



Chapter 6 - Tissues

LEARNING OUTCOMES

Students will able to:

- 1. Define tissue and differentiate it from cell.**
- 2. Differentiate between plant and animal tissue.**
- 3. Classify, explain, compare and differentiate various types of plant tissue like meristematic simple permanent and complex permanent tissue on the basis of structure ,location and function.**

LEARNING OUTCOMES

- 4. Identify, explain, classify and describe the function of different type of animal tissues like epithelial, connective, muscular, nervous tissue and draw their diagrams.**
- 5. Expected skill development: Skill developing scientific vocabulary ,critical thinking and comprehension of text.**
- 6. Development of creativity, reasoning, analytical skill and accuracy of diagrams.**

TOPICS TO BE COVERED

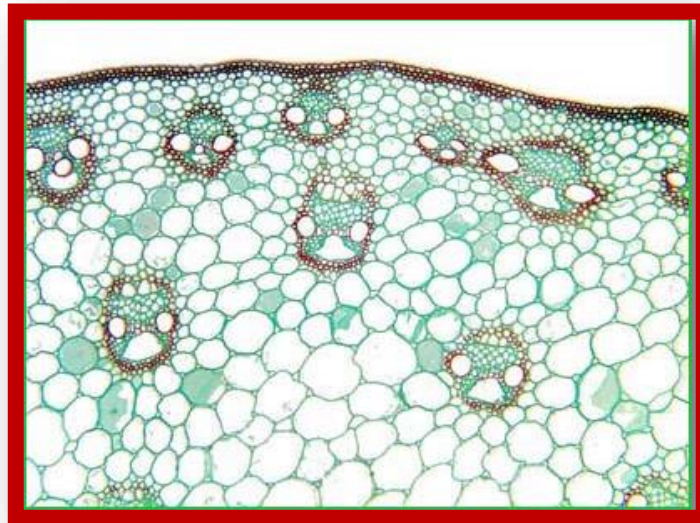
- **Tissue** –Definition
- **Are plant and animals made up of same types of tissues?**
- **Plant tissue**
- Meristematic tissue
- Permanent tissue- simple and complex permanent tissue
- **Animal tissues**
- Epithelial tissue
- Connective tissue
- Muscular tissue And Nervous tissue

INTRODUCTION

- **What is a cell?**
- **What are unicellular organism?**
- **What are multicellular organisms?**
- **Does multicellular organisms are made up of same types of cells?**
- **What is the organization of multicellular organisms?**

Tissue: *A group of cells that are similar in structure and work together to perform a particular function.*

- **Examples:-** In plants vascular tissue Xylem and phloem Conduct food and water are example of tissue.
- In animals Muscles contracts and relax to cause movements are examples of tissue.



Difference between plant and animal tissues

Plant Tissues	Animal Tissues
Plants do not move. Plants required less energy	Animals moves from one place to another . Animals required more energy than plants.
Most of the tissue provide them support and structural strength.	Their tissues are the ones that can support movement.

Difference between plant and animal tissues

Plant Tissues

Most of tissues are dead in plants as they can provide mechanical strength easily and required less maintaince



Animal Tissues

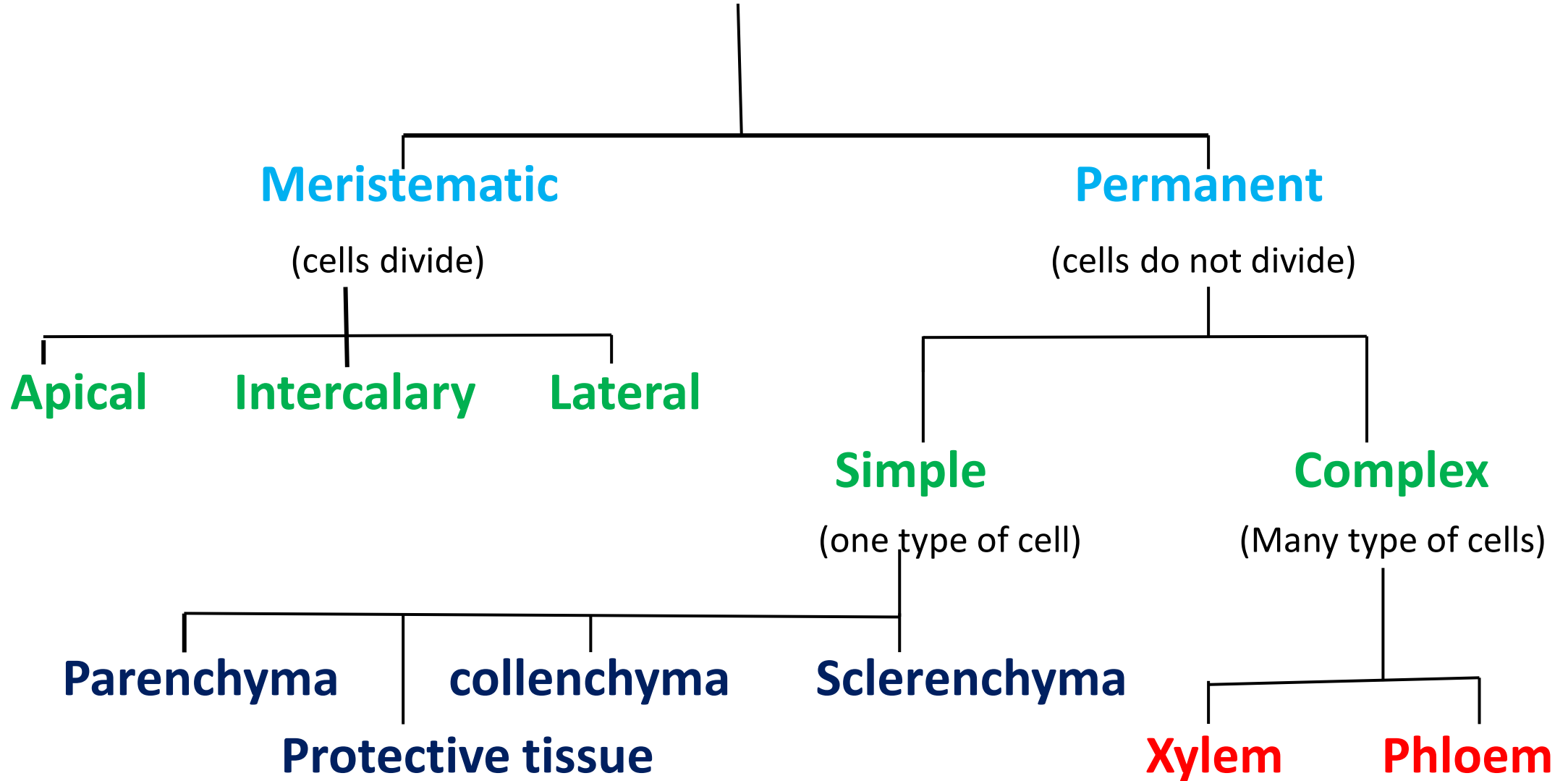
Most tissues in them are living. So they can move and perform several functions.



Difference between plant and animal tissues

Plant Tissues	Animal Tissues
Only certain parts of the plant can grow. The tissues present in such regions divide themselves and form new tissues.	Growth in animals is uniform and not only in certain regions of the body.
The structure of plant tissues is not very specialized as compared to animals	The organs and organ systems in animals are highly developed

Plant tissues

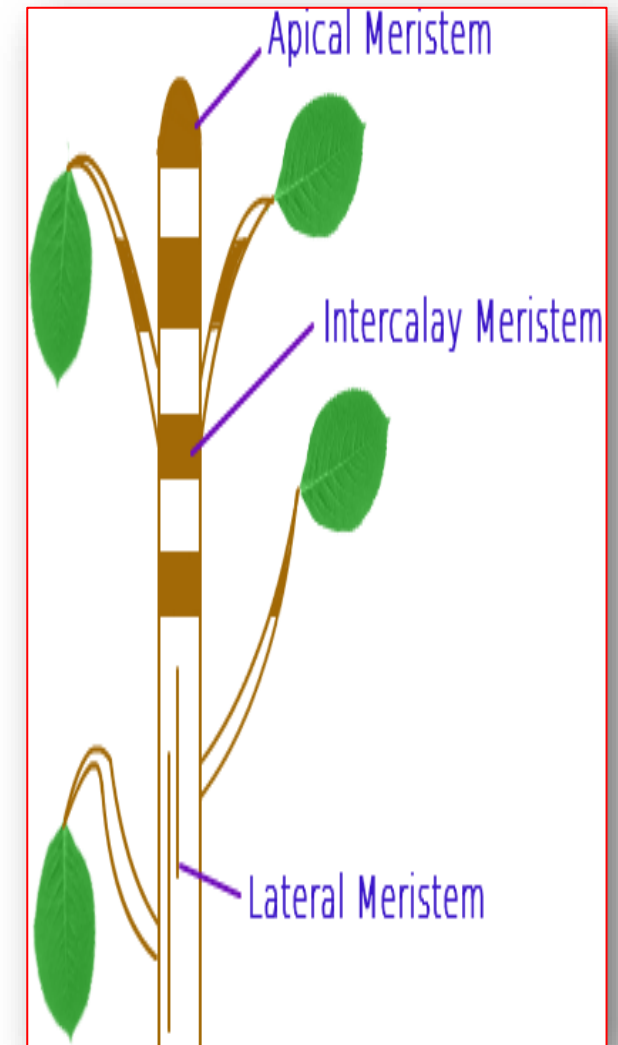


Meristematic tissue (Meristem)

- **Have the ability to divide and form new cells. Cells of meristems are active having dense cytoplasm thin cell wall and prominent nucleus.**
- **They lack vacuoles because it provide rigidity to cell and prevent quick cell division.**
- **It increase length and width of plant.**

Three type of meristematic tissue on the basis of their location

Type	Location	Function
Apical Meristem	Growing tip of shoot and root.	Increase the length of stem and root.
Intercalary Meristem	At the base of leaves and internode	Increase the length of internode or leaf.
Lateral Meristem (Cambium)	On the side of stem and root.	Increase the girth of stem and root

