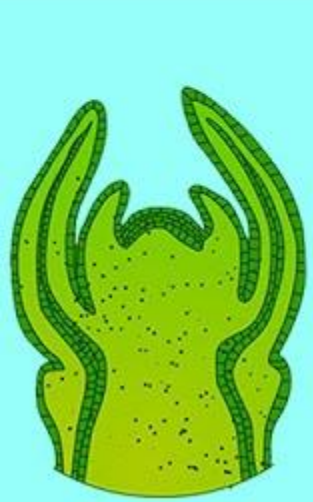
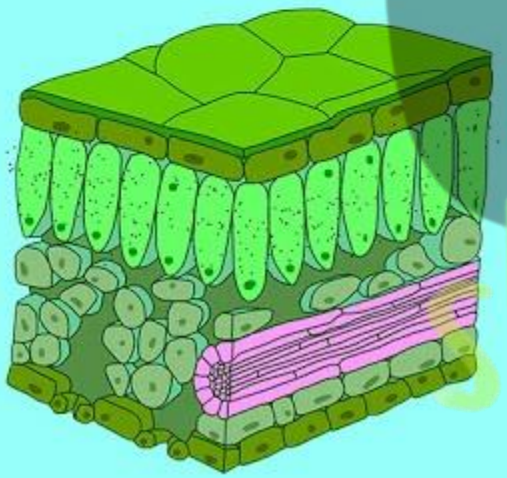
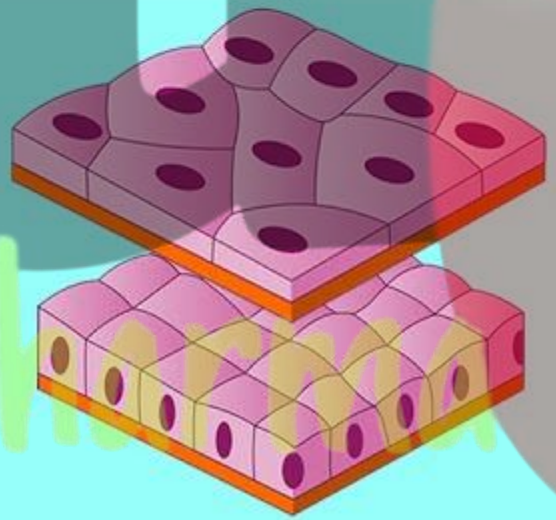
TISSUES

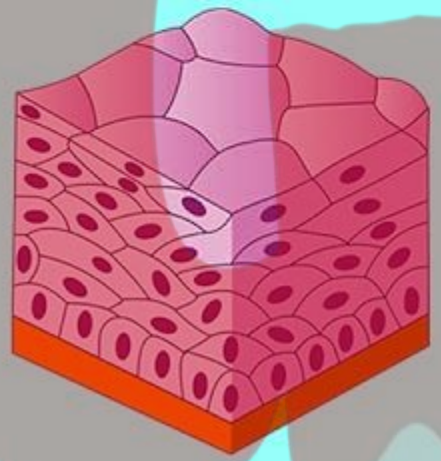
CLASS 9

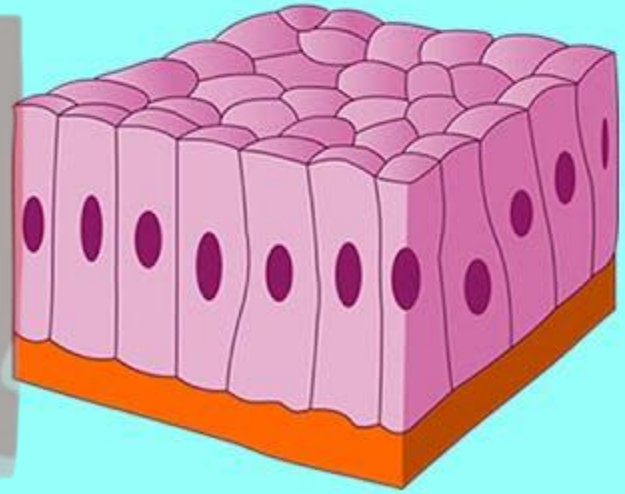
FULL CHAPTER

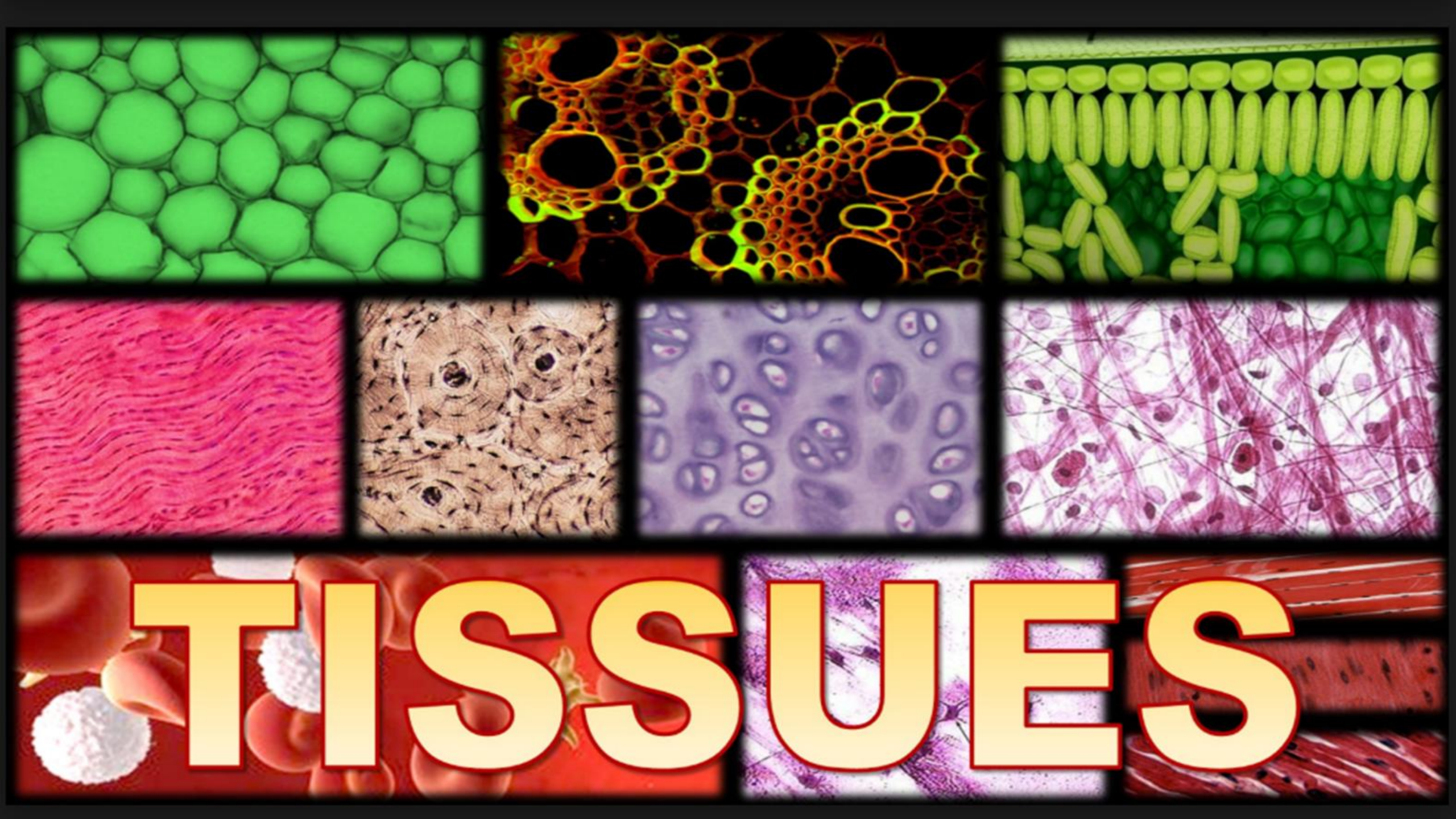








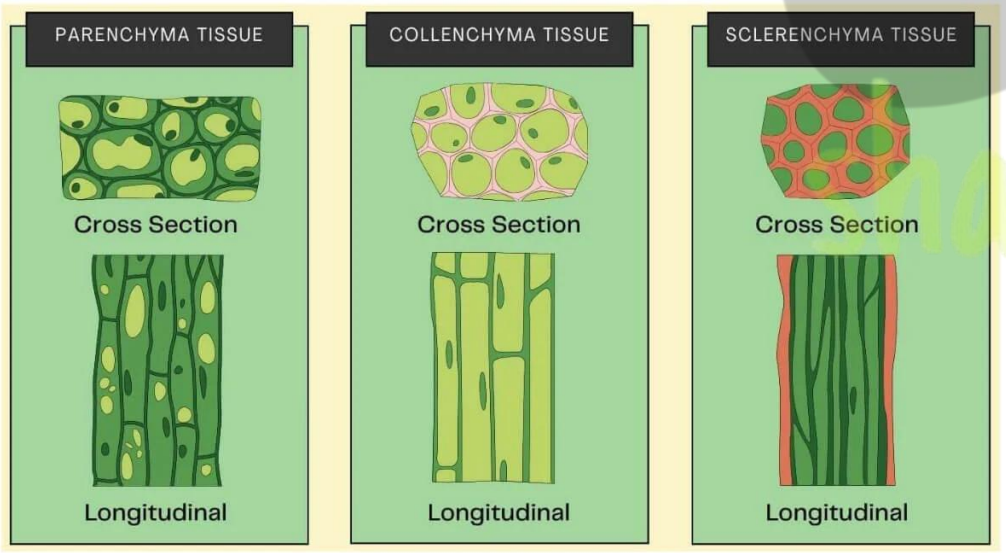


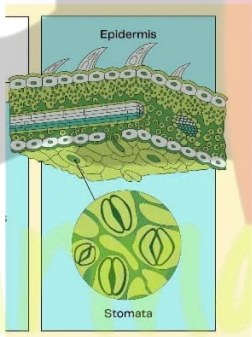

TISSUES

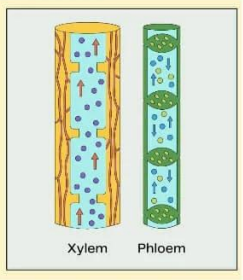
Tissue

A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.
OR,
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.
Example :- Blood, phloem and muscle

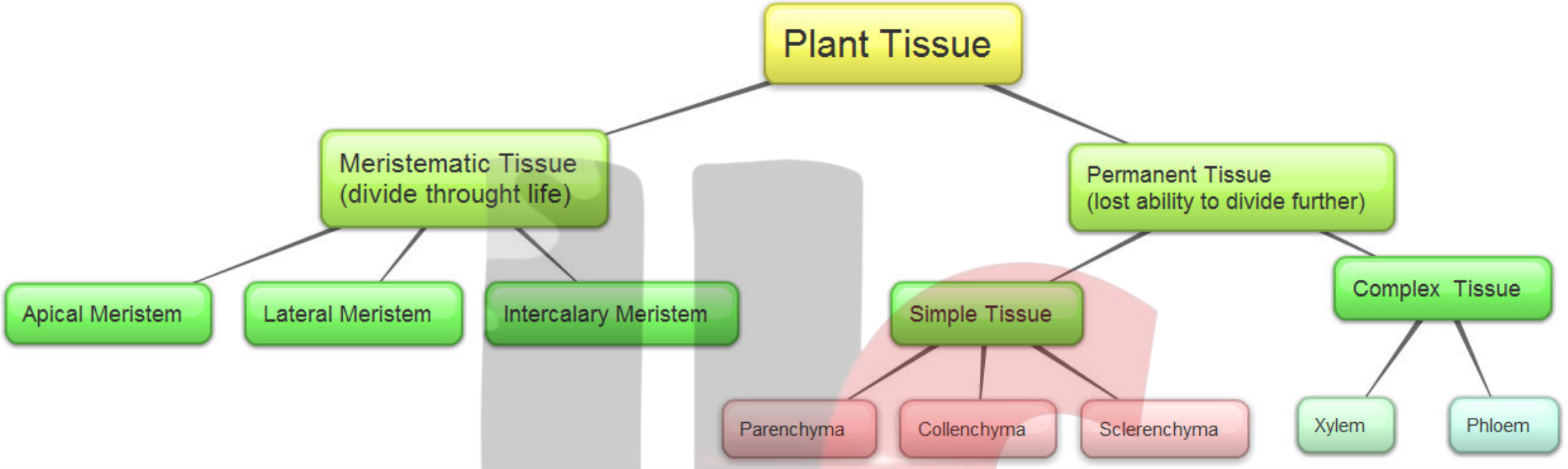
Types of Plant Tissues





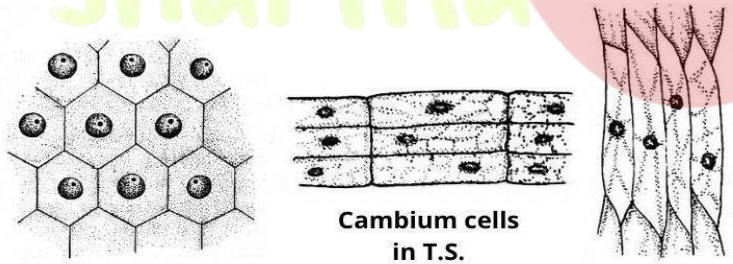


Plants are stationary or fixed – they don't move. Since they have to be upright, they have a large quantity of supportive tissue. The supportive tissue generally has dead cells Animals on the other hand move around in search of food, mates and shelter. They consume more energy as compared to plants. Most of the tissues they contain are living.



