma

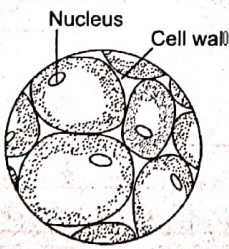
Sclerenchyma

Location

Soft parts of the plant such as cortex and pith.

Features

- (i) Cells are thin-walled.
- (ii) They are living cells.
- (iii) Oval, or round in shape.
- (iv) Dense cytoplasm.
- (v) Possess large central vacuole.



Function

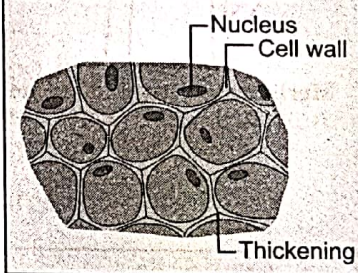
- (i) Acts as a packing tissue.
- (ii) Helps in storage of food.
- (iii) If chloroplast is present, helps in photosynthesis.
- (iv) Provides mechanical support.

Location

In the leaf stalks.

Features

Elongated cells with thickened cell wall at the corners.



Function

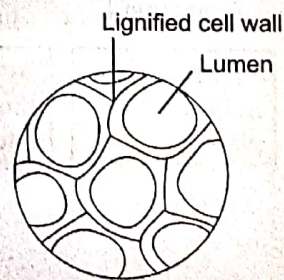
Mechanical support.

Location

Leaf veins, hard coverings of seeds, etc.