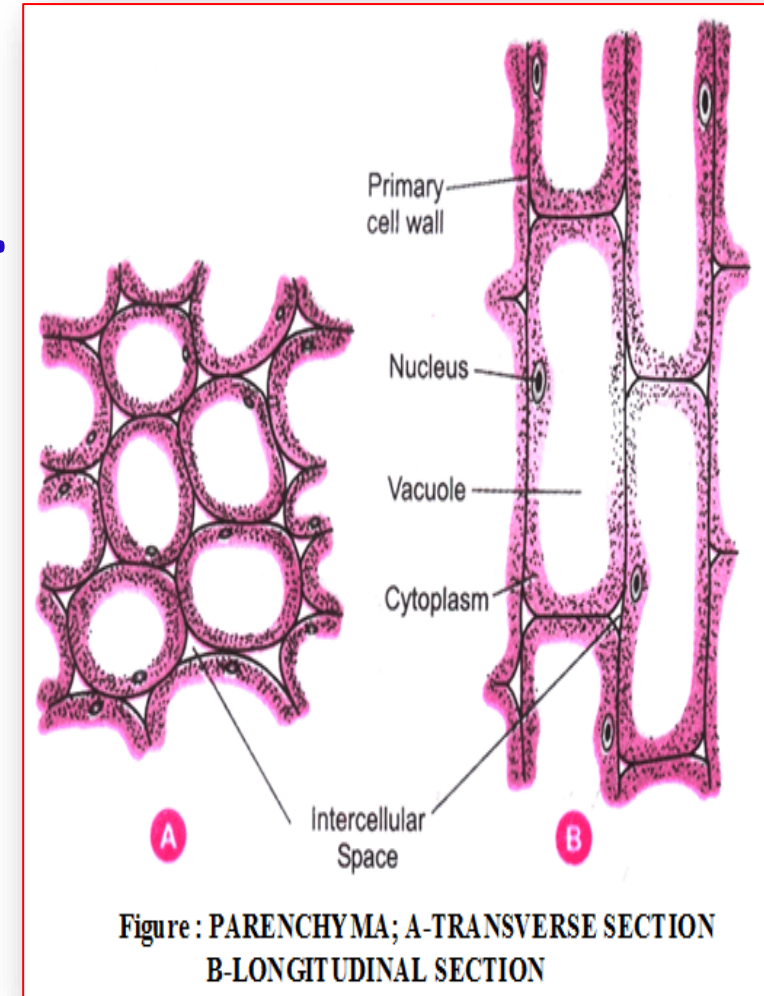


PERMANENT TISSUE

- Arise from meristematic tissue. Loss the ability to divide.
- Have definite shape, size and function.
- The process by which meristematic tissue form permanent tissue is called differentiation.
- It is of two types: -
- Simple and complex permanent tissue.

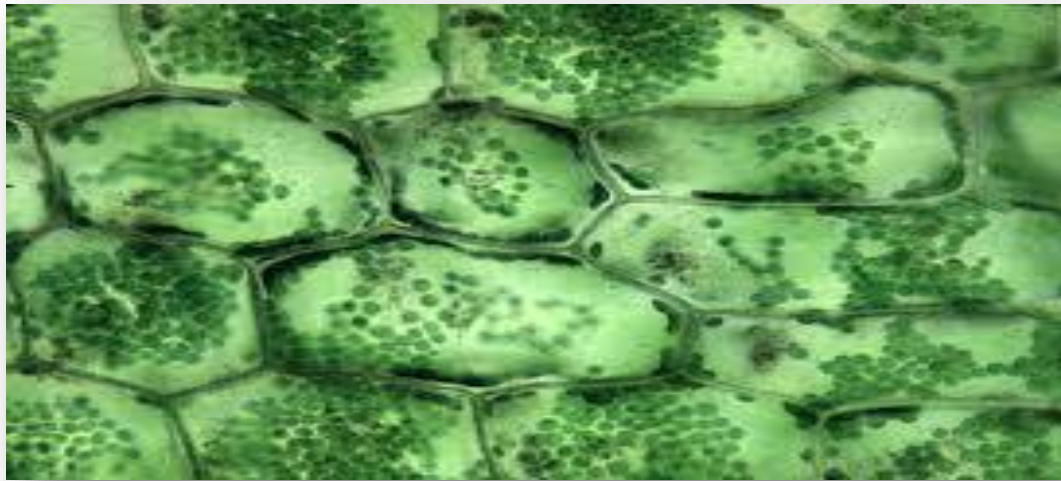
SIMPLE PERMANENT TISSUE

- **Parenchyma:-**
- It is basic (simple) type of packaging tissue.
- Has relatively unspecialised living cells.
- Thin cell wall and large intercellular spaces between the cell.
- It store food and provide support to plant.
- Found in soft parts of plants.

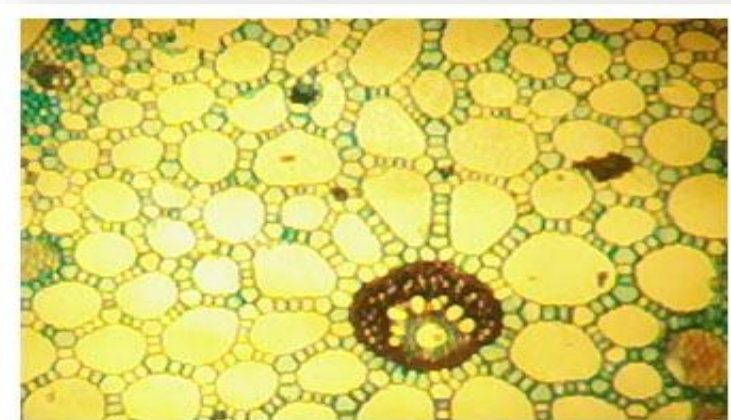


Chlorenchyma and Aerenchyma

- Parenchyma contains chlorophyll and perform photosynthesis it is called chlorenchyma.
- In aquatic plants, parenchyma has large air space to provide buoyancy to plants and exchange of gases it is called aerenchyma.



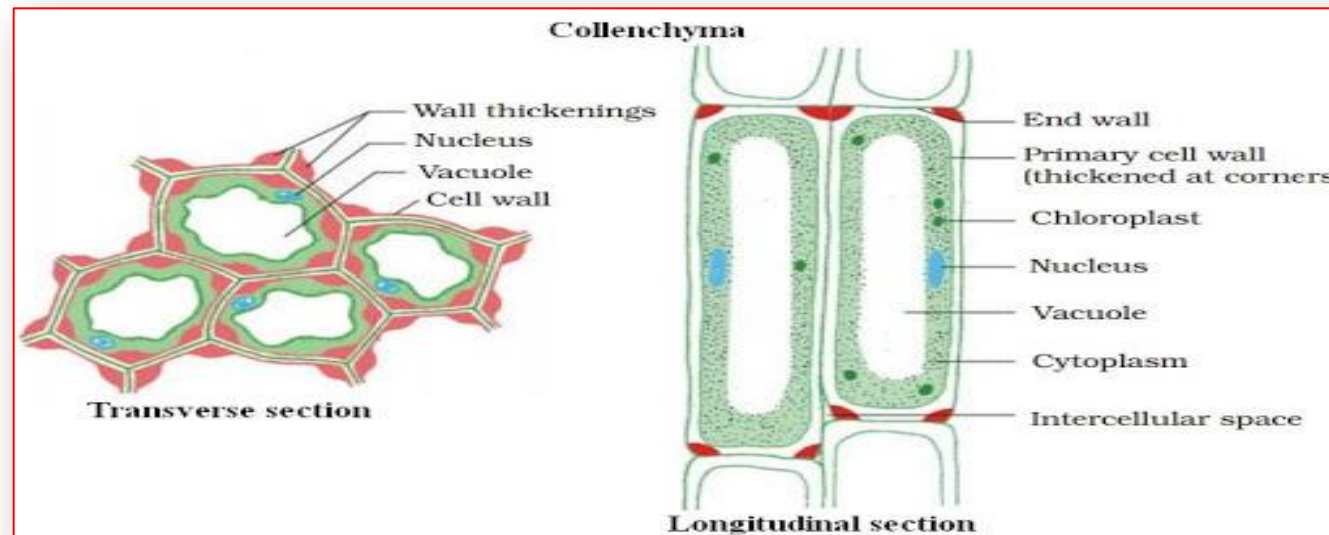
Chlorenchyma



Aerenchyma

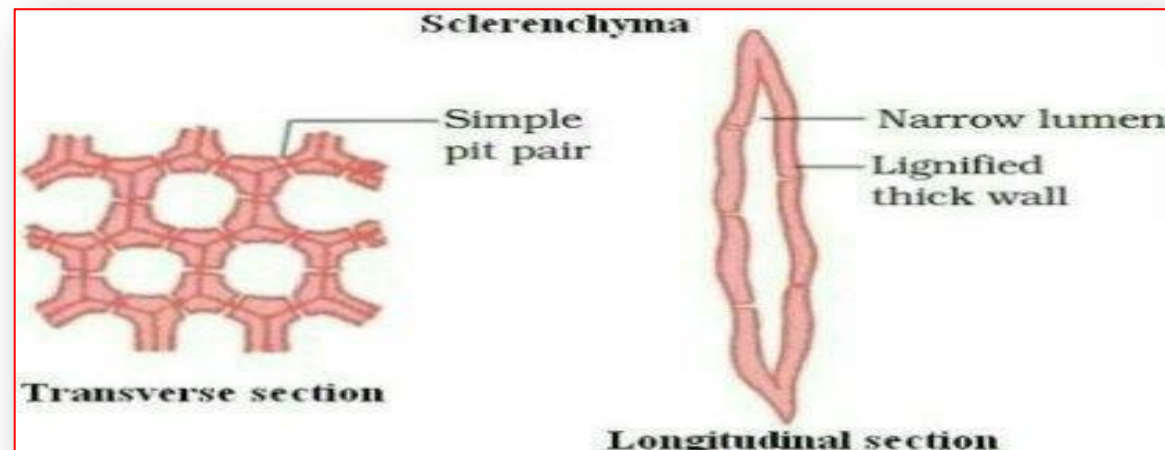
COLLENCHYMA

- Contains elongated living cells irregularly thickened at the corners.
- Intercellular space is less.
- Provide flexibility and mechanical support to leaves and stem and allow easy bending without break.
- Found in leaf stalks below the epidermis.