Meristematic Tissue

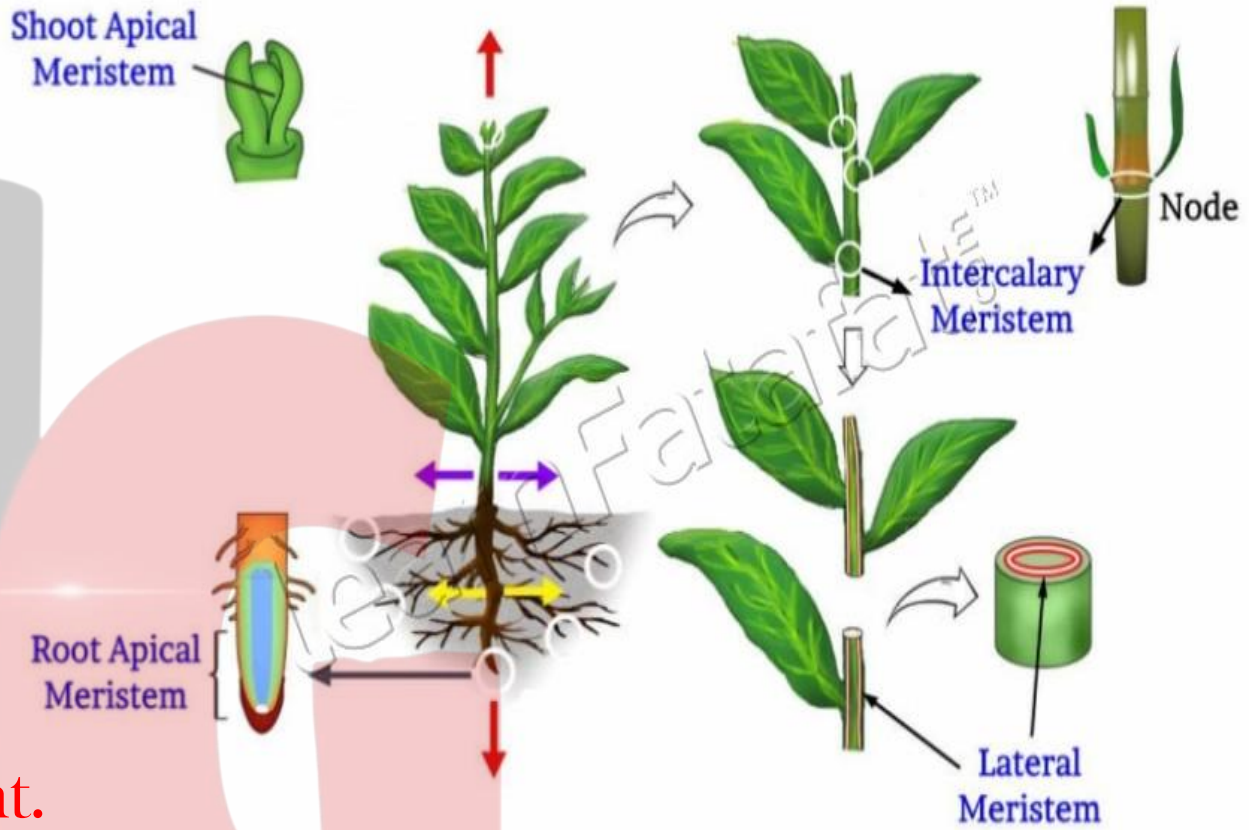
- The growth of plants occurs only in certain specific regions. This is because the dividing tissue, also known as meristematic tissue



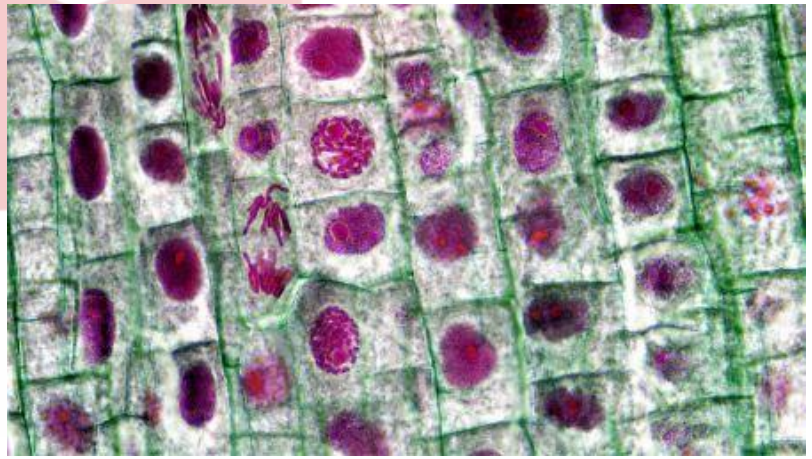
Characteristics :-

- Shape may be oval, spherical, polygon or rectangle.
- Very active
- Thin cellulose walls
- Having few or no vacuoles
- Dense cytoplasm
- Cell contain prominent and large nuclei.

❖ Found in the growing regions of the plant.



❑ Meristematic tissues lack vacuoles because their primary function is cell division, not storage



Apical meristem :-

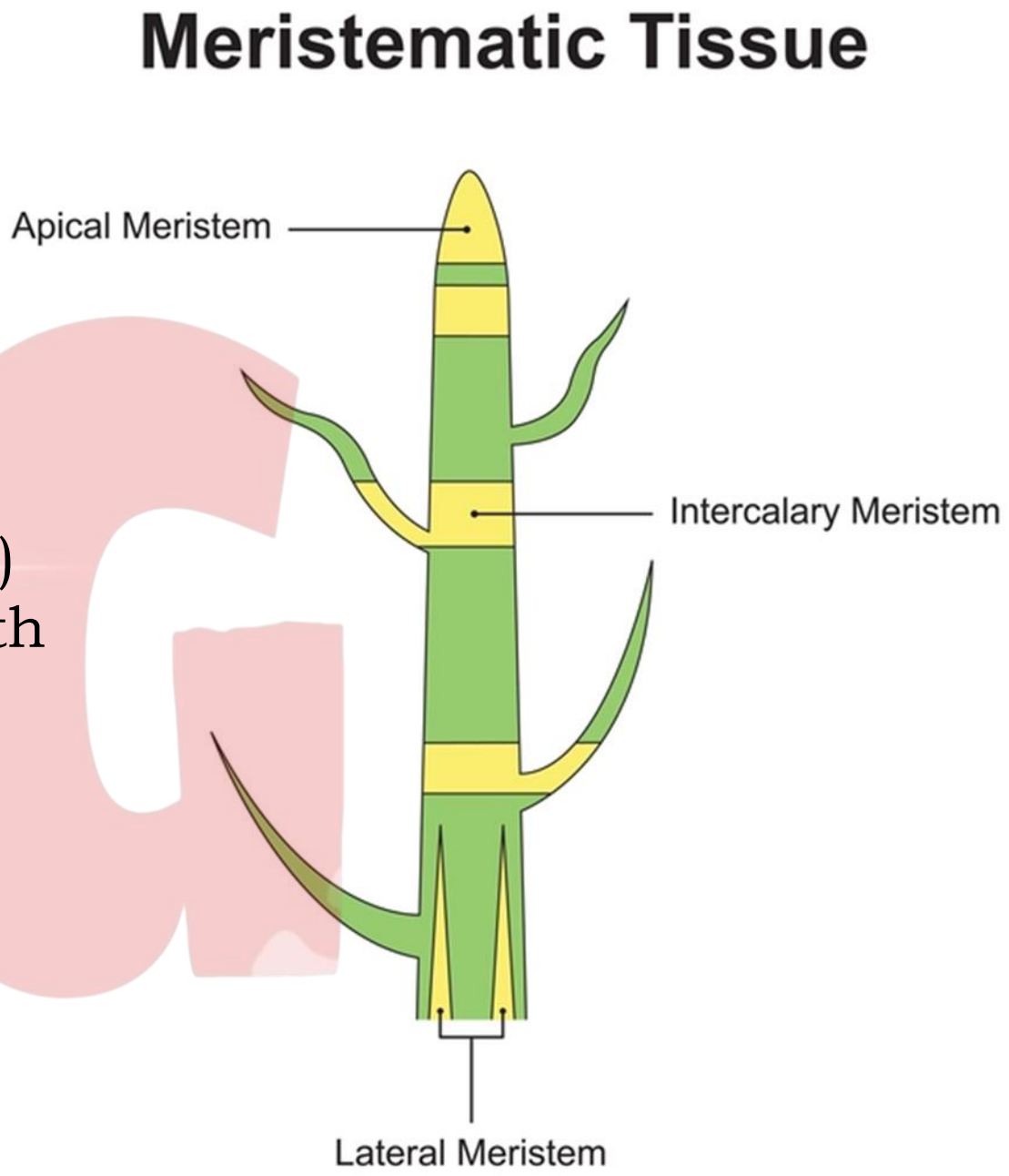
- Present at growing tip of stems & roots
- Function :- Elongation of roots & stems
  Increase height of plants
  c/d primary growth.

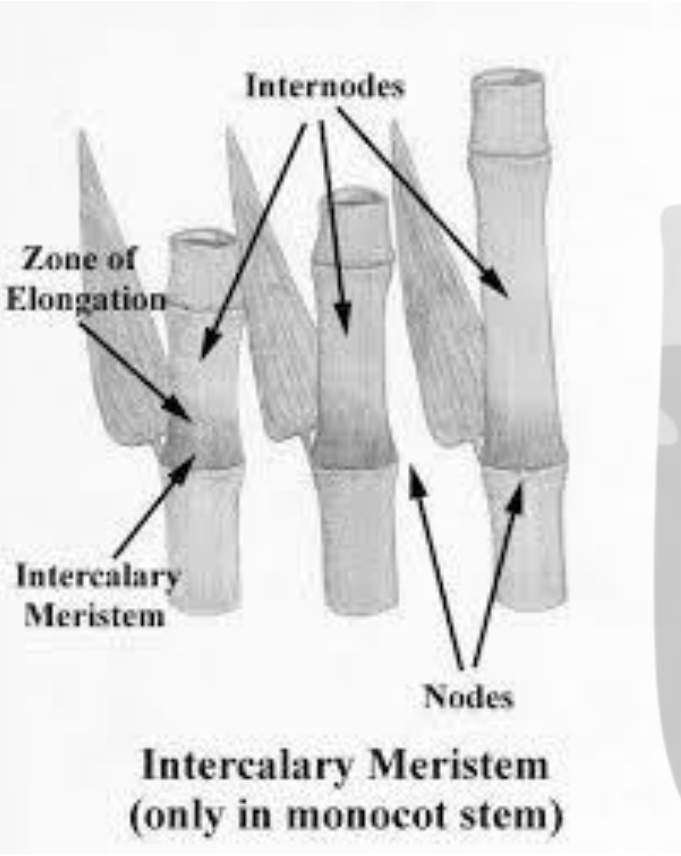
Lateral meristem :-

- Found in beneath of the bark and in vascular dicot roots and stem (internode)
- Function :- Increase in diameter and girth of stem and roots c/d secondary growth.