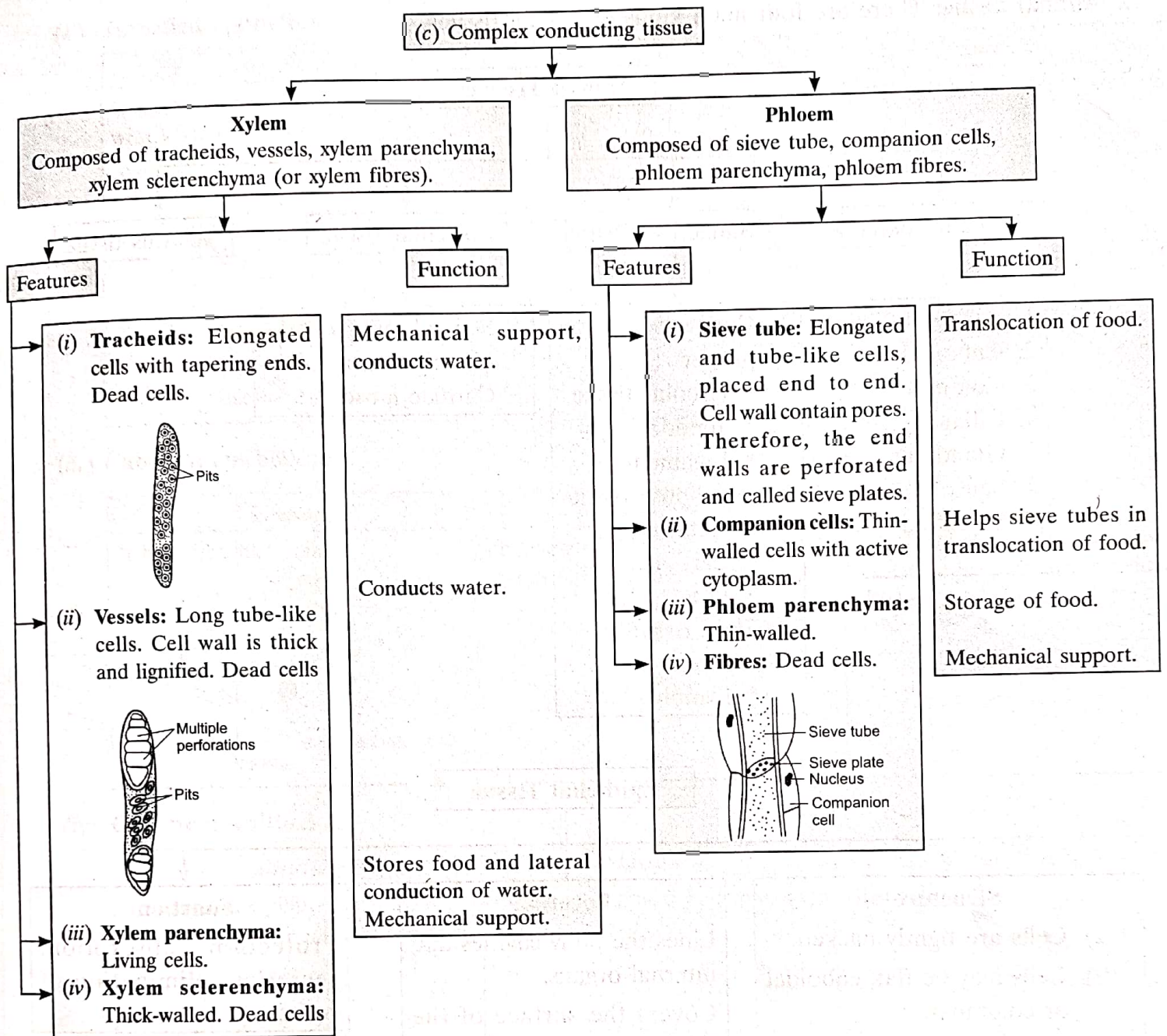
Features

Dead cells without protoplasm, very thick wall due to the deposition of lignin.



Function

Protection



Comparison of meristematic and permanent tissue.

| <i>Meristematic tissue</i> | <i>Permanent tissue</i> |
|--------------------------------------|---------------------------------------|
| (i) Has actively dividing cells. | (i) The cells do not divide. |
| (ii) The cells are undifferentiated. | (ii) The cells are differentiated. |
| (iii) Vacuoles are absent. | (iii) Vacuoles are present. |
| (iv) Has thin cell wall. | (iv) Cell wall may be thin or thick. |
| (v) Intercellular spaces are absent. | (v) Intercellular spaces are present. |