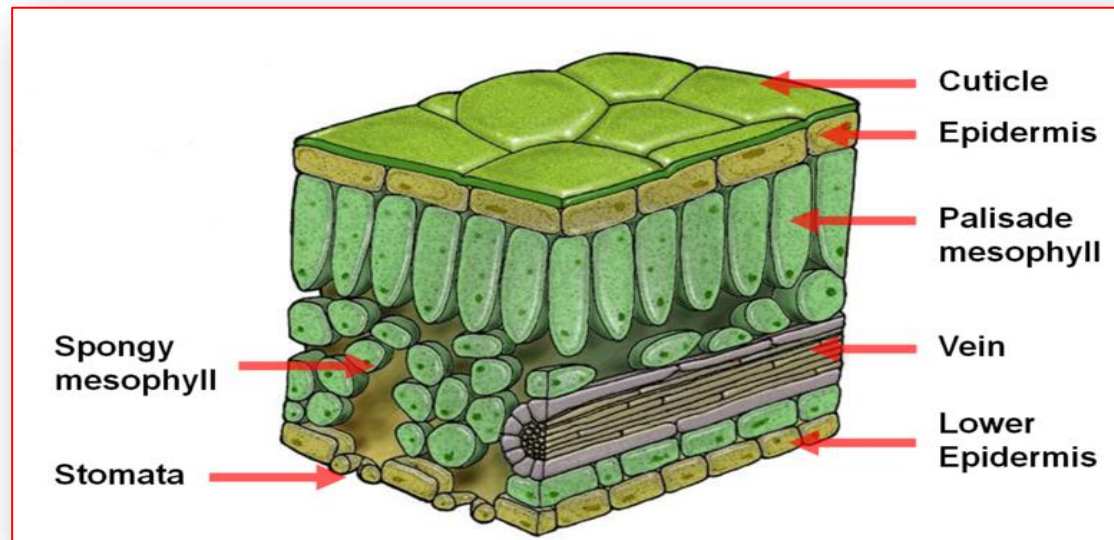
SCLERENCHYMA

- Consist of long, narrow, thick walled dead cell.
- Cell wall contains lignin which act as cement and harden them.
- Intercellular space absent.
- It provide strength and rigidity to plant and make them hard and stiff.
- Present around vascular bundles, in leaf veins, in the hard covering of seed, husk of coconut and nuts.



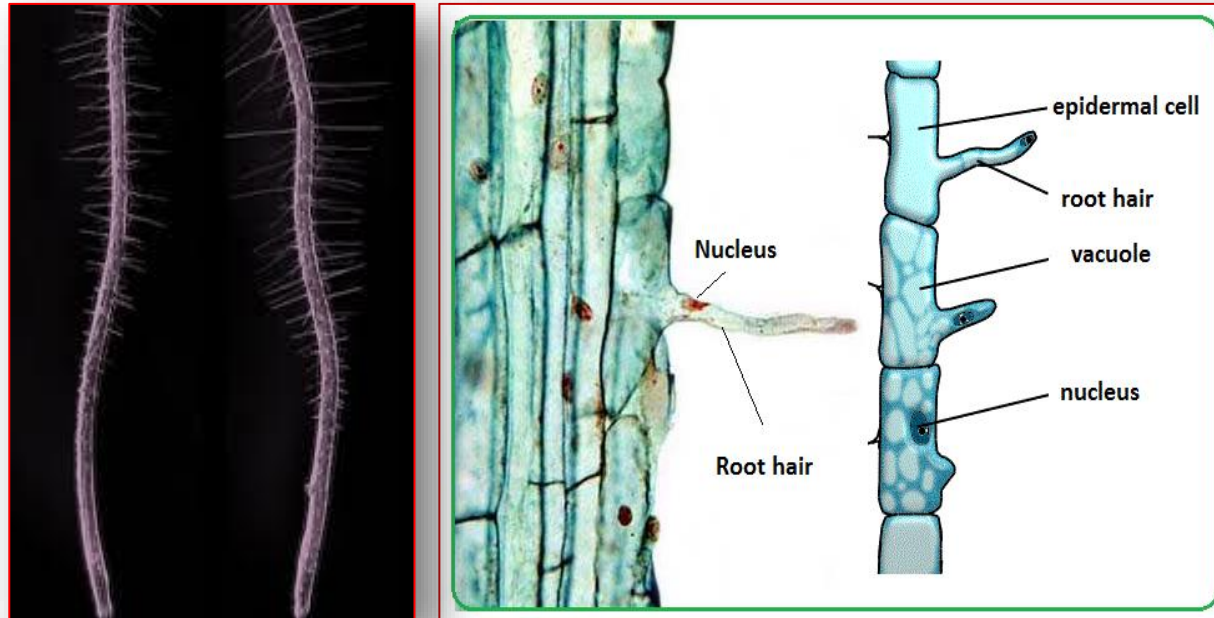
EPIDERMIS

- It is outermost protective layer of plant parts.
- It is usually made up of single layer of flat cells without inter cellular spaces. Outer and side walls are thicker.
- On aerial parts epidermal cells secretes waxy water resistant layer called cuticle. Which prevent loss of water , injury and invasion of pathogens.



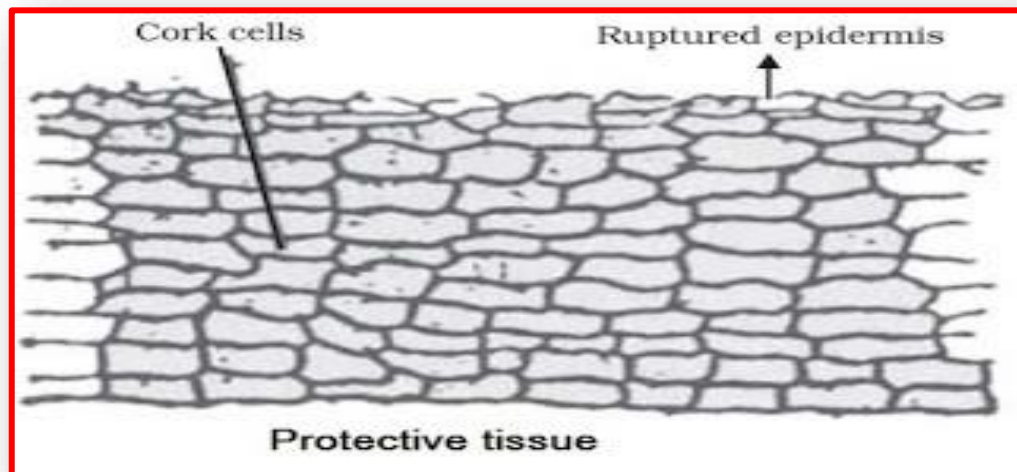
EPIDERMIS

- Plants of dry habitats have thick epidermis and thick waxy layer of cutin on their outer surface.
- Epidermal cells of root have root hairs which increase the surface area.



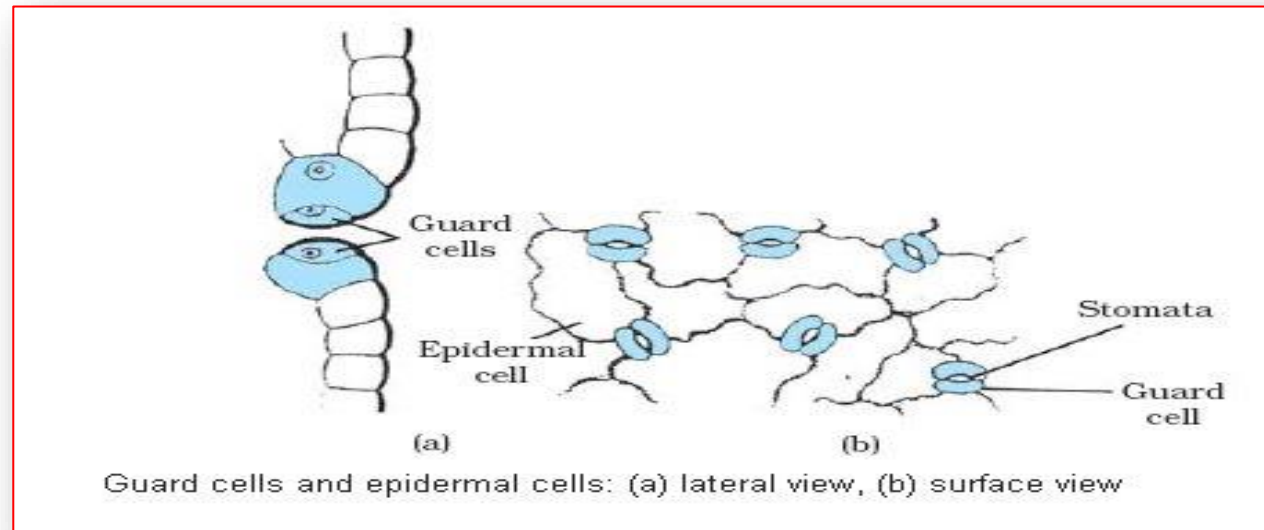
CORK

- As plants grow older epidermis is replaced by secondary meristem.
- It divide and form cells on both side.
- Cells of on outside cut of from this layer and form several layer thick cork or bark.
- Cells of cork are dead, without intercellular spaces and have chemical suberin in their walls.



STOMATA

- Stomata are small pores in the epidermis of leaf.
- Stomata are enclosed by two kidney shaped guard cells.
- They help in exchange of gases with the atmosphere.
- Transpiration also occur through it.

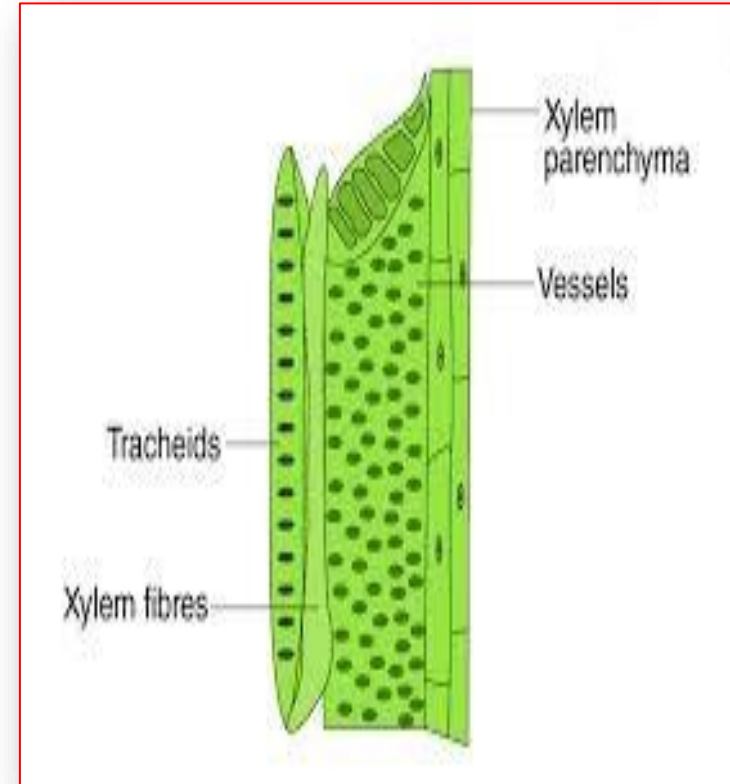


COMPLEX PERMANENT TISSUE

- **They are made up of more than one type of cells.**
- **Xylem and phloem are examples.**
- **Both are conducting tissue and form vascular bundles.**
- **They made possible survival of vascular plant in terrestrial environment.**