Intercalary meristem :-

- Located at the base of leaves and near node
- Function :- Increase the length of organ such as leaves & node





Intercalary Meristem
(only in monocot stem)

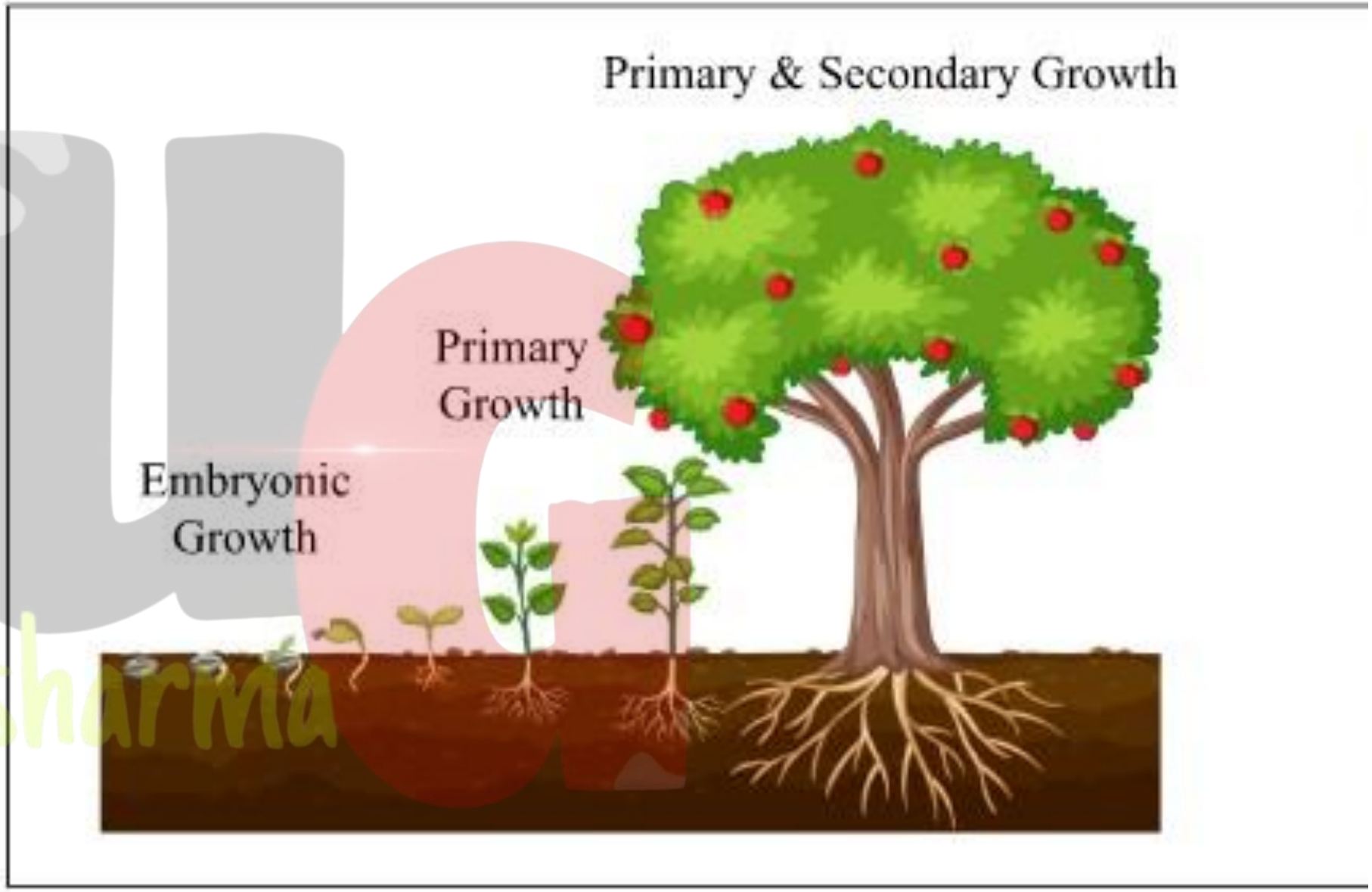
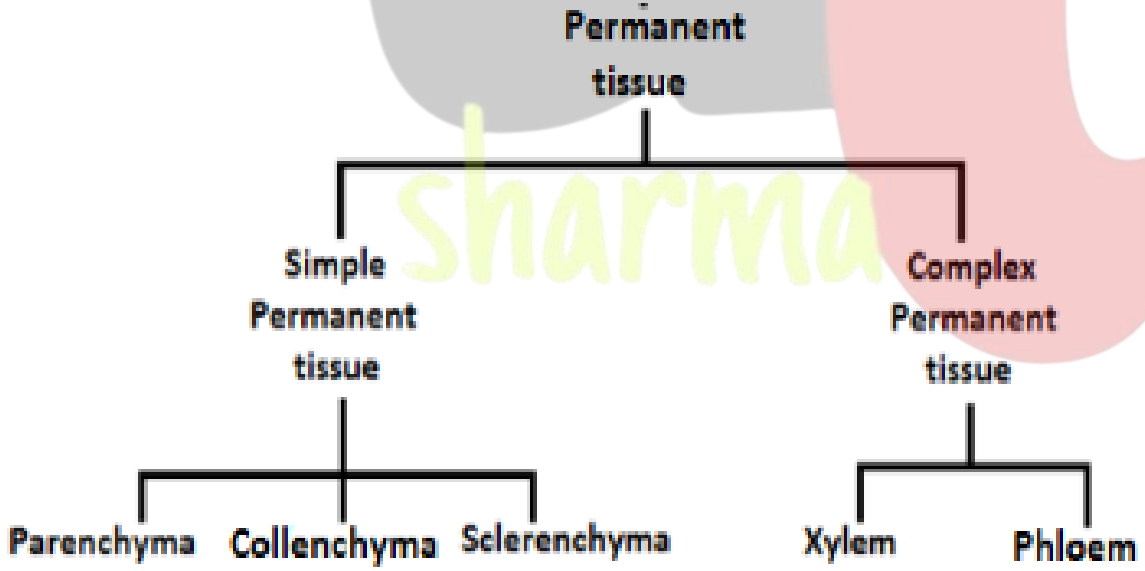


Fig: Different stages of growth

PERMANENT TISSUE

- The cells formed by meristematic tissue take up a specific role and lose the ability to divide, and form a permanent tissue.
- The tissues that are completely grown and have lost the ability to divide are known as permanent tissue.
- The process of taking up a permanent shape, size, and a function is called differentiation.
- Differentiation leads to the development of various types of permanent tissues.



Simple Permanent Tissue

- These are made up of same type of cells which are similar structurally and functionally.
- They include two types of tissue Supporting Tissues and Protective tissues.

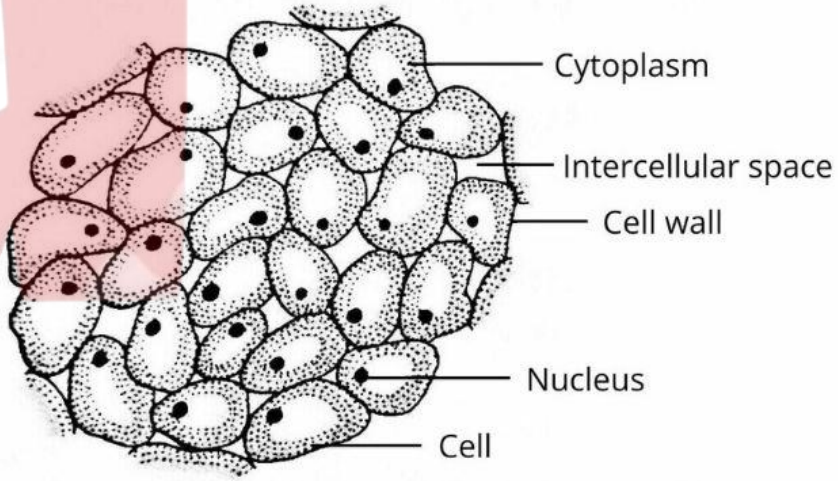
• ***Supporting Tissues:*** *These are supportive in function.*

→ *There are three types of Supporting tissues i.e. Parenchyma, Collenchyma and Sclerenchyma.*

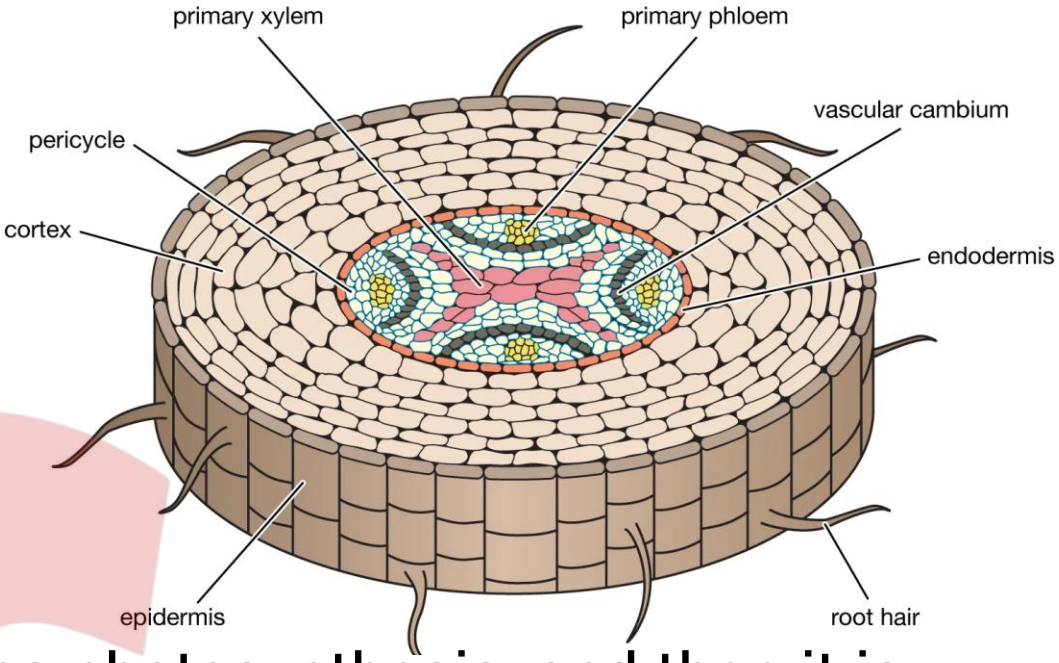
01. PARENCHYMA

Nature

→ It is the most common simple permanent tissue.
→ Thin walled cells, oval or spherical in structure.
→ Cell wall mainly composed of cellulose & pectin.
→ Large central vacuole for food & water storage.
→ Primary function is food storage.
→ Having intercellular spaces



Occurrence

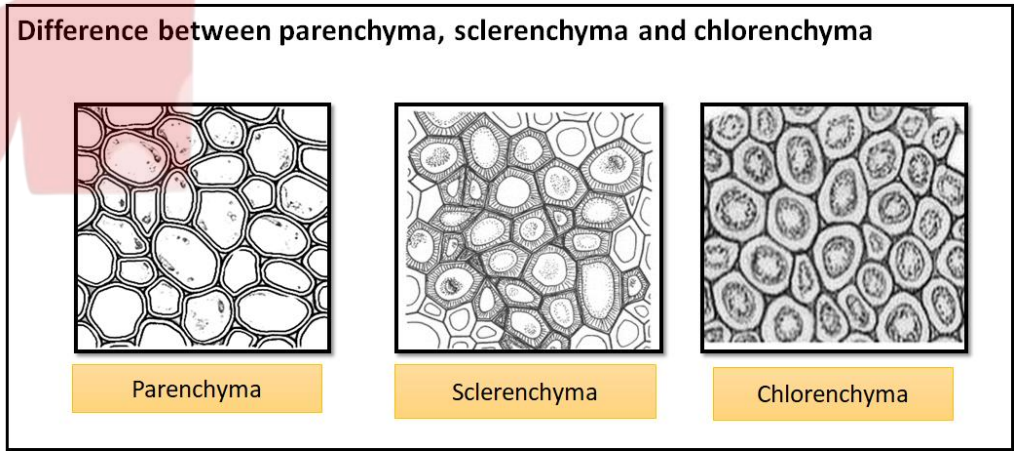


- Plant bodies such as stems, roots, leaves and soft part of plants as cortex of roots

Parenchyma

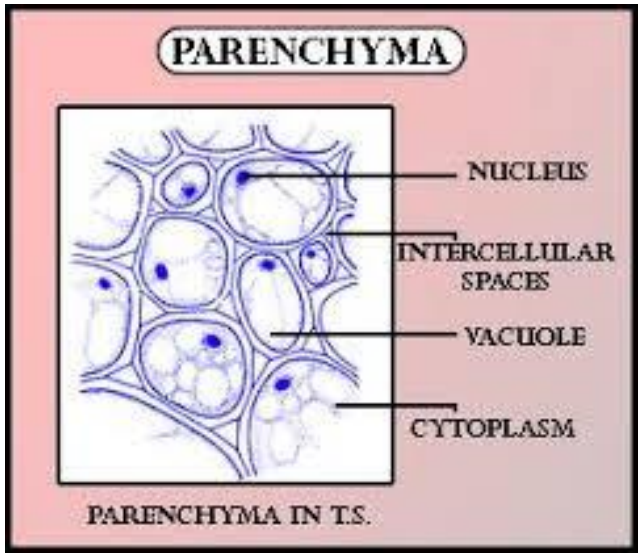
Chlorenchyma Aerenchyma

- Parenchyma contains chlorophyll and performs photosynthesis, and then it is called chlorenchyma.
- In aquatic plants, large air cavities are present in parenchyma to help them float. Such a parenchyma type is called aerenchyma.