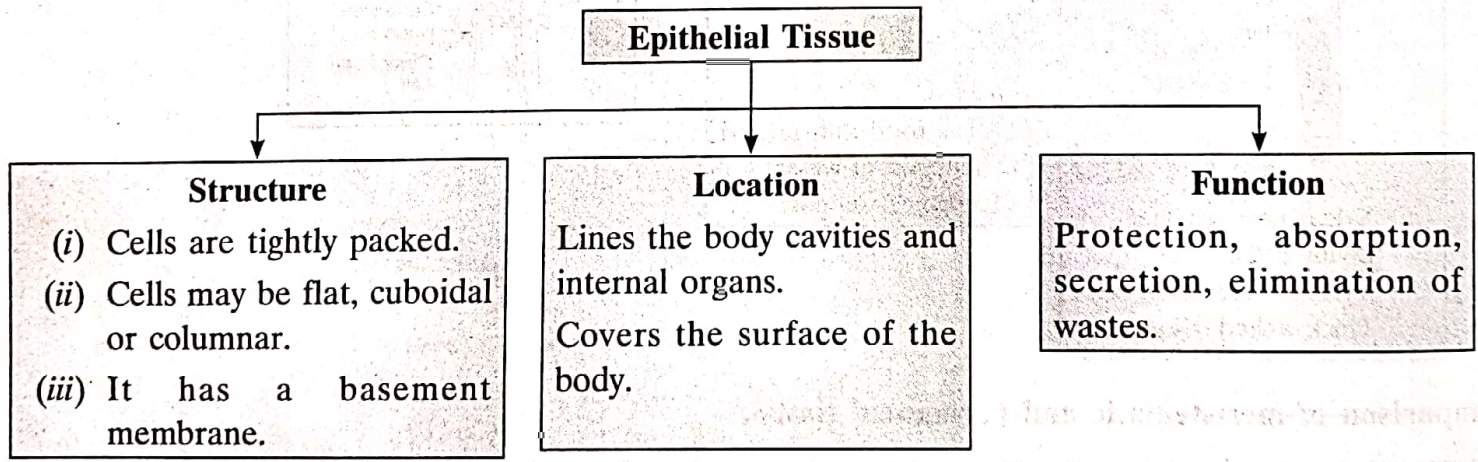
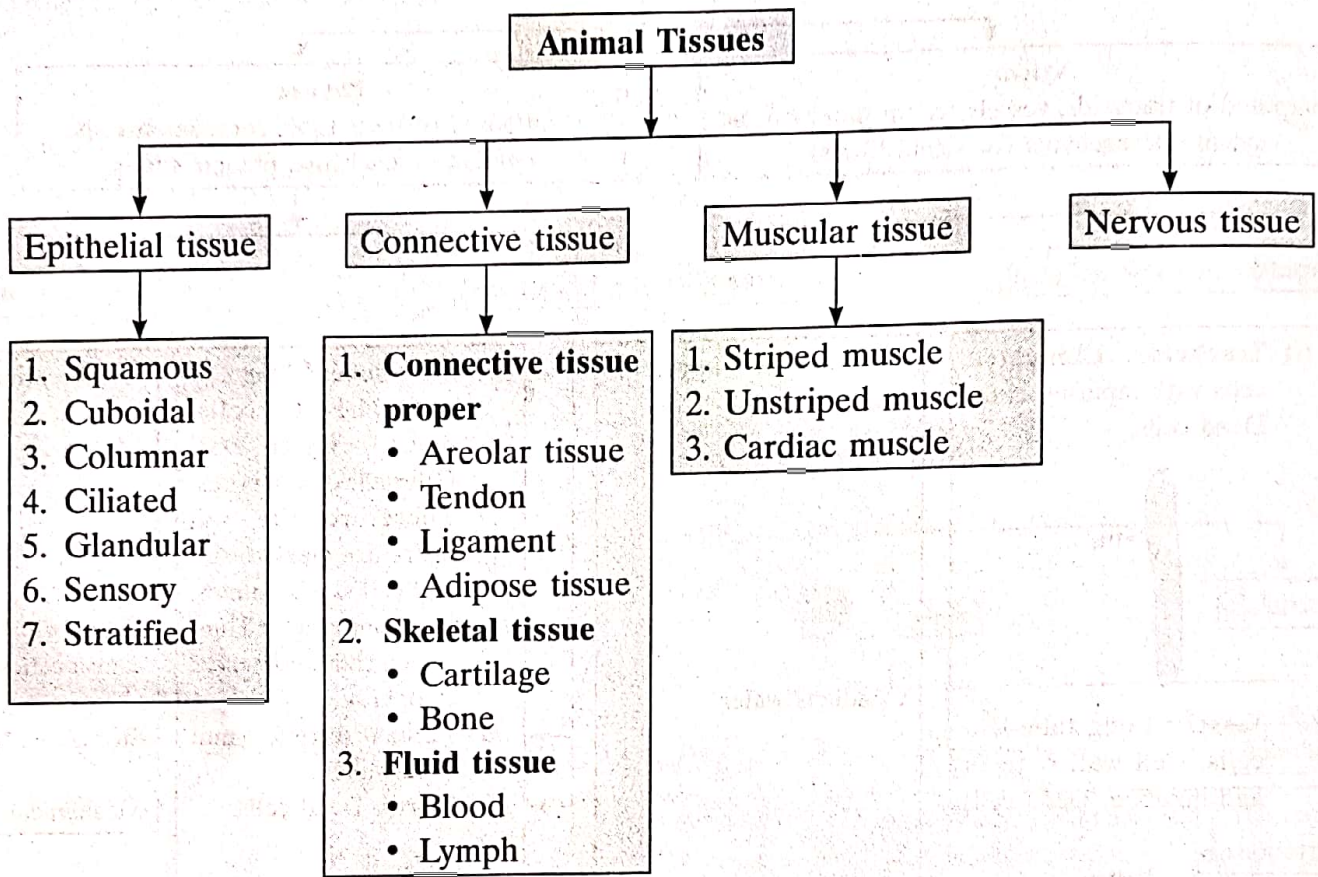
Comparison of xylem and phloem.

| <i>Xylem</i> | <i>Phloem</i> |
|--|--|
| (i) Most of the cells are dead. | (i) Cells are living except phloem fibres. |
| (ii) Conducts water in one direction (from roots to leaves). | (ii) Translocates food in both direction. |