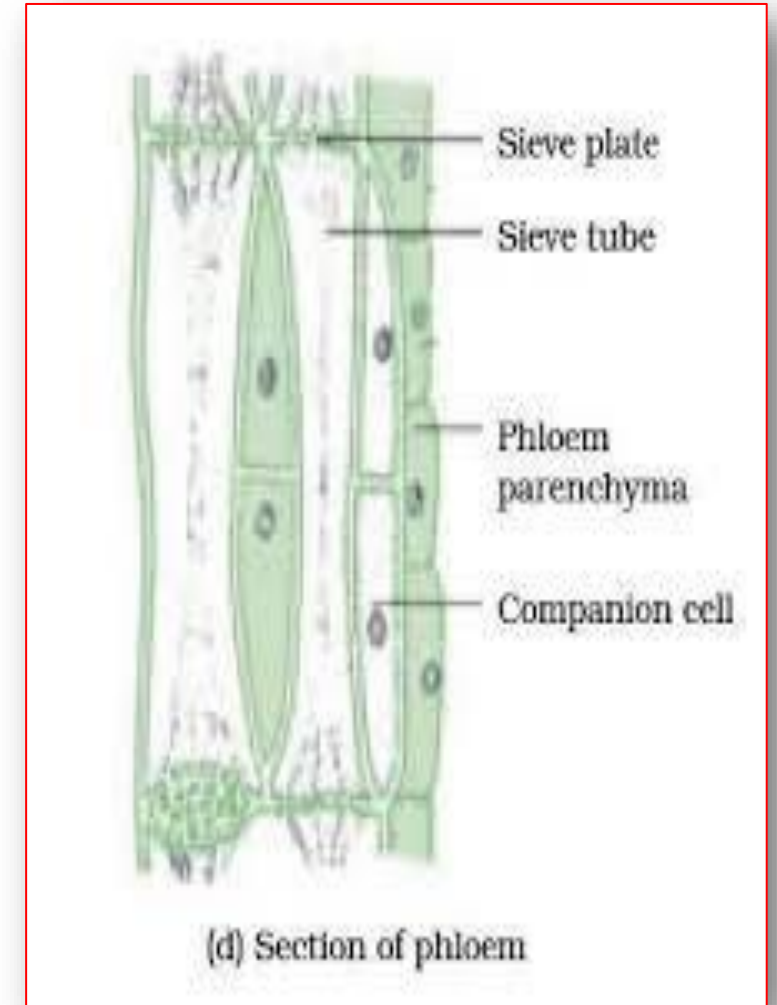
XYLEM

- It consist of tracheids, vessels, xylem fibre and xylem parenchyma.
- Contains thick cell walls.
- Except xylem parenchyma all are dead Cells.
- Xylem fibre are provide support.
- Parenchyma store food and do sidewise conduction.
- Tracheids and vessels are tubular structure which conduct water and minerals vertically.



PHLOEM

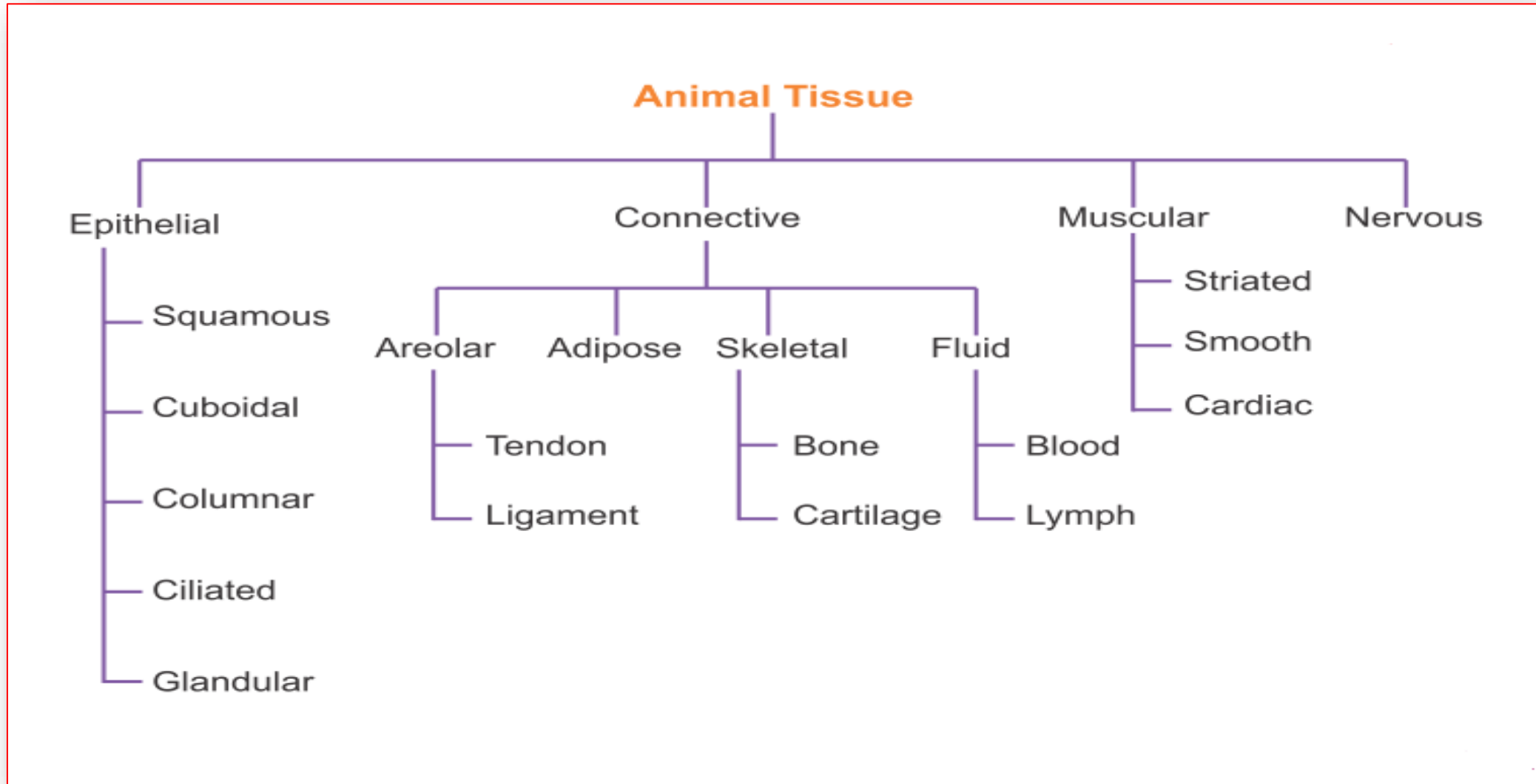
- Made up of four elements sieve tubes, companion cells, phloem fibres and phloem parenchyma.
- Except phloem fibre all are living cells.
- Sieve tubes are tubular cells with perforated walls.
- Phloem transport food.
- Phloem transport is bidirectional.



RECAPITULATION

- **What is the unique feature of meristem?**
- **What are different types of permanent tissues?**
- **Name the dead elements of xylem and phloem.**
- **Name the protective tissue present in plants.**
- **State the characteristics of cells of epidermis.**
- **Name the chemical present in cork.**

ANIMAL TISSUE



Epithelial tissue (Epithelium)

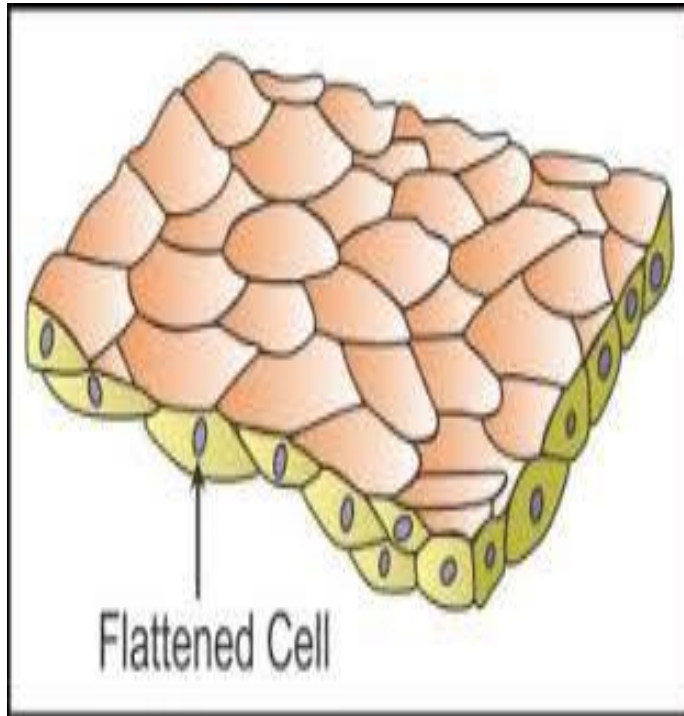
- It is the covering or protective tissue of animals.
- Made up of tightly packed cells which form a continuous layer with no intercellular spaces .
- Separated from underlying tissue by fibrous basement membrane.
- The permeability of epithelial cells regulate the exchange of material between body and environment.

Types of epithelium

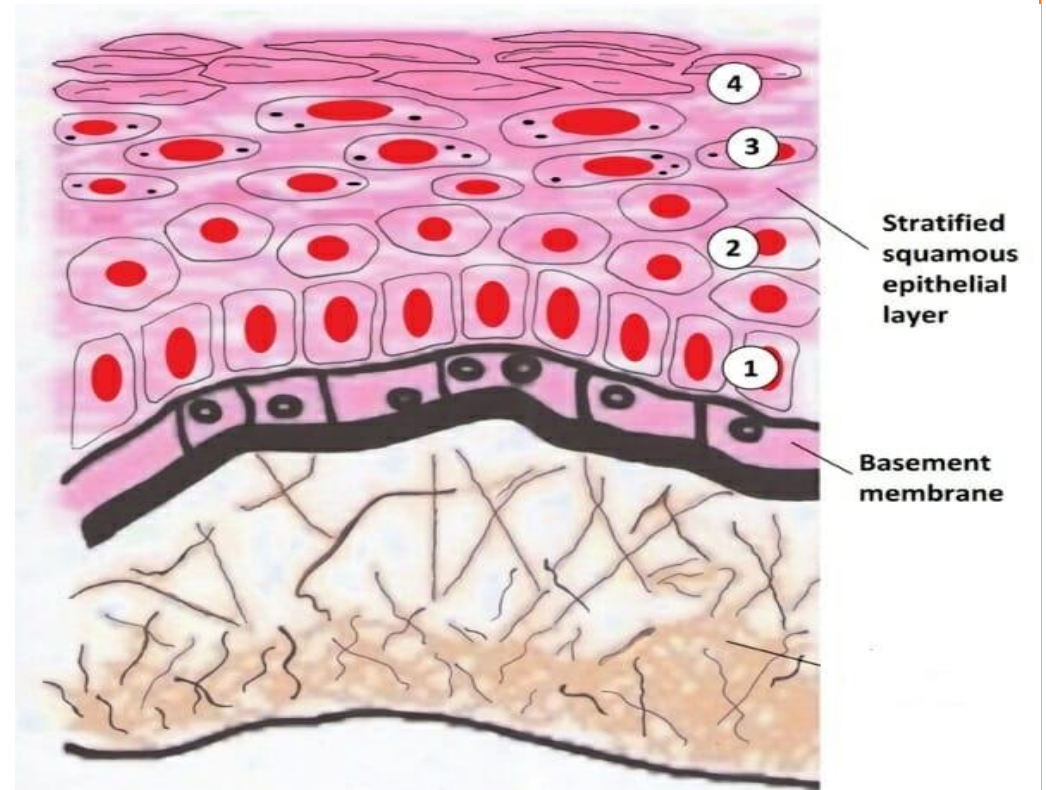
Type of epithelium	Characteristics	Location	Function
Squamous epithelium	Cells are thin and flat.	Lungs alveoli, Blood Vessels, Oesophagus Lining of mouth	Protection Exchange of substances between blood and cells and at alveoli
Stratified Squamous epithelium	Flat cells arranged in many layers to prevent wear and tear.	Skin	Protection