Functions :-

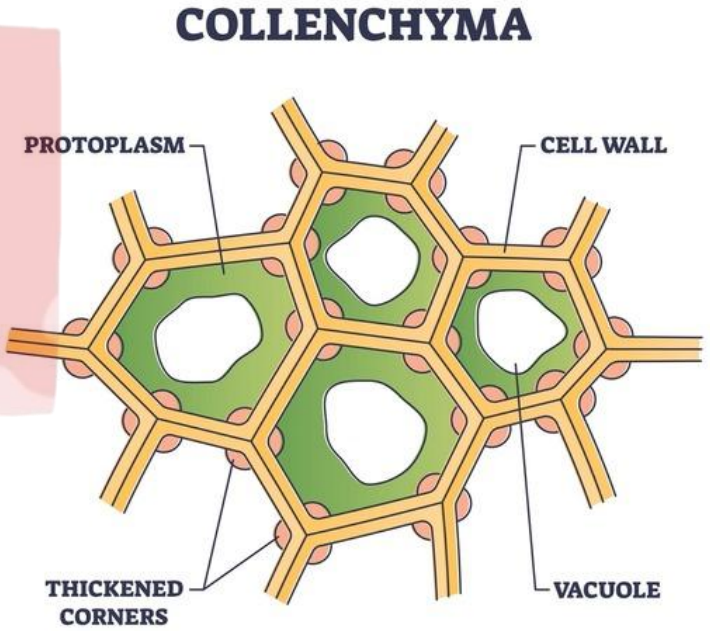
- Store food and waste product.
- Transport of material occurs through cell wall.
- Serves as a packing tissue - to fill the space between other tissues.



02. COLLENCHYMA

Nature :-

- The cells of this tissue are living, elongated and irregularly thickened at the corners.
- There is very little intercellular space

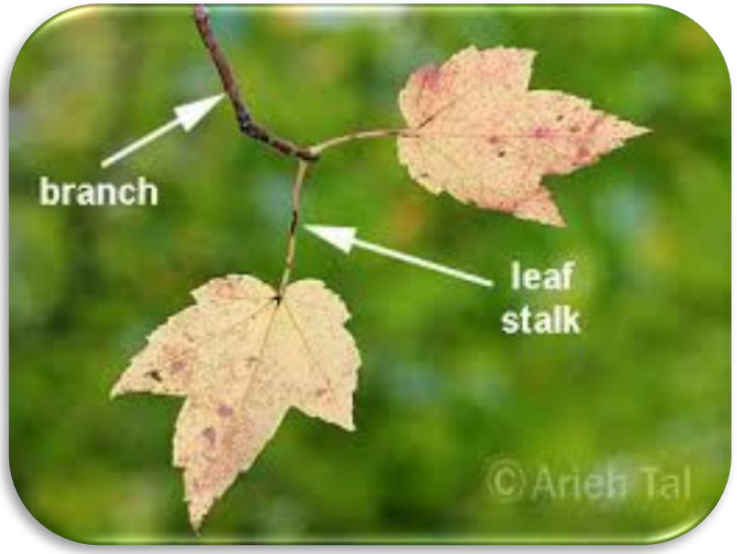


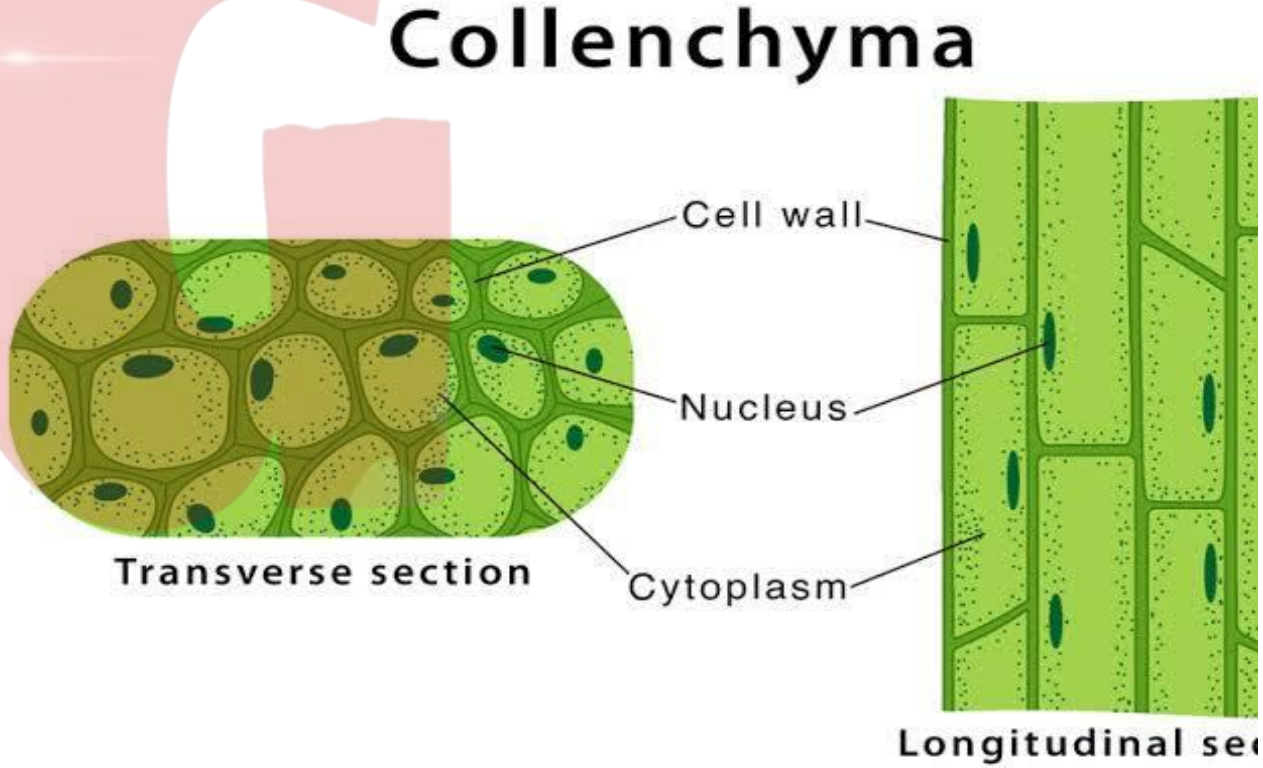
Occurrence

- Located below the epidermis in leaf stalks and stem.

Functions :-

- Provide mechanical support and elasticity (flexibility).
- Allow to bend easily to the various part of the plants without breakdown as climber stems & tendrils.
- Manufacture less amount of sugar and starch due to presence of little amount of chloroplast.

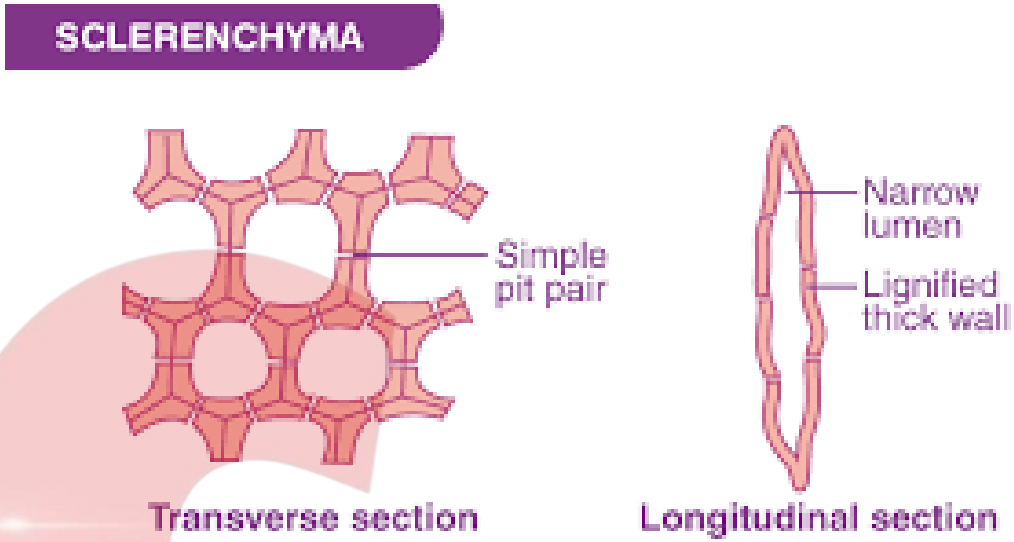




03. SCLERENCHYMA

Nature :-

- It is made of sclerenchymatous tissue.
- The cells of this tissue are dead.
- They are long and narrow as the walls are thickened due to lignin (Lignin is water-proof material).
- There is no intercellular space



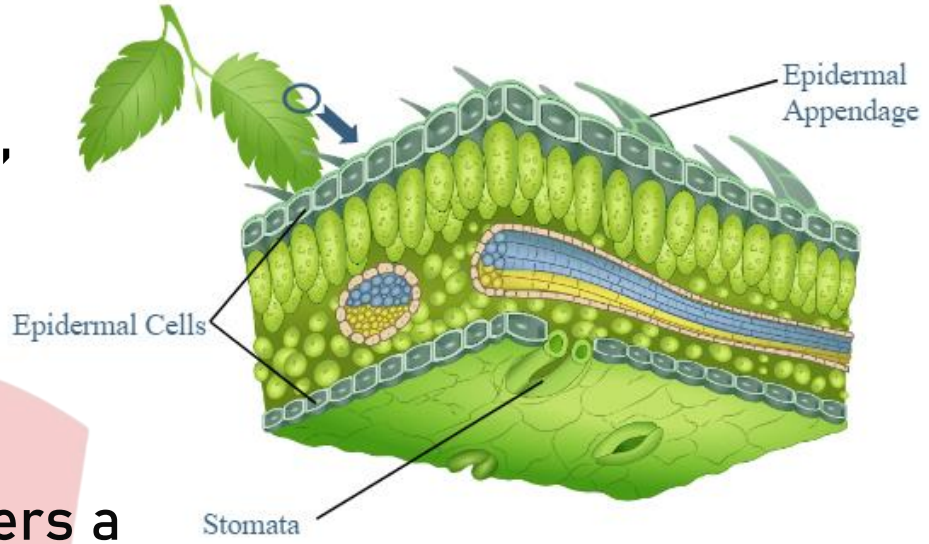
Occurrence :-

- They are found in stems, roots, veins of leaves, hard covering of seeds and nuts.
- Husk of coconut is made up of sclerenchyma tissue.

Function :-

- It gives strength, rigidity, flexibility and elasticity to plant body.
- Sclrenchyma Fibres are used in the manufacture of ropes, mats & certain textile fibres.

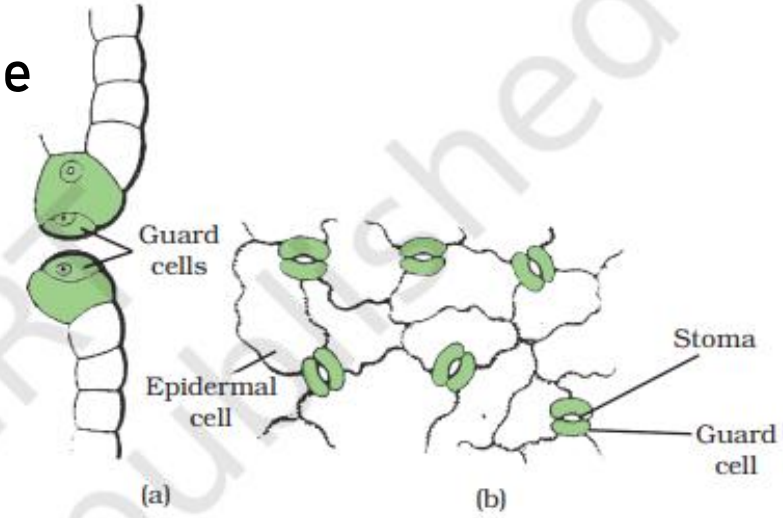
Protective Tissues :-



- Protective tissues form the outermost layer of a plant, serving as a barrier against external factors.
- These tissue provide protection to the plants.
- They consist of Epidermis and Cork/Phellem.

Epidermis

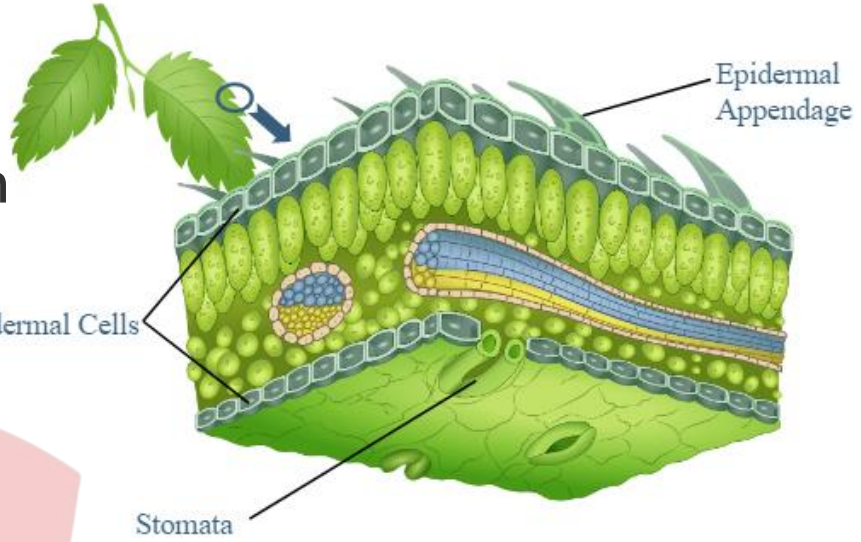
- The epidermis is the outermost layer of cells that covers a plant's various parts, such as roots, stems, and leaves.
- Epidermal cells on the aerial parts of the plant often secrete a waxy, water resistant layer on their outer surface.
- This aids in protection against loss of water, mechanical injury and protect by parasitic fungi.
- Epidermal tissue form a continuous layer without intercellular spaces.
- Water resistance substance is thick in desert plants.