Table 2.2: Comparison between Three Kinds of Simple Permanent Tissues

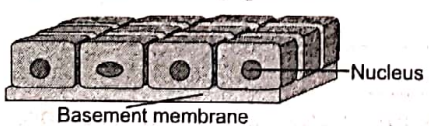
| S.No. | <i>Parenchyma</i> | <i>Collenchyma</i> | <i>Sclerenchyma</i> |
|-------|---|---|---|
| 1. | It is composed of living cells. | The cells are living in nature. | The cells are dead. |
| 2. | Cells contain cytoplasm. | Cytoplasm is present in the cells. | Cells are devoid of cytoplasm. |
| 3. | Cell wall is thin. | Cell wall is thick, especially at corners. | Cell wall is uniformly thick. |
| 4. | Cell wall is composed of very less cellulose. | Abundant cellulose and pectin form the cell wall. | Cell wall is mainly made up of lignin; but in some, it is made up of both cellulose and lignin. |
| 5. | Cells are loosely packed. | Cells are compactly packed. | Cells are tightly packed. |
| 6. | Intercellular spaces are present. | Intercellular spaces are absent. | Intercellular spaces are absent. |
| 7. | It is mainly a food storage tissue. | It provides flexibility to the plant body. | It provides mechanical support. |

2. **Animal tissue:** There are four main kinds of animal tissues.

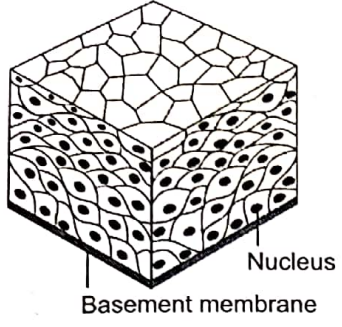


I. Depending upon the shape and function of the cells, the epithelial cells are classified into:

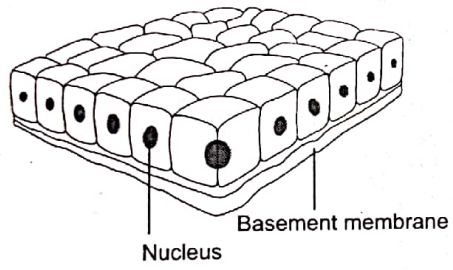
(i) Squamous epithelium

| Structure | Location | Function |
|--|--|--|
| <ul style="list-style-type: none"> • Cells are thin, flat or irregular with distinct nuclei. • Cells are closely packed.  | Lining of cavities such as mouth, oesophagus, alveoli, blood vessels, etc. | Protects the underlying parts from mechanical injury, entry of germs and drying. It filters the materials as it is semi-permeable. |

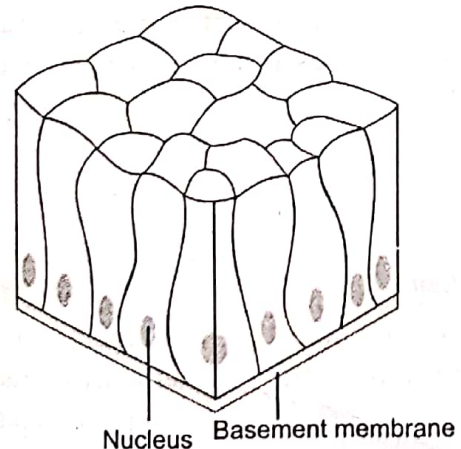
(ii) **Stratified epithelium**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|-----------------|------------------------------------|
| Cells are arranged in many layers with various shapes.  | Found in skin. | Protection from mechanical injury. |

(iii) **Cuboidal epithelium**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|--|--|
| It has cube-like cells.  | Found in kidney tubules, salivary glands, sweat glands, etc. | It helps in absorption, secretion and excretion, and also provides mechanical support. |

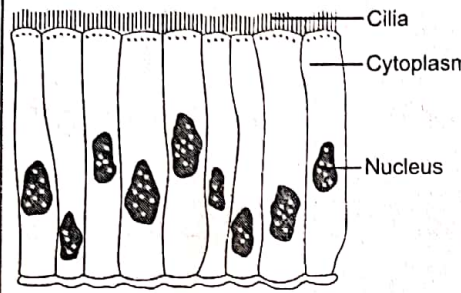
(iv) **Columnar epithelium**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|--|----------------------------------|-----------------|
| (i) Cells are pillar-like. (ii) Nuclei are situated at the base.  | Lining of stomach and intestine. | Absorption. |

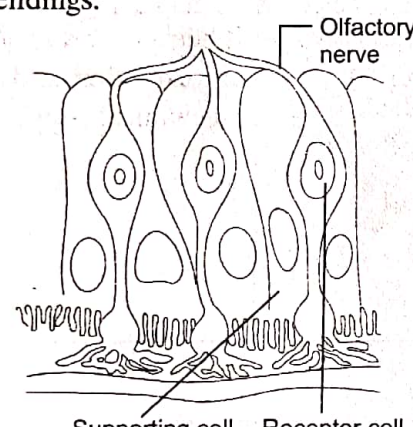
(v) **Glandular epithelium**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|---------------------------------|-----------------|
| Cells are large, they are modified columnar epithelium. | Sweat glands, tear glands, etc. | Secretion. |