TYPES OF EPITHELIUM

- Squamous epithelium



- Stratified squamous epithelium



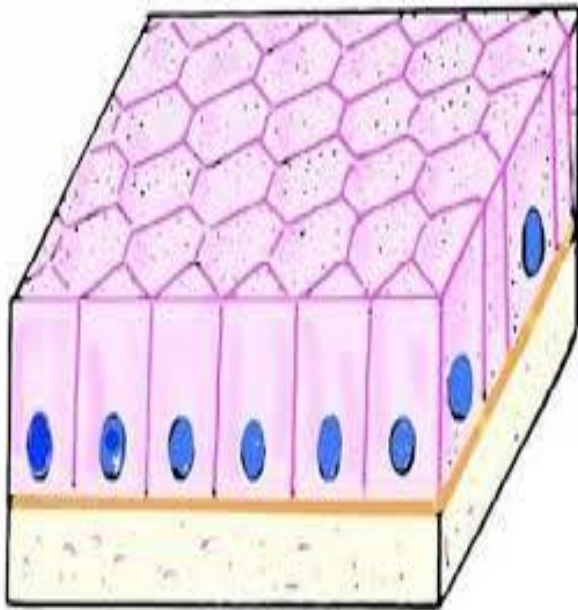
TYPES OF EPITHELIUM

Type of epithelium	Characteristics	Location	Function
Columnar epithelium	Tall pillar like cells. Nucleus at the base	Inner lining of intestine,	Absorption and secretion
Ciliated columnar epithelium	Tall cells with cilia	Respiratory tract	Pushes the mucus forward to clear respiratory tract

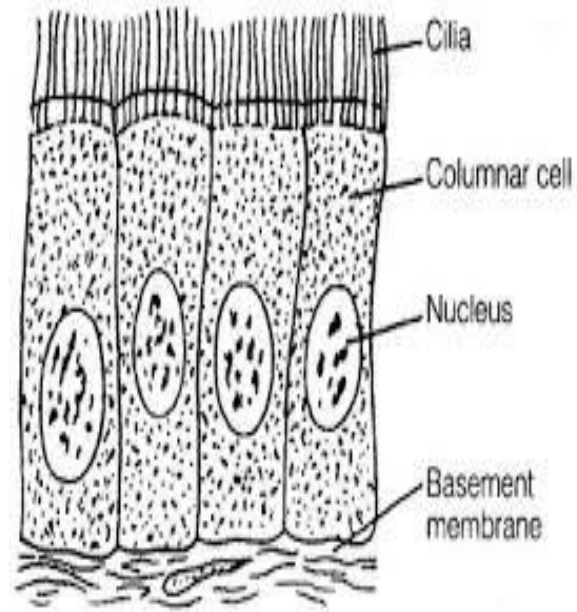
Type of epithelium	Characteristics	Location	Function
Cuboidal epithelium	Cube cells	Kidney tubules, ducts of salivary glands.	Mechanical support
Glandular epithelium	Epithelial cells folds inward and form multicellular gland, acquire additional specialisation as glands	Goblet cells are present in mucus membrane	Secretion

Types of epithelium

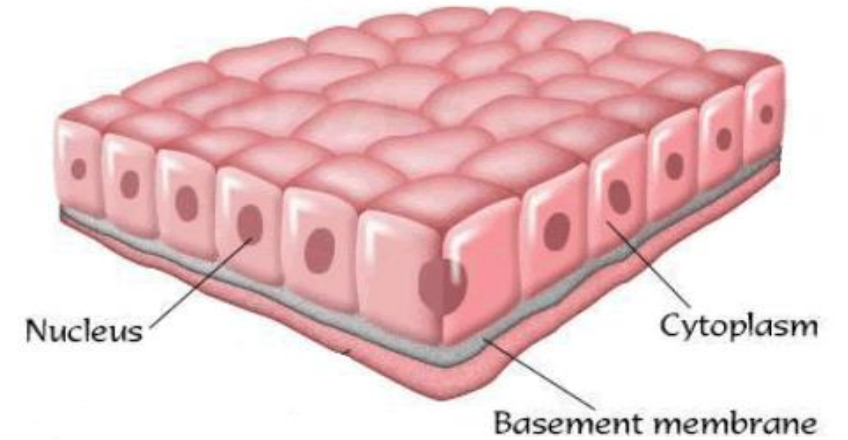
Columnar



Ciliated

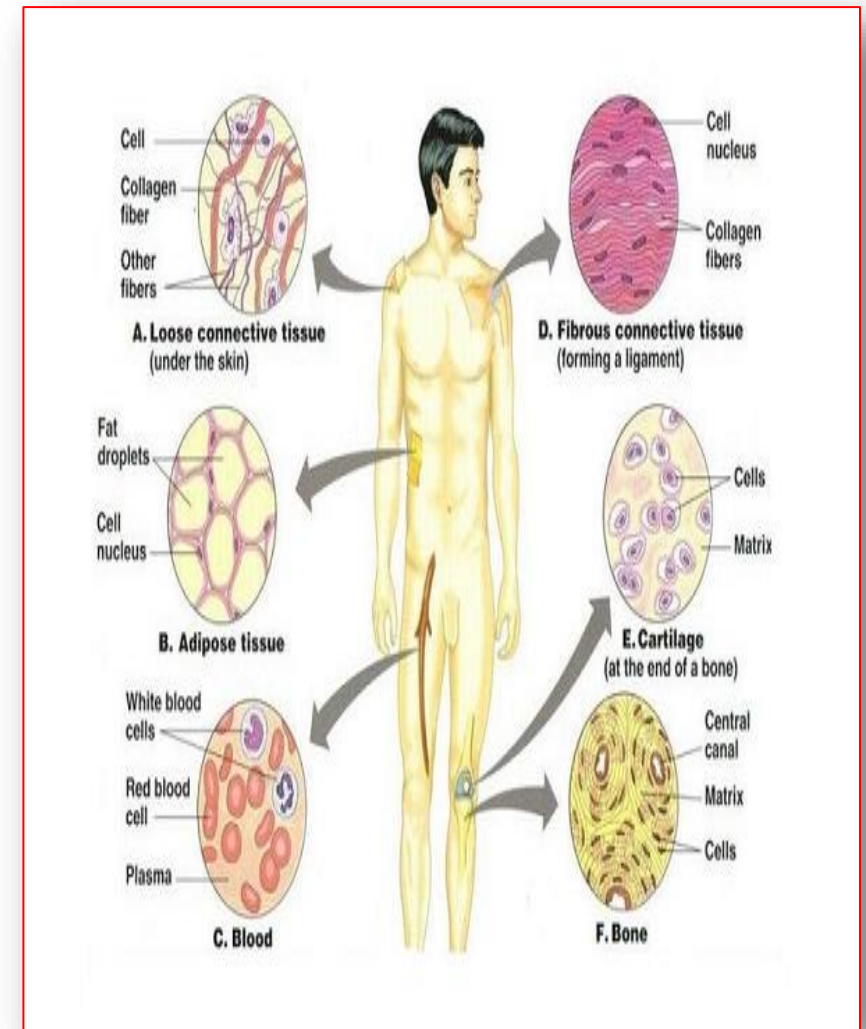


Cuboidal



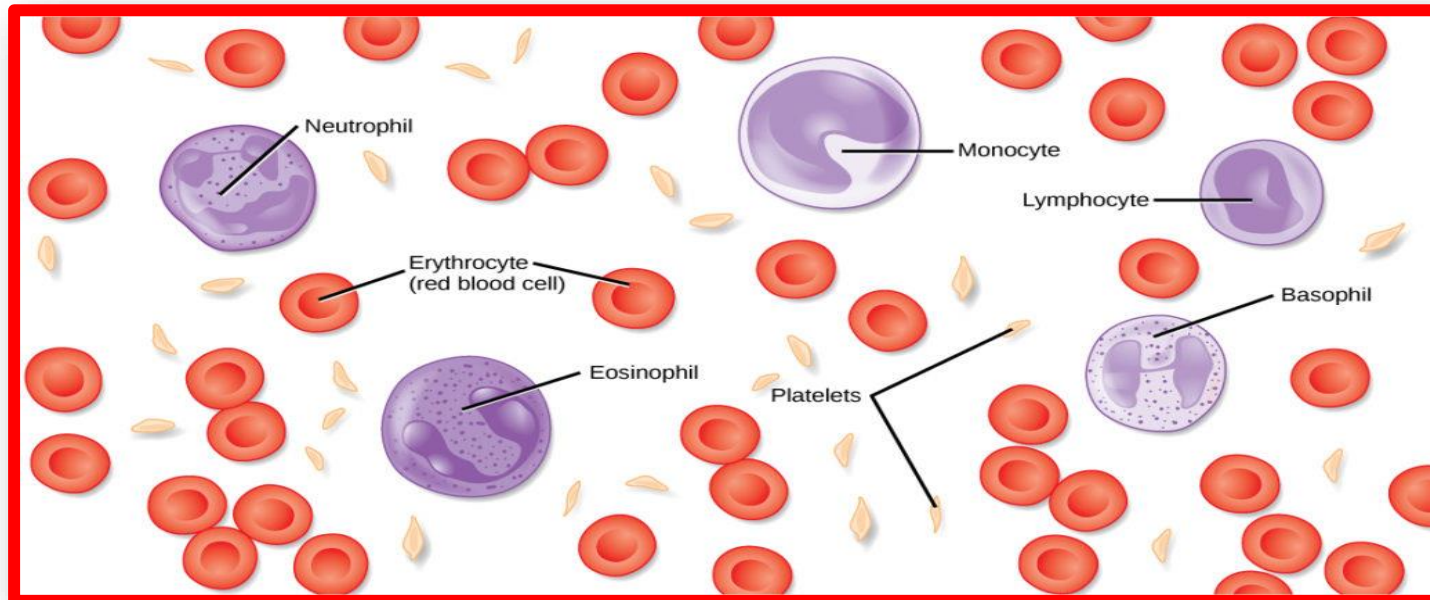
CONNECTIVE TISSUE

- It connect various tissues in an organ.
- Loosely packed Cells are embedded in matrix.
- Matrix may be jelly like, fluid, dense or rigid.