- Cells of epidermis of leaves are not continuous at some places due to the presence of small pores called as stomata.
- Each stomata is guarded by a pair of bean-shaped cells called as guard cells.

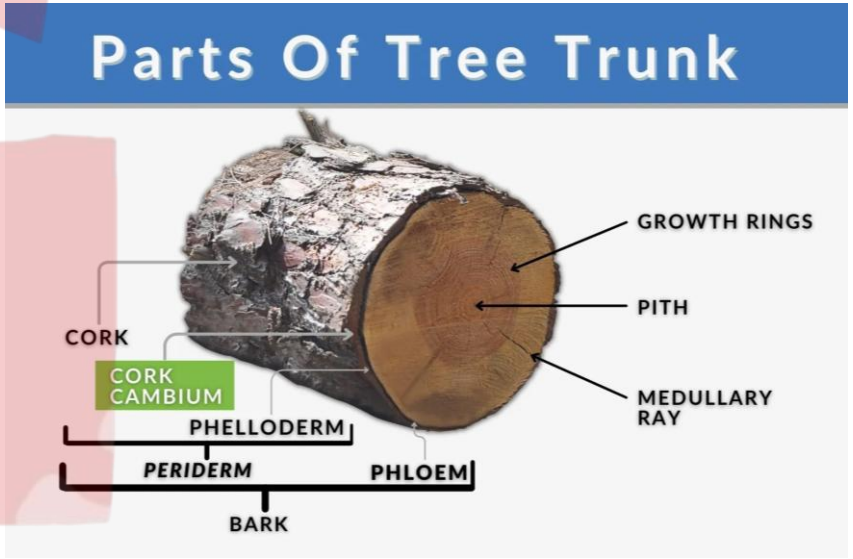
Functions of Epidermis

- The main function of epidermis is to protect the plant from water loss and infection.
- Stomata in epidermis allow gaseous exchange to occur during photosynthesis respiration.
- Stomata also helps in transpiration.



Cork (or Phellem)

- In older stems and roots, the epidermis is replaced by a tougher, multilayered protective tissue called cork.
- Cork is composed of dead, compactly arranged cells with no intercellular spaces.
- The cell walls of cork are thickened by a waxy substance called suberin, making them impermeable to water and gases.



Function:

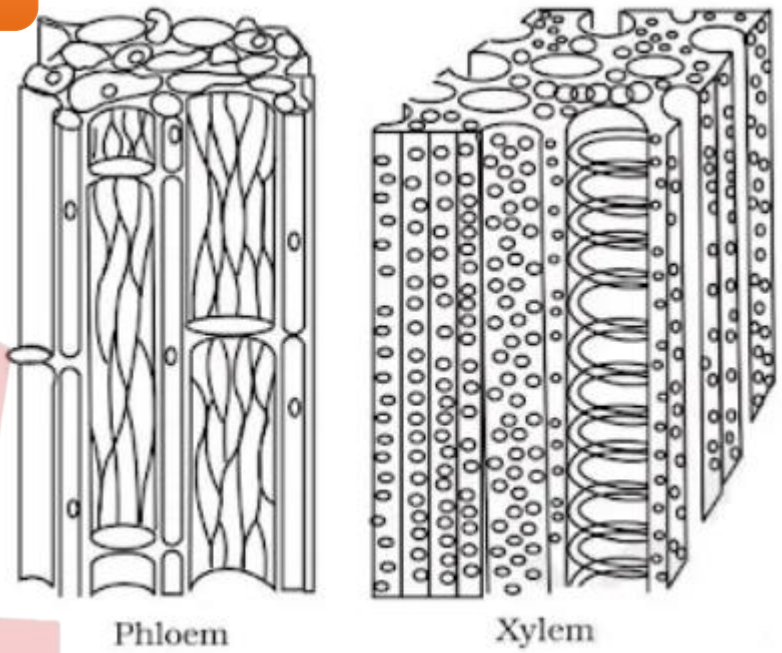
- Cork provides a durable, waterproof, and insulating barrier that protects the plant from water loss, temperature extremes, mechanical injury, and infections.

Difference between Parenchyma, Collenchyma and Sclerenchyma

Features	Parenchyma	Collenchyma	Sclerenchyma
Cell shape	Isodiametric cells which are oval, spherical or polygonal in shape.	Circular, oval or polyhedral.	Variable in shape. Fibres and sclereids.
Cell wall	Thin cellulosic cell wall.	Uneven thickening on their cell wall.	Lignified secondary cell wall present.
Cytoplasm	Abundant	Present	Absent
Nucleus	Present (Living tissue)	Present (Living tissue)	Absent (Dead tissue)
Vacuoles	Large vacuole	Vacuolated	Absent
Intercellular spaces	Present	Absent	Absent
Occurrence	Basically packing tissue, all soft part of plant-pith, cortex, medullary rays.	Dicot stems, petiole and beneath the epidermis. Absent in monocot and roots.	Dicot hypodermis, bundle sheath, pericycl, seed, pulp of fruits.
Functions	Food storage, photosynthesis.	Provide tensile strength, mechanical support, photosynthesis.	Protection from stress and strain, mechanical strength.

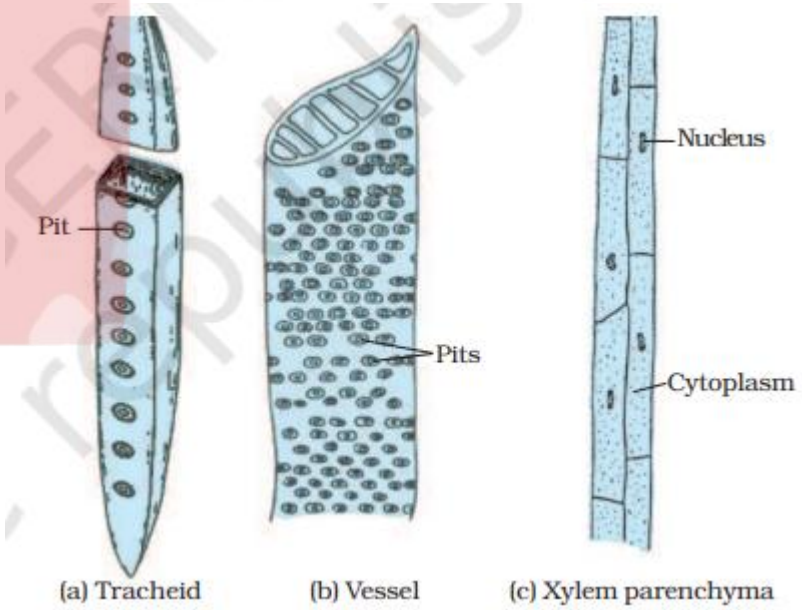
COMPLEX PERMANENT TISSUE

→ Complex tissues are made of more than one type of cells which work together as a unit.
→ It helps in transportation of organic materials, water & minerals.
→ It is also known as conducting or vascular tissue.
→ Xylem & phloem together form vascular bundles.



Xylem

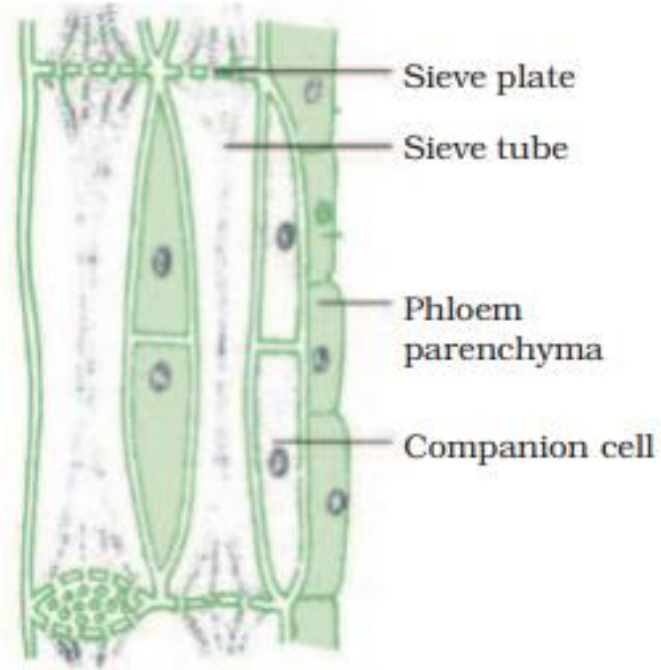
- Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.
- Tracheids and vessels have thick walls, and many are dead cells when mature.
- Tracheids and vessels are tubular structures. This allows them to transport water and minerals vertically.



- The xylem parenchyma stores food.
- Xylem fibres are mainly supportive in function

Phloem

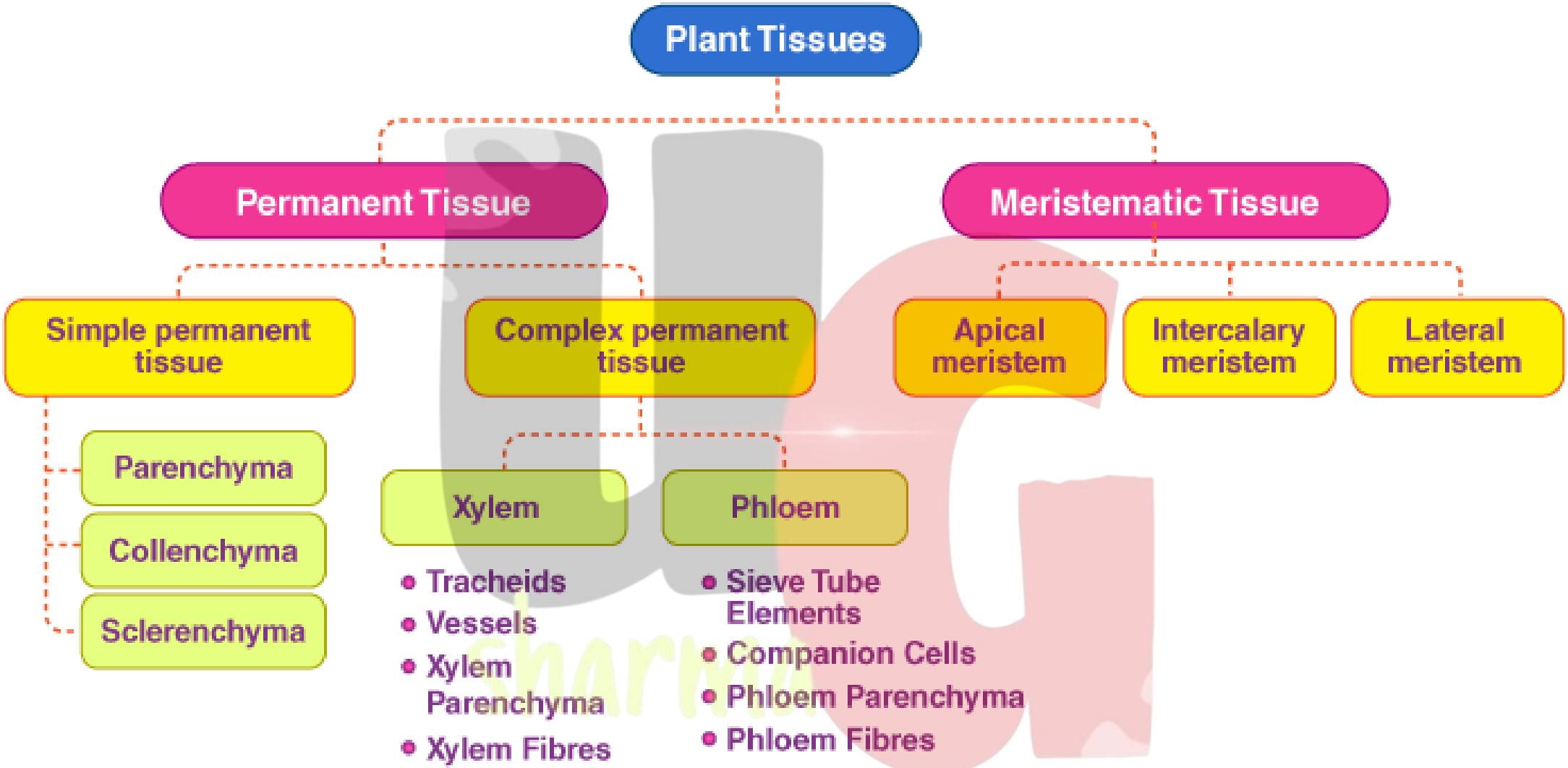
- Phloem is made up of five types of cells: sieve cells, sieve tubes, companion cells, phloem fibres and the phloem parenchyma .
- Sieve tubes are tubular cells with perforated walls (small hole).
- Phloem transports food from leaves to other parts of the plant.
- Except phloem fibres, other phloem cells are living cells.