(vi) **Ciliated epithelium**

| Structure | Location | Function |
|---|--|---|
| <p>Columnar epithelium which bear cilia.</p>  <p>Cilia Cytoplasm Nucleus</p> | <p>Found at the lining of trachea, kidney tubules, oviduct, etc.</p> | <p>To move materials in one direction by the rhythmic beating of cilia.</p> |

(vii) **Sensory epithelium**

| Structure | Location | Function |
|--|---|-----------------------------------|
| <p>Modified epithelial cells with nerve endings.</p>  <p>Olfactory nerve Supporting cell Receptor cell</p> | <p>Nasal passage, retina (of eye), taste buds, etc.</p> | <p>Helps to perceive stimuli.</p> |

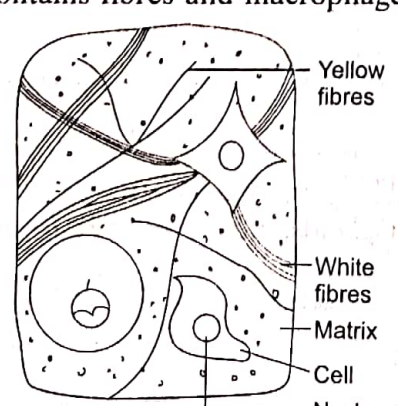
II. Connective tissue

| Structure | Location | Function |
|--|-------------------------------------|--|
| <p>Cells are loosely packed and are present in the matrix.</p> | <p>Bone, cartilage, blood, etc.</p> | <p>Connect bones to muscles, bind tissues, acts as packaging tissue.</p> |

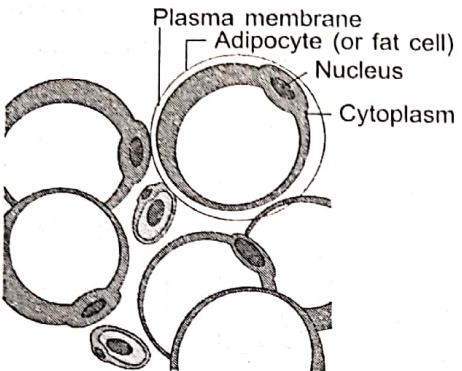
It is further classified into:

(a) **Connective tissue proper**

(i) **Areolar connective tissue (packing tissue)**

| Structure | Location | Function |
|--|--|--|
| <p>Cells are loosely packed. Matrix contains fibres and macrophages.</p>  <p>Yellow fibres White fibres Matrix Cell Nucleus</p> | <p>Joins skin to muscles, fills spaces, beneath the epithelium, etc.</p> | <p>(a) It acts as packing and supporting tissue. (b) Helps to repair tissues. (c) Joins skin to muscles.</p> |

(ii) Adipose tissue

| Structure | Location | Function |
|---|--|---|
| Contain fat cells that are round or oval in shape.  | Below the skin, around internal organs (like kidneys) and in yellow bone marrow. | (i) Stores fat. (ii) Acts as an insulator. (iii) Provide shape to the limbs. (iv) Acts as shock absorbing cushions around kidneys. |

(iii) Tendon (Fibrous connective tissue)

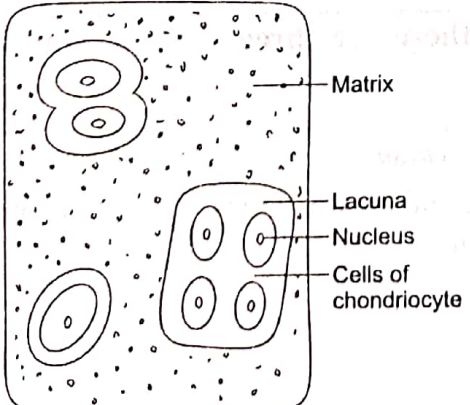
| Structure | Location | Function |
|---|------------------------|---------------------------|
| It is strong and has limited flexibility. | Join muscles to bones. | Connect muscles to bones. |

(iv) Ligament (Fibrous connective tissue)