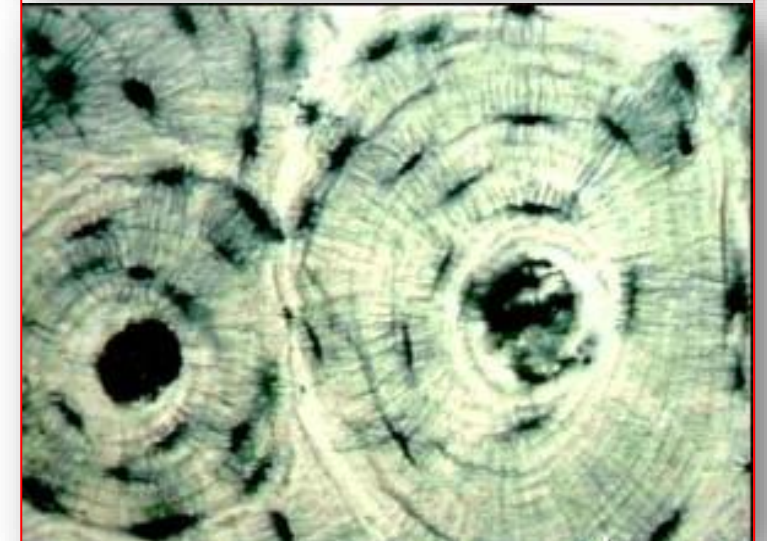
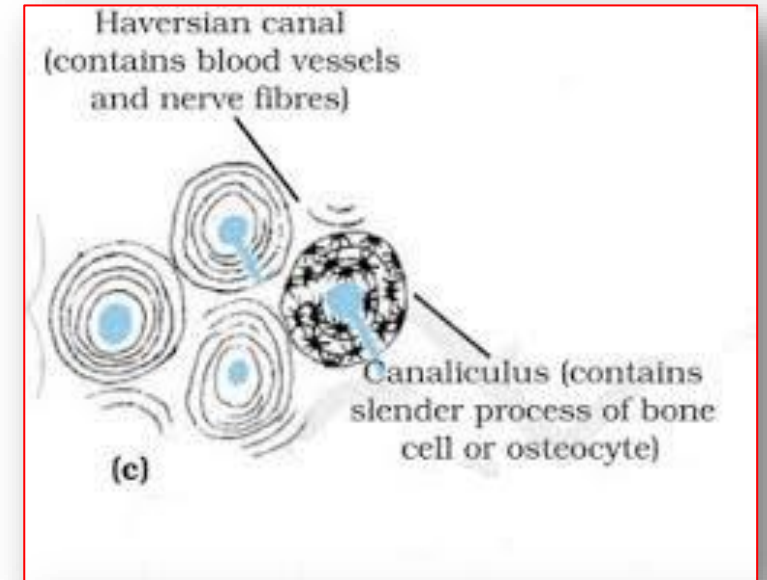
BLOOD

- *Matrix is fluid called plasma.*
- *Plasma contain protein ,salts and hormones.*
- *Plasma RBC, WBC and PLATELETS are suspended.*
- *Blood transport materials to different parts of body.*



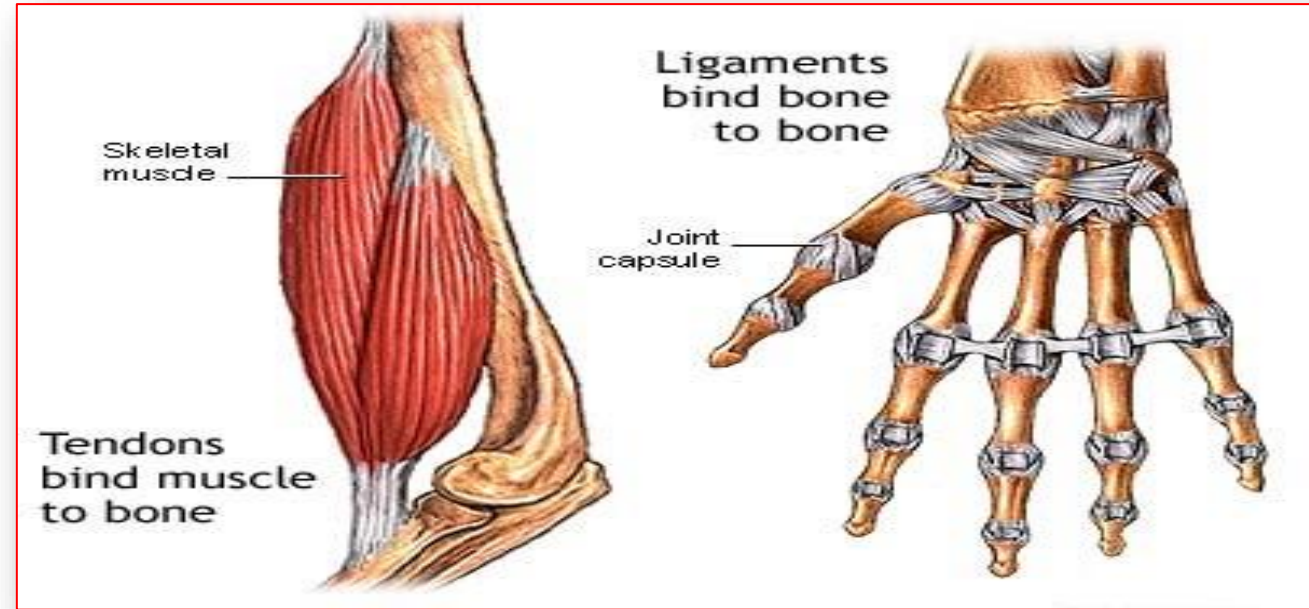
BONE

- Bone Is Strong And Nonflexible Tissue.
- Matrix Is Hard.
- It Is Made Up Of Salts Of Calcium And Phosphorus.
- Matrix Contains Bone Cells Or Osteocytes.
- Bone Form Skeleton That Support Body And Anchors The Muscle.



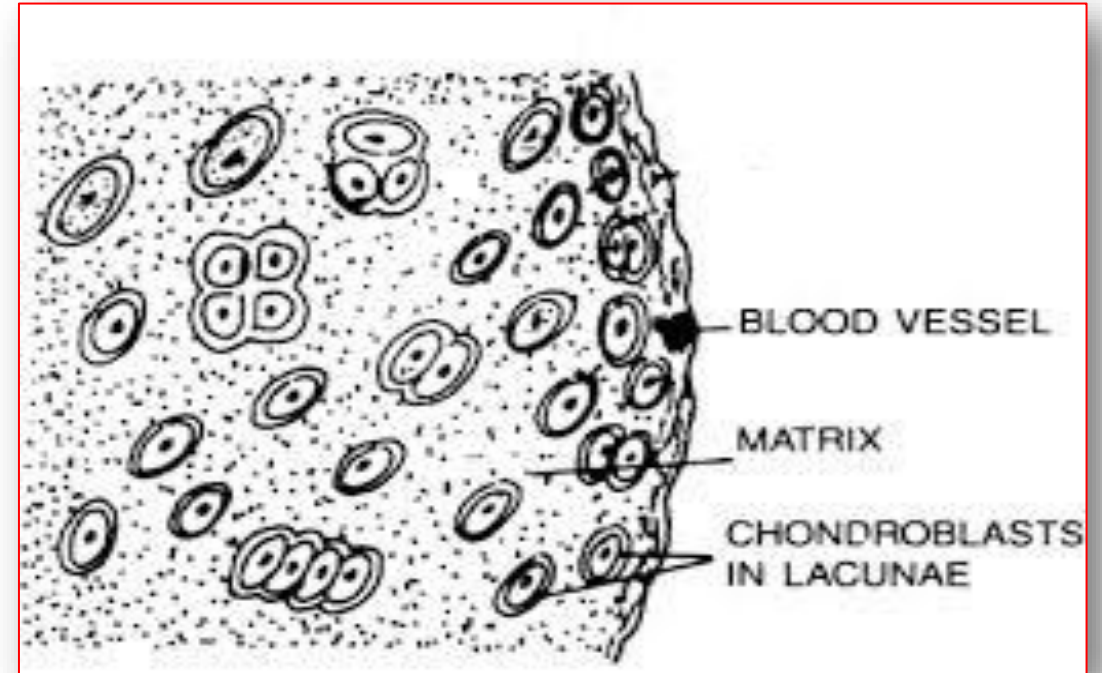
LIGAMENT AND TENDONS

- Ligament is very elastic and have little matrix.
- Ligament connect bone to bone.
- Tendons are fibrous tissue less flexibility but great strength.
- Connects muscles to bones



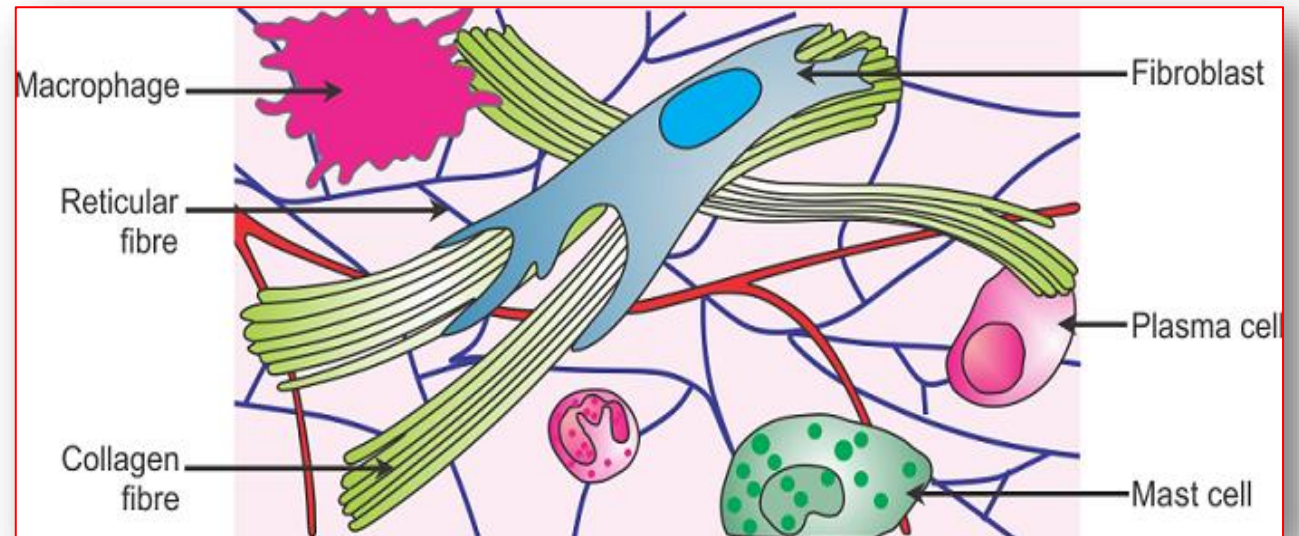
CARTILAGE

- Matrix is solid composed of sugars and protein.
- Cells (**chondrocytes**) are widely spaced and present in matrix.
- Cartilage is **softer than bone** due to presence of sugar and protein.
- It is found in nose, ear, trachea, larynx and smoothens the bone surface at joint.