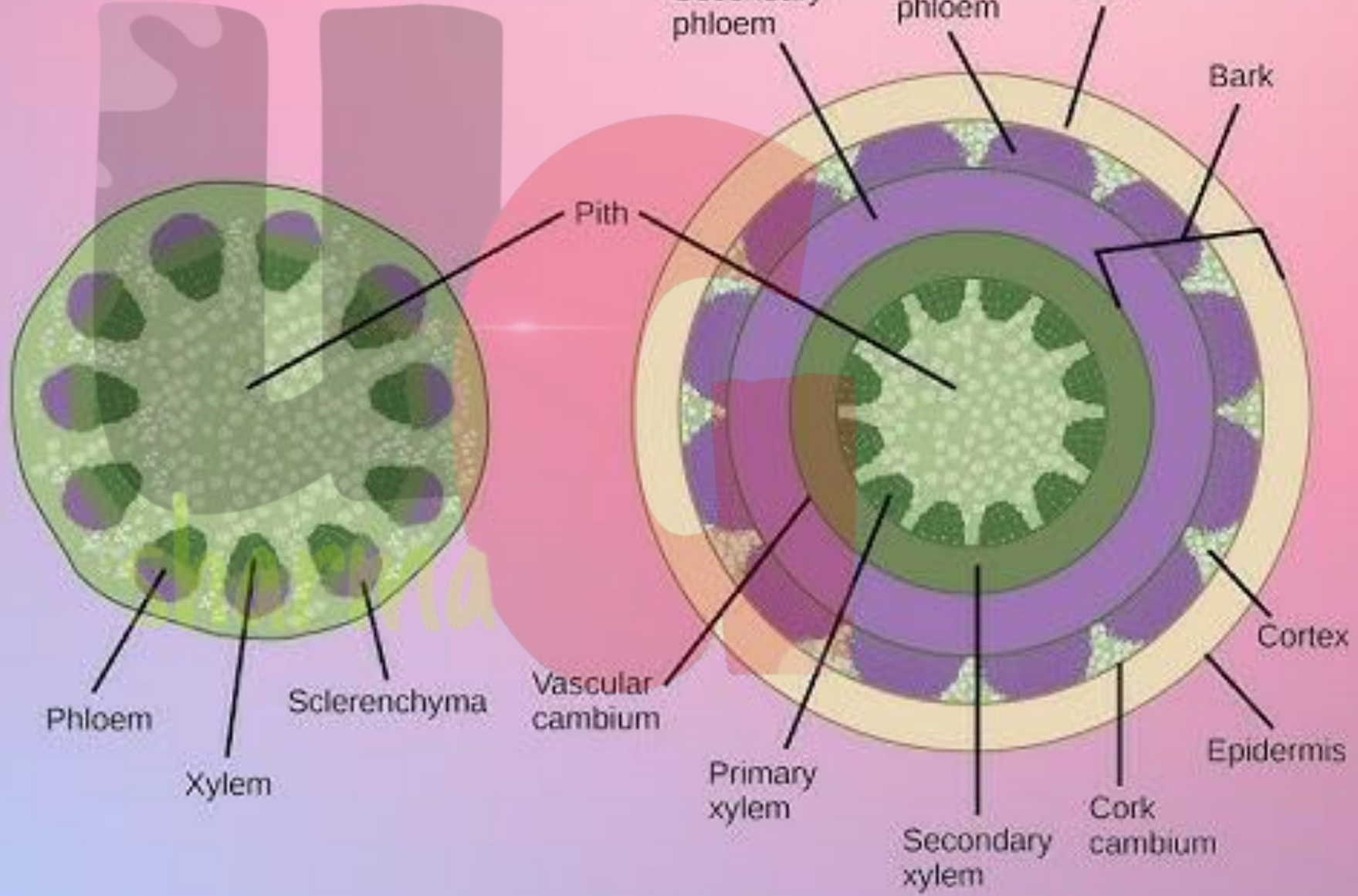
(d) Section of phloem

Fig. 6.7: Types of complex tissue

Features	Xylem	Phloem
Cells: Living/dead	Dead	Living
Cell walls: Thickness	Thick	Thin
Material	Lignin	Cellulose
Permeability	Impermeable	Permeable
Cross walls	None	Sieve plates
Cytoplasm	None	Yes
Function	Carries water and salts	Carries sugars
Direction of flow	Upwards	Down and up
Special features	Fibres	Companion cells


Plant Tissues
Permanent Tissue
Meristematic Tissue
Simple permanent tissue
Complex permanent tissue
Apical meristem
Intercalary meristem
Lateral meristem
Parenchyma
Collenchyma
Sclerenchyma
Xylem
Phloem
Tracheids
Vessels
Xylem Parenchyma
Xylem Fibres
Sieve Tube Elements
Companion Cells
Phloem Parenchyma
Phloem Fibres

Meristematic Tissues



Questions

1. What is a tissue?
2. What is the utility of tissues in multi-cellular organisms?

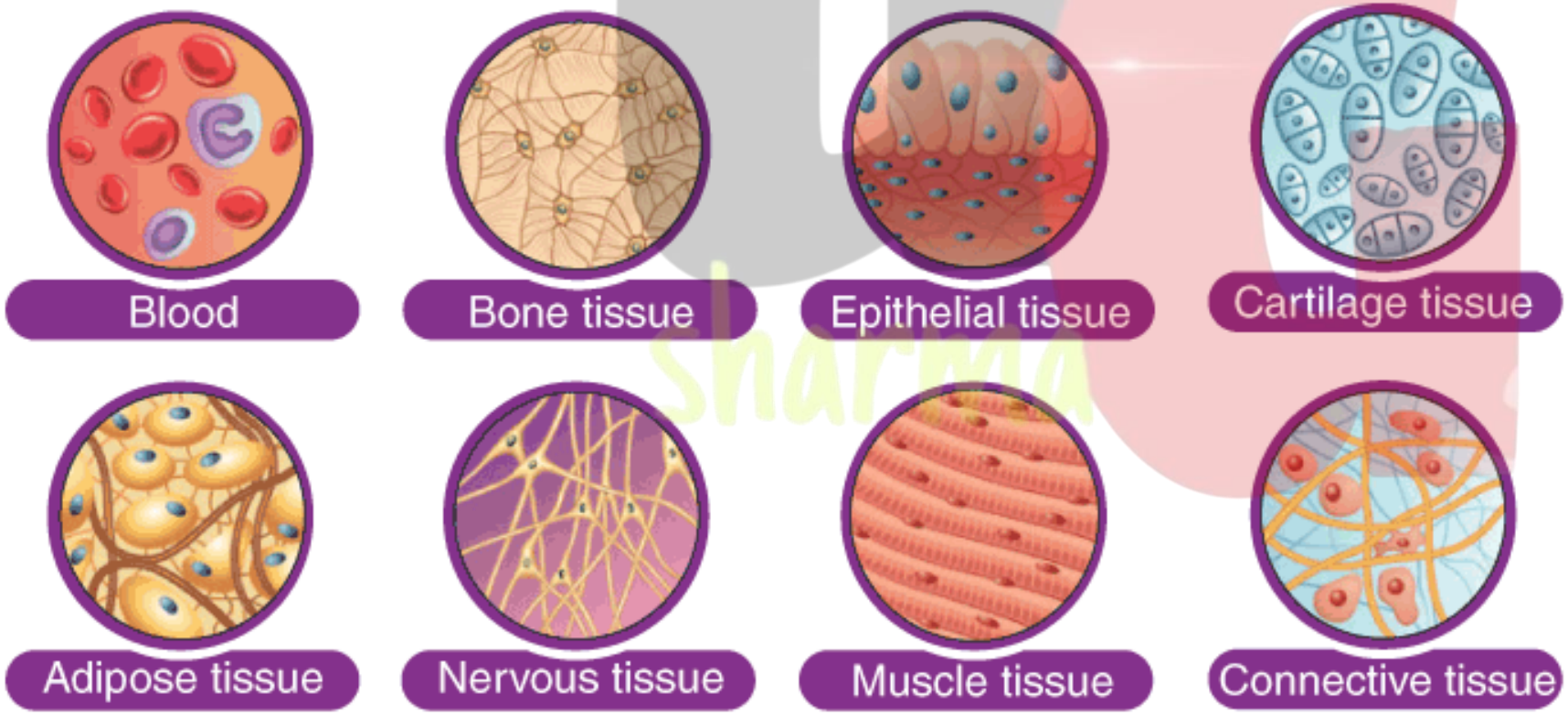
Questions

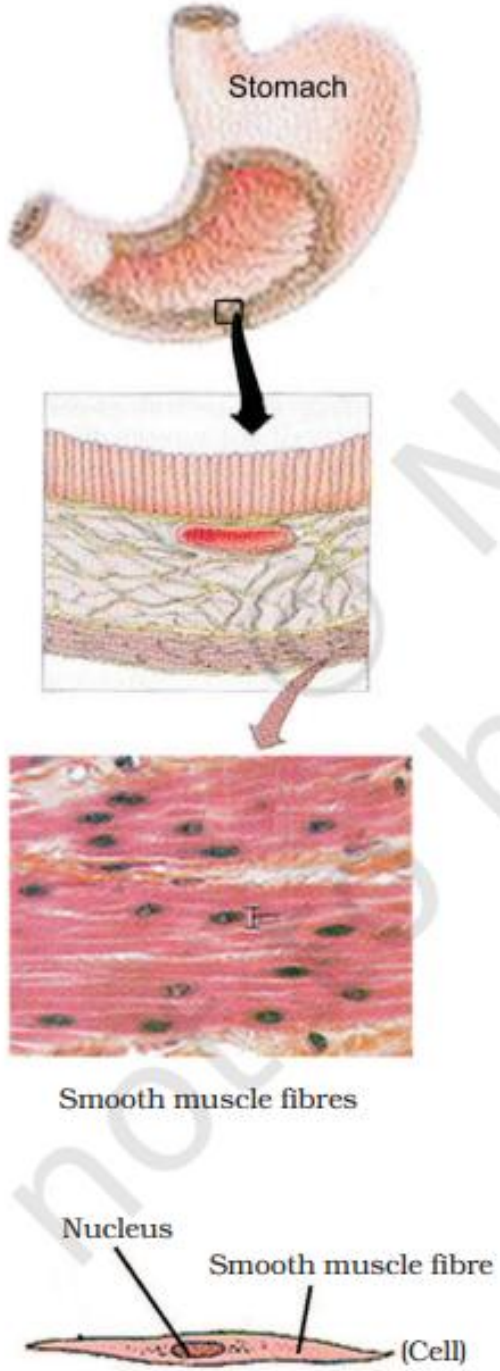
1. Name types of simple tissues.
2. Where is apical meristem found?
3. Which tissue makes up the husk of coconut?
4. What are the constituents of phloem?

Animal Tissues

The different types of animal tissues are :-

(i) Epithelial tissue
(ii) Connective tissue
(iii) Muscular tissue and
(iv) Nervous tissue.

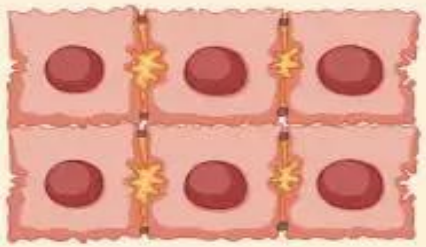




01. EPITHELIAL TISSUE

- The covering or protective tissues in the animal body are epithelial tissues.
- Covers most organs and also from a barriers to keep different body systems separate.
- The skin, lining of the mouth & blood vessels, lungs alveoli and kidney tubules.
- Tightly packed and form a continuous sheet.
- Almost no intercellular spaces.
- 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.
- All epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.