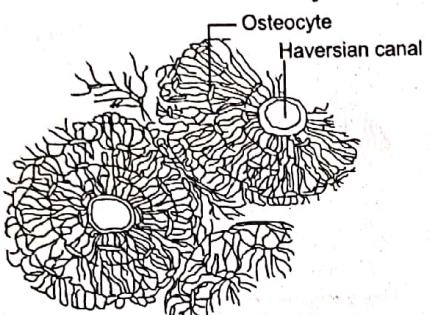
| Structure | Location | Function |
|---------------------------------------|--------------------------|---|
| It is elastic and has great strength. | Connects bones to bones. | To make the joint strong thereby helps in movement. |

(b) Skeletal tissue

(i) Cartilage (Supportive connective tissue)

| Structure | Location | Function |
|---|---|---|
| (i) Cells are widely spaced. (ii) Matrix is composed of proteins. (iii) Blood vessels and nerves are absent. (iv) It is non-porous.  | Found in the nose tip, ear pinna, end of long bones, etc. | Provides support and flexibility to the body parts. |

(ii) Bone

| Structure | Location | Function |
|--|--------------|--|
| (i) Porous tissue. (ii) Matrix contains calcium salts. (iii) Has blood vessels and nerves. (iv) Cells are living known as osteoblasts or osteocytes.  | Endoskeleton | (i) Provides shape. (ii) Protects the important organs. (iii) Anchors muscles. |

(c) Fluid connective tissue.

(i) Blood

| Structure | Location | Function |
|---|-------------------------|---|
| It contains plasma, RBCs, WBCs and platelets. | Found in blood vessels. | (i) Transports respiratory gases. (ii) Helps to fight diseases. (iii) Helps in clotting of blood. |

(ii) Lymph

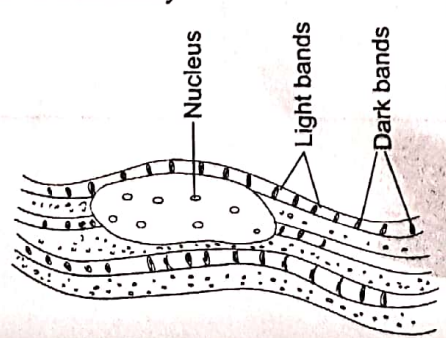
| Structure | Location | Function |
|---|-----------------------|---|
| Filtered blood plasma, colourless (mainly contains white blood cells) Lack RBC and some proteins. | In lymphatic vessels. | (i) Transports nutrients. (ii) Removes CO ₂ from tissue fluid to blood. |

III. Muscular tissue

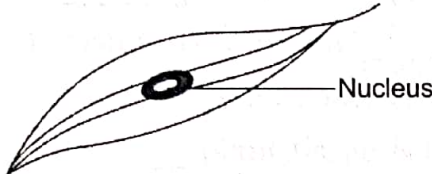
| Structure | Location | Function |
|---|--|---------------------------------|
| Elongated and large, contains contractile proteins. | Attached to the limbs, heart, alimentary canal, etc. | Movement of various body parts. |

On the basis of structure, function and location there are three types of muscular tissue.

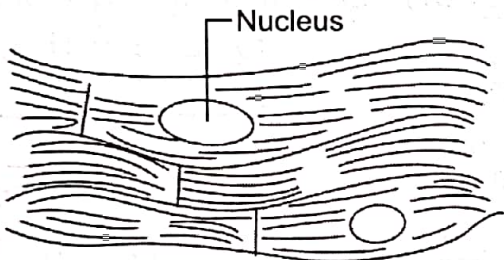
(i) Striated (striped muscle)

| Structure | Location | Function |
|--|---|----------------------|
| Contain long fibres having nucleus and alternate light and dark bands. It is voluntary.  | Found in the muscles of limbs, face, neck, etc. | Helps in locomotion. |