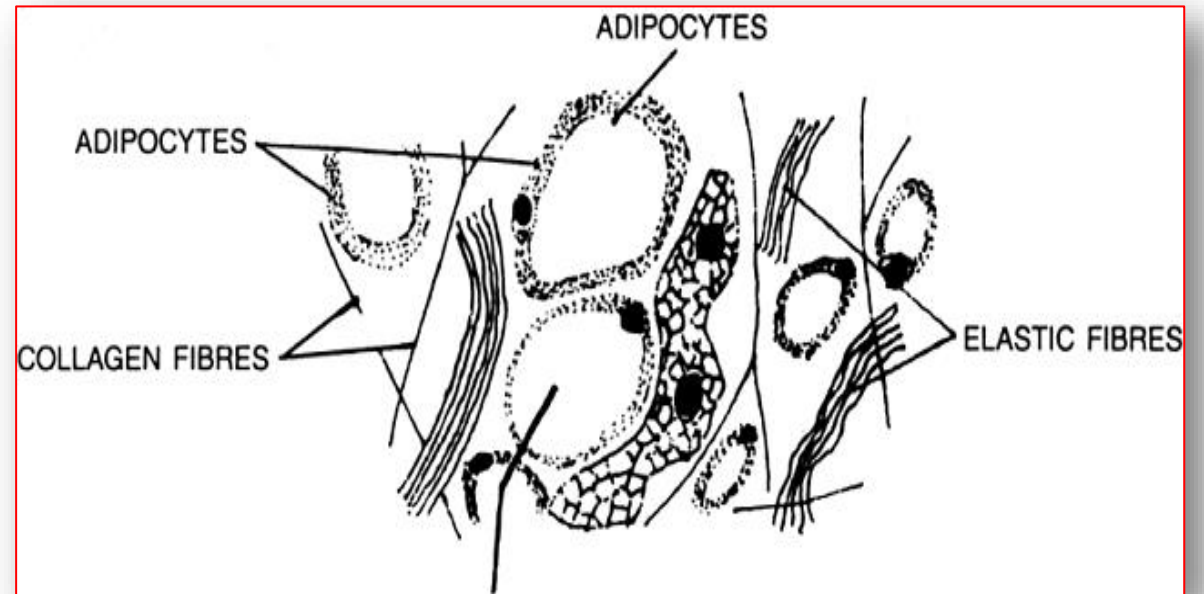
AREOLAR TISSUE

- Matrix is semifluid containing different types of cells and fibres.
- It holds organs in place and provide support to them..
- Found between skin and muscles, around blood vessels, nerves and in bone marrow.
- It helps in repair of tissues.



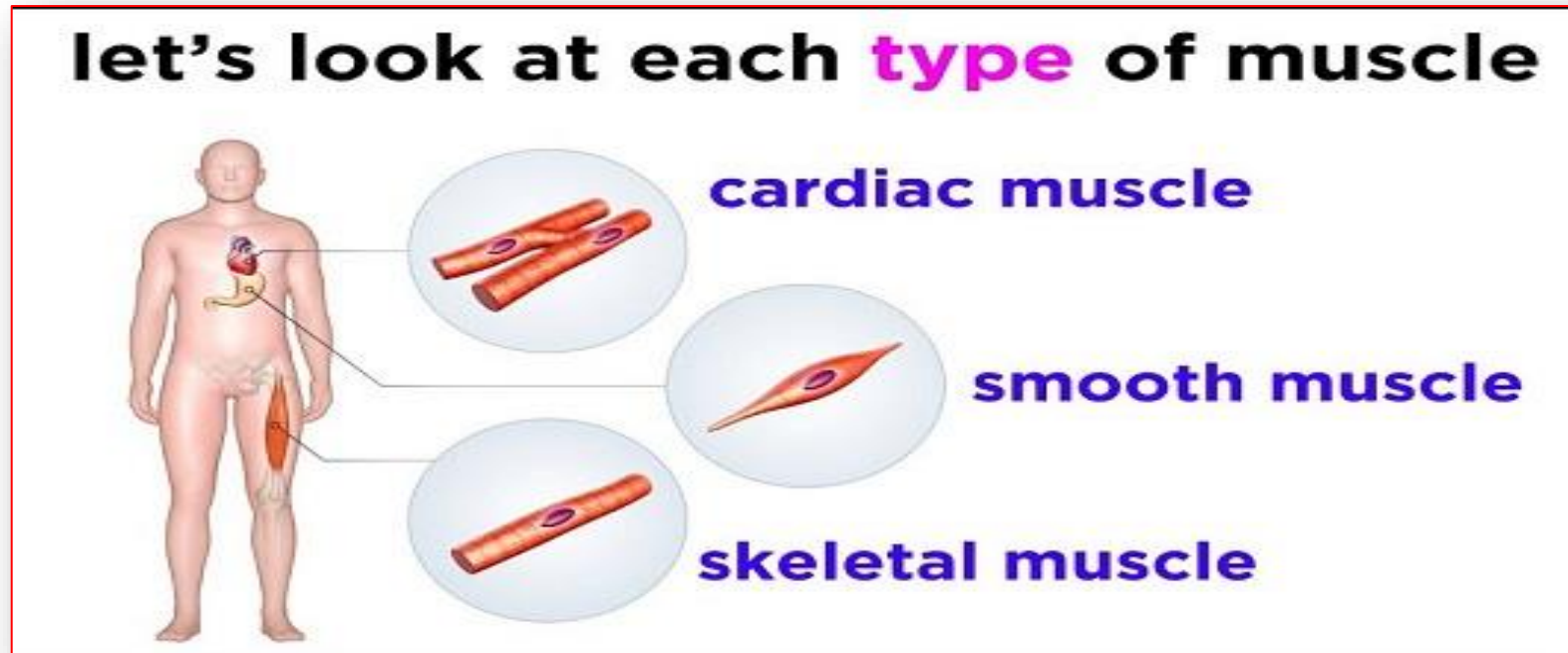
ADIPOSE TISSUE

- It contains fat cells called adipocytes.
- Cells are filled with fat globules.
- Found below skin and between internal organs.
- It store fat and also act as insulator.



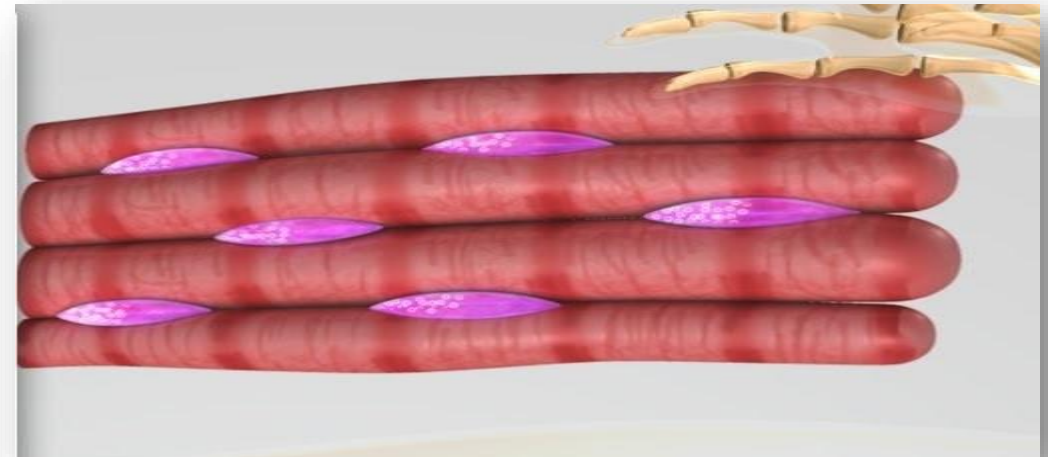
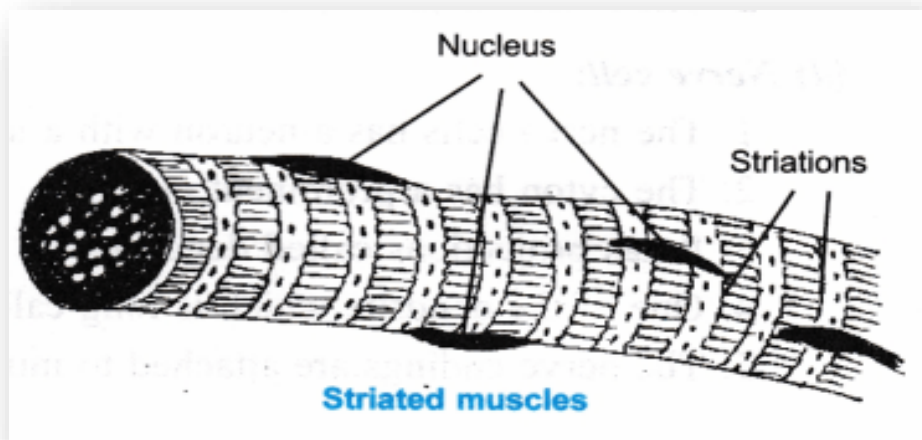
MUSCULAR TISSUE

- It consist of elongated muscle cells called muscle fibre.
- Muscle contain contractile proteins which contract and relax.
- It brings movement in body.