EPITHELIAL TISSUES AND THEIR FUNCTIONS

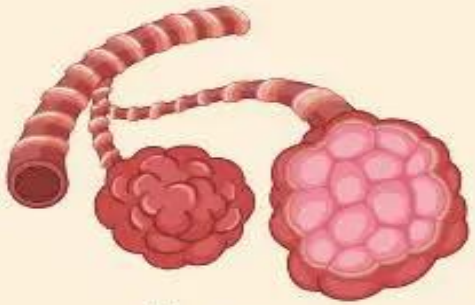


Skin
(protection)

Thyroid
(secretion)

Intestine
(absorption)

rsscience.com



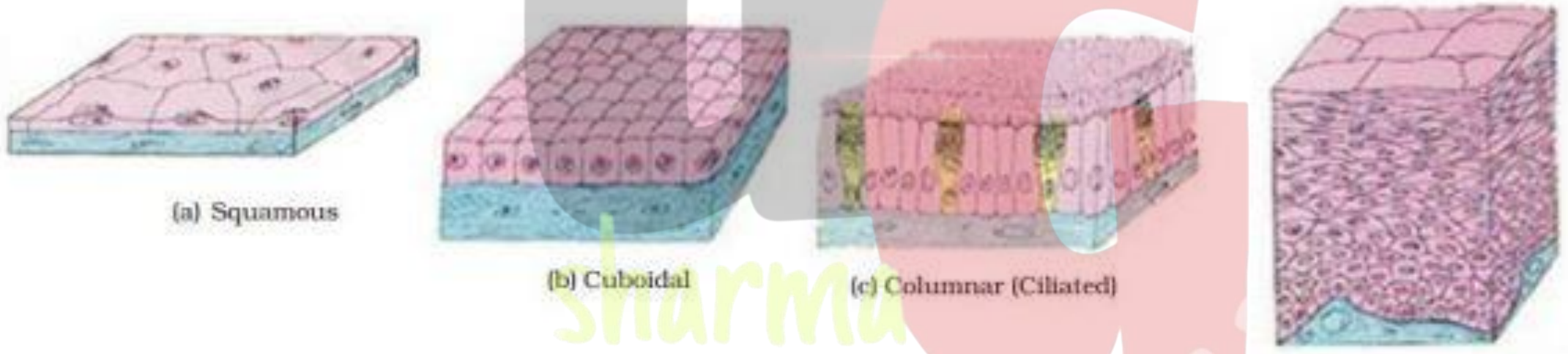
Lung
(protection & gas exchange)

Liver
(secretion)

Kidney
(filtration)

Epithelial Tissue

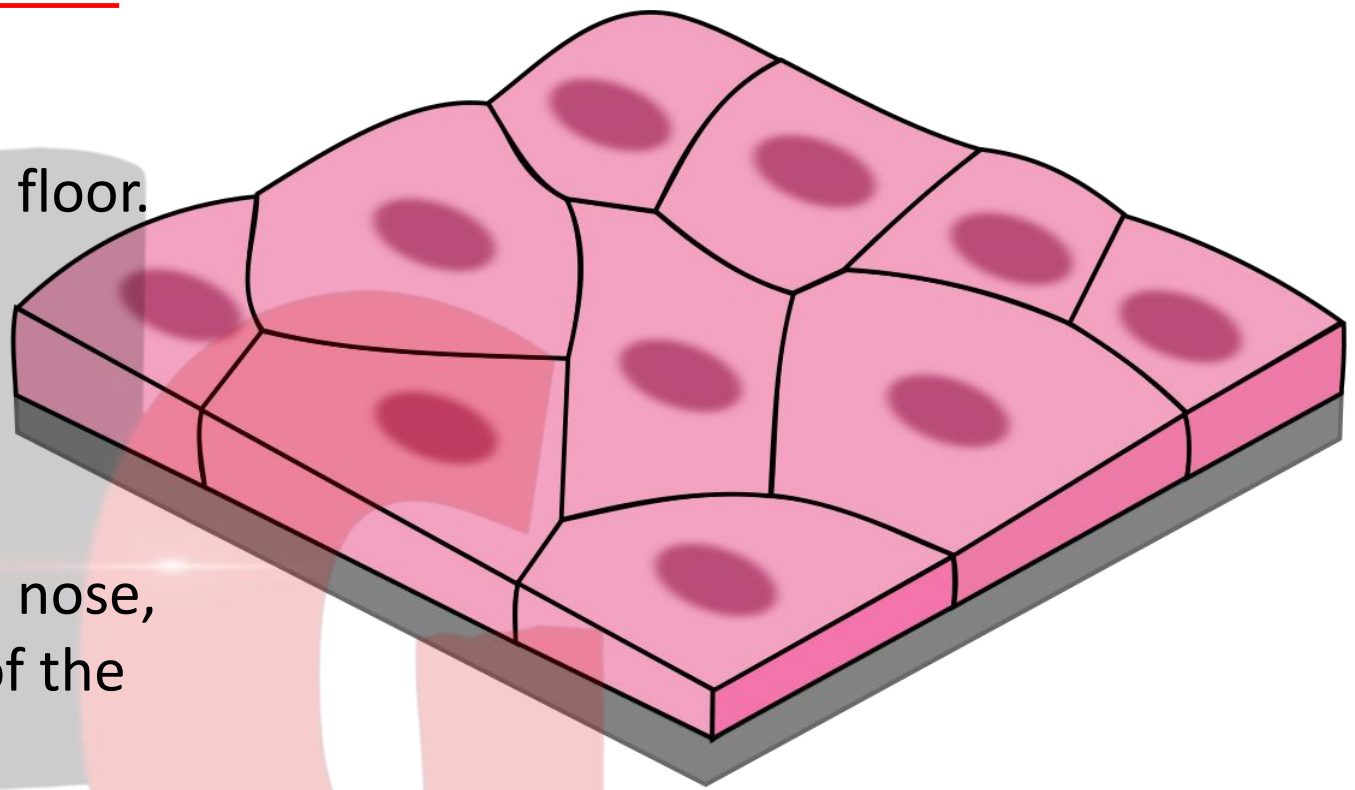
- Simple Squamous Epithelium
- Stratified Squamous Epithelium
- Cuboidal Epithelium
- Columnar (ciliated) Epithelium



Different types of epithelial tissues

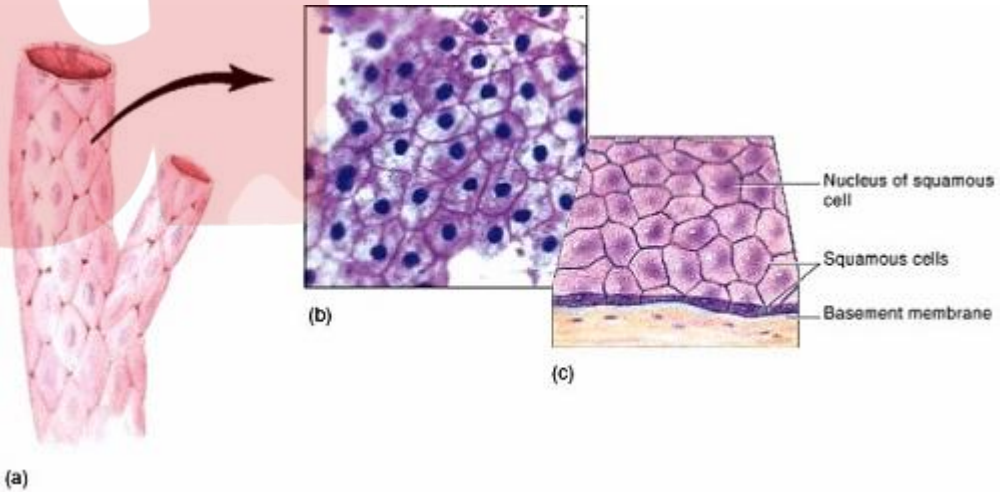
(i). Simple Squamous Epithelium

- Cells are arranged in single layer.
- Cells arranged end to end like tiles on a floor.
- Cells are polygonal in surface view.
- Form lining of cavities



Location :-
lining of cavities (as mouth, oesophagus, nose, alveoli etc.) blood vessels and covering of the tongue and skin.

Functions :-
Transportation of substances occurs through a selectively permeable surface by the process of diffusion.

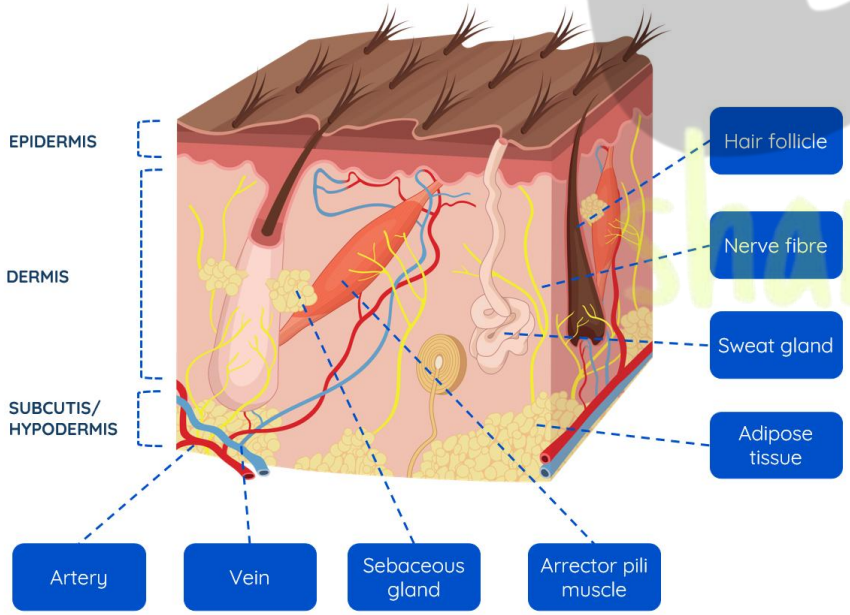


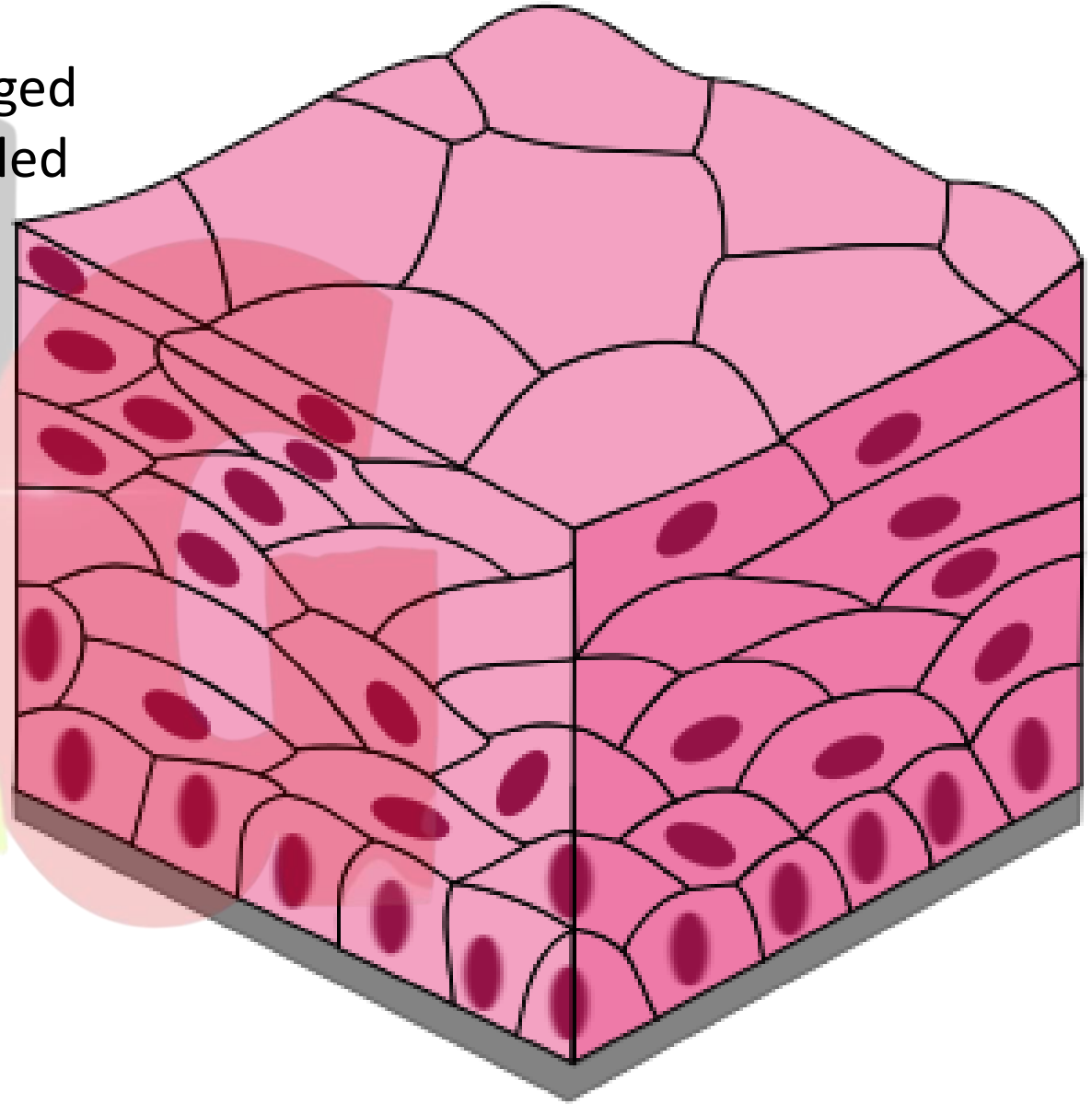
(ii). Stratified Squamous Epithelium

- When cells of squamous epithelium arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.