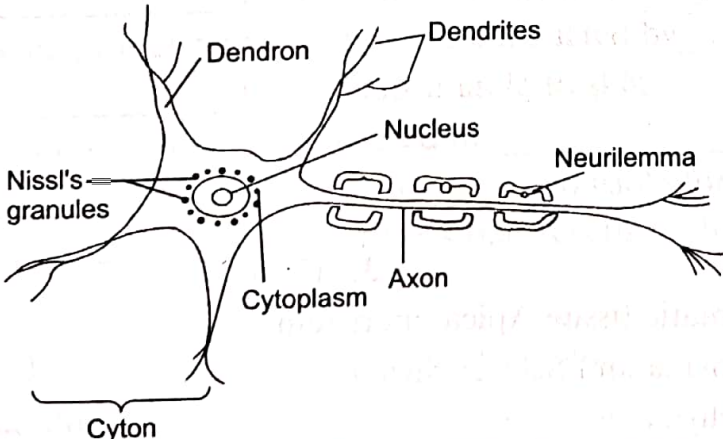
(ii) **Unstriated (Smooth muscle)**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|---|---|
| <p>It is spindle-shaped and uninucleated. It is involuntary.</p>  <p>Nucleus</p> | <p>Walls of visceral organs, ureter, iris, etc.</p> | <p>(i) Movement of food in the alimentary canal. (ii) Opening and closing of tubes.</p> |

(iii) **Cardiac muscle**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|----------------------|---|
| <p>The fibres are branched, striated and uninucleated. They have intercalated discs.</p>  <p>Nucleus</p> | <p>In the heart.</p> | <p>Rhythmic contraction of the cardiac muscle helps to pump blood to various parts of the body.</p> |

(iv) **Nervous tissue**

| <i>Structure</i> | <i>Location</i> | <i>Function</i> |
|---|--|--|
| <p>Consists of neurons (nerve cells), each neuron consists of a cyton (cell body) which contains nucleus, dendrons, dendrites and a long axon.</p>  <p>Dendron Dendrites Nucleus Neurilemma Nissl's granules Cytoplasm Axon Cyton</p> | <p>Found in the brain and spinal cord.</p> | <p>To receive impulses for perception.</p> |

Quick Notes

1. A tissue is a group of similar cells which have identical origin, structure and function.
2. Plants have two types of tissues, meristematic and permanent based on their ability to divide.
3. The actively dividing cells of meristematic tissue are found in the growth regions.
4. Permanent tissue cannot divide and is of supporting, protective and vascular type.
5. Supporting or simple permanent tissue is composed of thin-walled parenchyma cells; collenchyma cells which are thickened at corners and sclerenchyma cells with thick lignified cell walls.
6. Epidermis and cork of the plants form the protective tissues and help the plants to survive under adverse conditions.
7. Vascular tissue includes complex permanent tissues, xylem and phloem.
8. Xylem helps in the transportation of water from the roots to the other parts of the plants, whereas phloem translocates food manufactured in the leaves to various parts of the plants.
9. Animal tissues are much more diverse than plant tissues, and are of four types namely; epithelial, connective, muscular and nervous tissue.
10. Epithelial tissue covers the entire body surface, internal body cavities and the passages leading to the exterior.
11. The epithelial tissue can be categorised into five types based on their location and function – squamous, cuboidal, columnar, glandular and ciliated epithelium.
12. Connective tissue, also termed as supportive tissue, connects different tissues or organs of the body and integrates them into a single unit. These are further categorised into fibrous, skeletal and fluid connective tissues.
13. Fibrous connective tissue includes tendons, cartilage and adipose tissues. Tendons attach muscles to the bones while ligaments connect two bones.
14. Adipose tissue stores fat and forms the largest repository of energy.
15. Cartilages and bones are skeletal connective tissues. They form the endoskeleton of the body and provide it mechanical support.
16. Fluid connective tissue includes blood and lymph. These transport nutrients, respiratory gases and hormones to the body.
17. Blood is a red-coloured fluid that consists of plasma and three different types of blood cells.
18. Muscular tissue is made up of muscle fibres or muscles which help in the movement of body and its parts. It can be categorised into skeletal, smooth and cardiac muscles based on structure and location.
19. Nervous tissue comprises of neurons that receive the stimulus from the external environment and pass to the body parts, resulting in response.

1. Differentiate between the following:
 - (a) Meristematic and permanent tissue.
 - (b) Xylem and phloem.
 - (c) Columnar epithelium and ciliated epithelium.
 - (d) Skeletal muscles and cardiac muscles.
 - (e) Collenchyma and sclerenchyma.
 - (f) Bone and cartilage.
 - (g) Cell and tissue.
2. Explain the structure and functions of different kinds of blood cells present in human body.
3. Draw a well-labelled structure of a typical nerve fibre. Write the characteristic features and function of each part.
4. List the different elements of plant vascular tissues. Explain their structure and role in transportation in plants.
5. Tabulate the differences between three kinds of simple permanent plant tissues. Draw structure of each to support your answer.