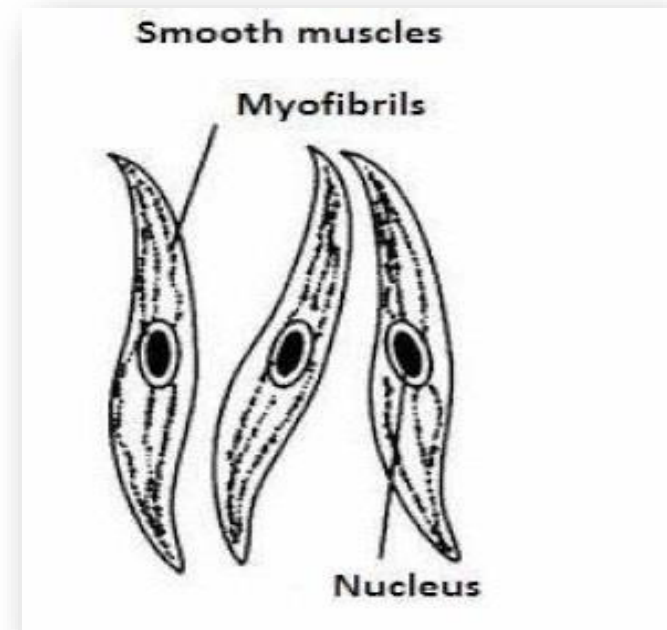
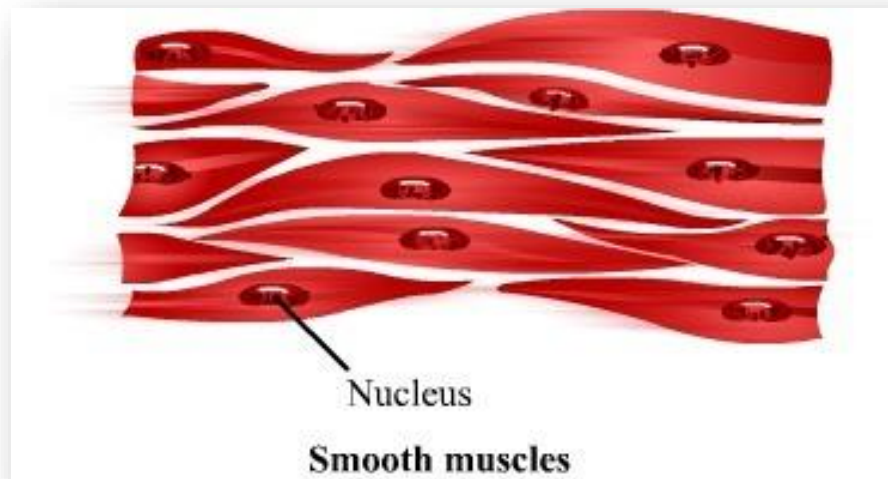
STRIATED /SKELETAL MUSCLES

- **Structure**-Long, cylindrical, unbranched, multinucleated muscle cells with alternate light and dark band or striations.
- **Location**-Present in limbs, mostly attach to bones so also called skeletal muscles.
- **Function**-Help in body movement, they move as per our will so called voluntary muscles.



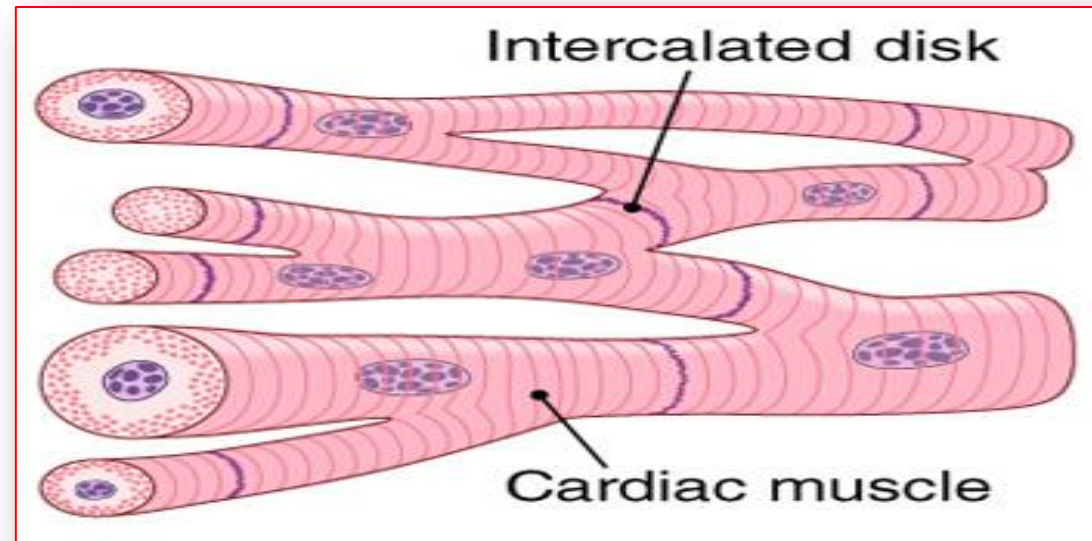
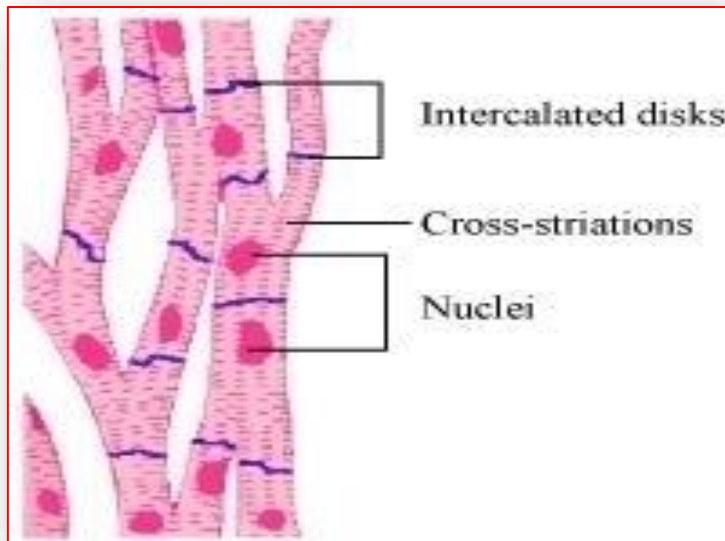
SMOOTH / UNSTRIATED MUSCLES

- **Structure**-Long, Spindle shaped , Uninucleate cells, having no Striations
- **Location**- Found in alimentary canal, Blood vessels, Iris of eye, in ureters, bronchi of lungs
- **Function**-Movement of food in alimentary canal and internal organs, they are involuntary muscles.



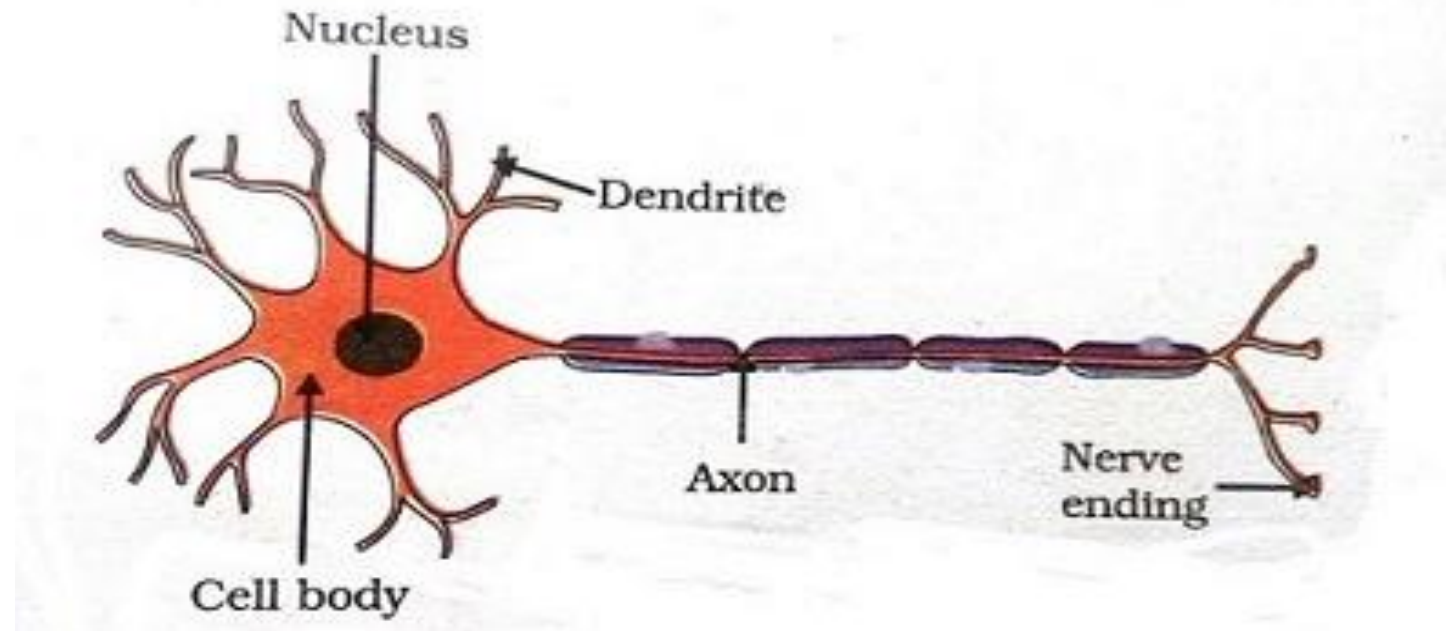
CARDIAC MUSCLE

- **Structure**-Cylindrical, branched and uninucleate muscle cells with striations.
- **Location**-Wall of heart
- **Function**-Rhythmic contraction and relaxation of heart throughout life they are involuntary muscles.



NERVOUS TISSUE

- It is made up of nerve cells called neurons.
- Neurons consist of three parts cyton or cell body, dendrites and axon.
- Cyton contain nucleus and cytoplasm.
- Dendrites are many short, branched part.
- Axon is single, long part.



NERVOUS TISSUE

- **Location**-Brain, spinal cord and nerves.
- **Function**-Respond to stimulus and transmit response very rapidly from one part to another. In the body.
- Nerves and muscles form functional combination which make animals to move rapidly in response to stimuli.

RECAPITULATION

- **What are different types of epithelial tissues?**
- **Why is blood called a connective tissue.**
- **Which tissue acts like an insulator?**
- **Which tissue connects bone to bone?**
- **What are different types of muscles?**
- **Name the tissue that transmits stimulus in the body.**

Home Work

- Ncert exercise on page :- 69,73,78,79.
- Activities-6.1 to 6.5.
- Prepare a Fact sheet about simple permanent plant tissues, Epithelial tissues and connective tissues Using points structure, location and functions.
- Prepare mind maps for plant tissues and animal tissues.

References

- Ncert:Science class 9th text book Chapter-6 Tissues Page no 68 to 79
- <https://www.britannica.com/science/fundamental-tissue>
- <https://youtu.be/fNQ92ZGWpOA>[https](https://youtu.be/f483wM28FNk)
- <https://youtu.be/f483wM28FNk>

THANK YOU