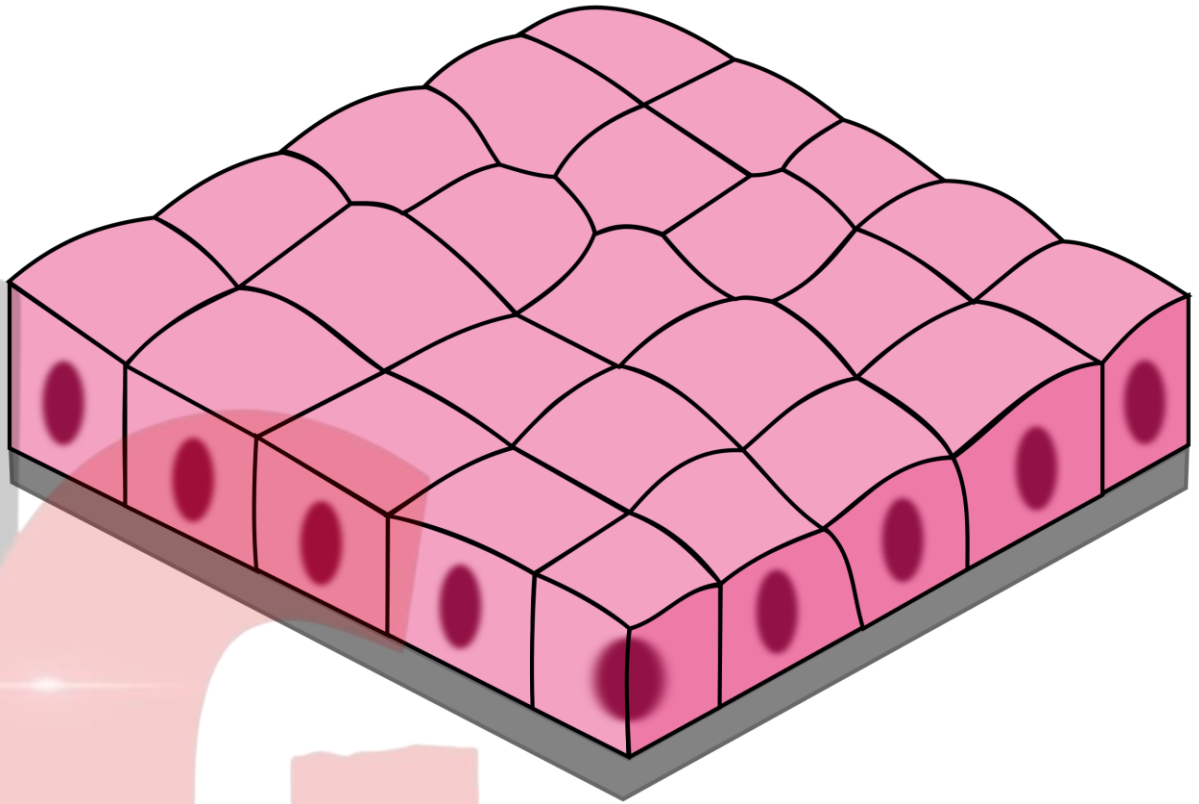
Location :- Skin

Function :- Prevent from wear and tear.





(iii). Cuboidal Epithelium



- Cell are cube – shaped.

Location :-

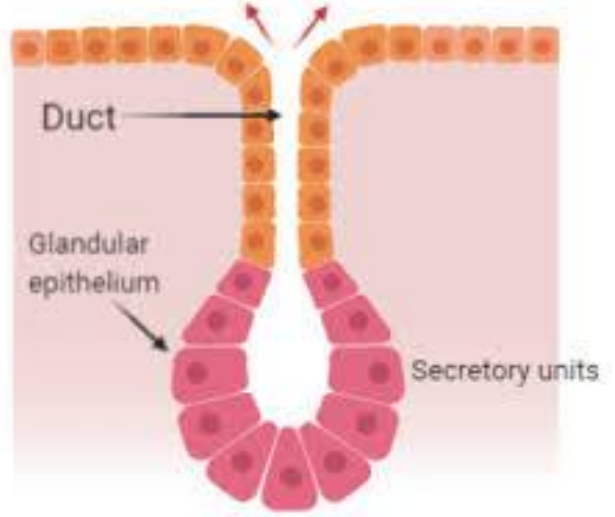
The lining of kidney tubules and ducts of salivary glands

Function :-

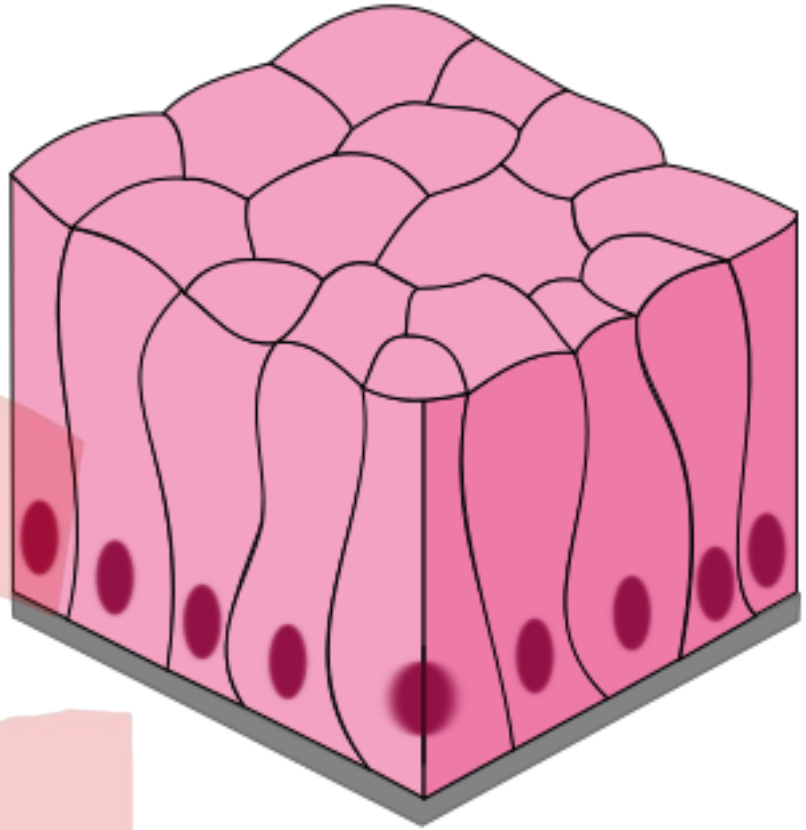
Absorb of useful material from urine before passed out.

Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This is glandular epithelium.

Produce and secrete substances like sweat, milk, enzymes, and hormones.



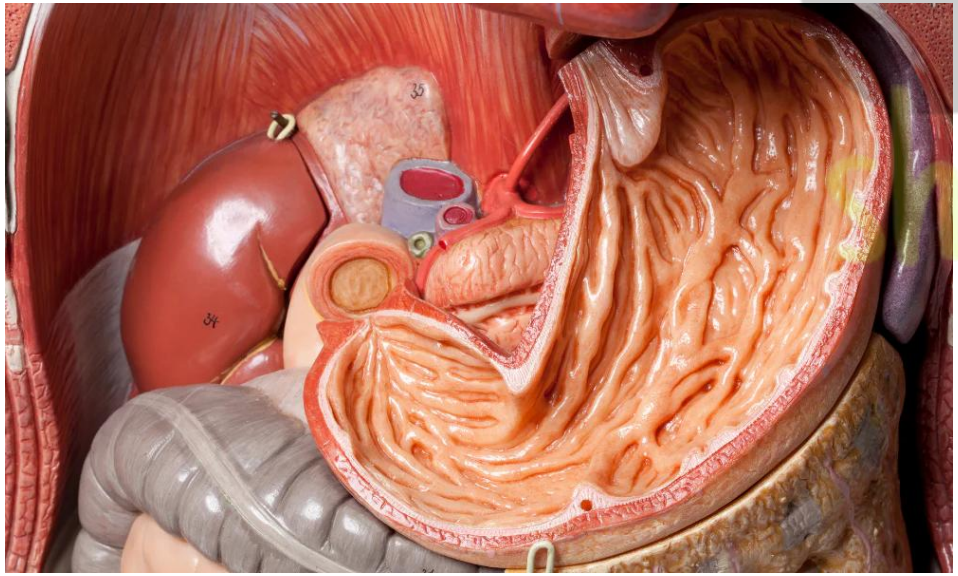
(iv). Columnar Epithelium

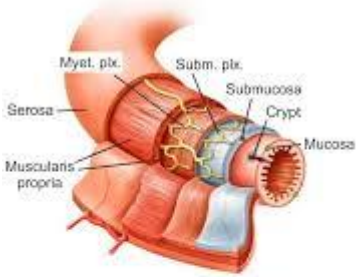


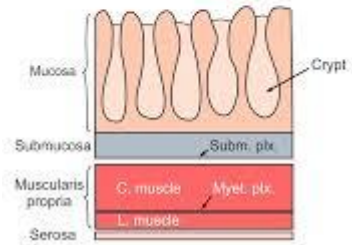
- These cells are tall and cylindrical like pillars

Location :-
Inner lining of the stomach and intestine.

Function :-
It absorbs nutrients from digested food.





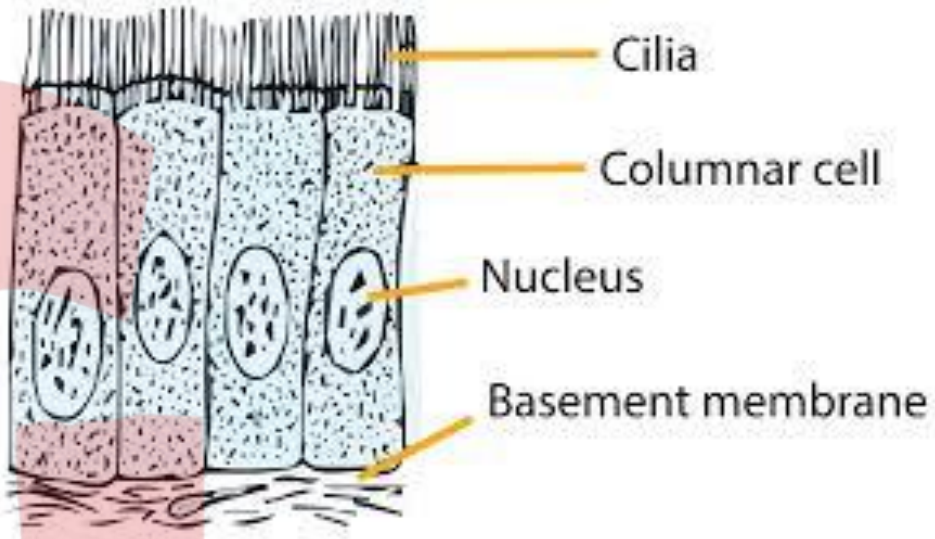


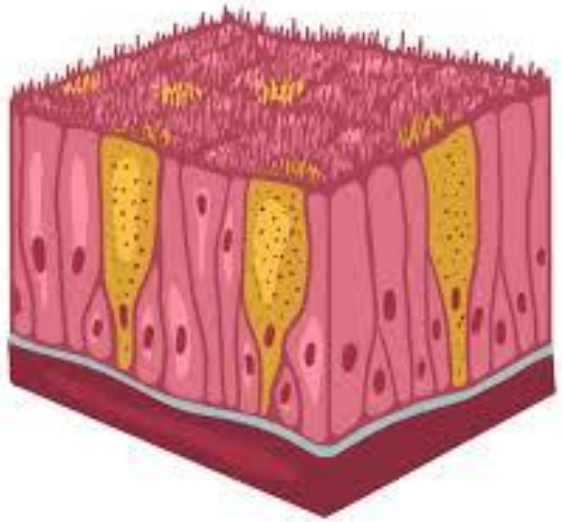
Ciliated Columnar Epithelium

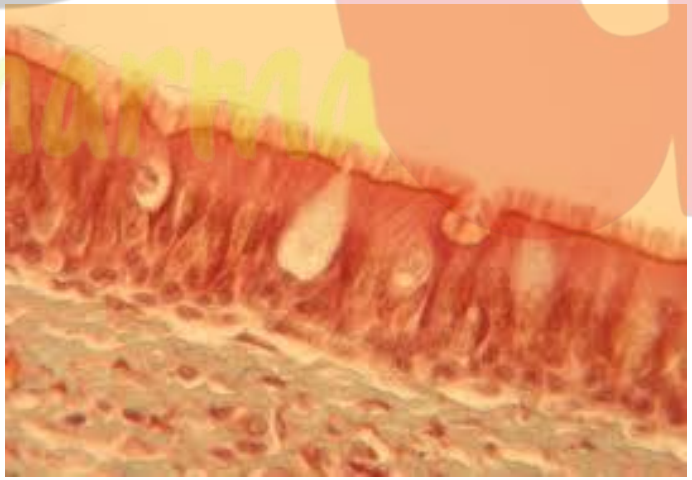
- The cells of Columnar epithelium have hair like projection (called cilia) on the outer surface which helps in movement of particle.

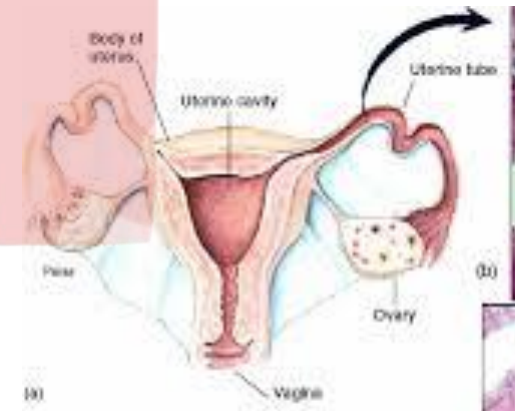
Location :-
In respiratory tract, in fallopian tube.

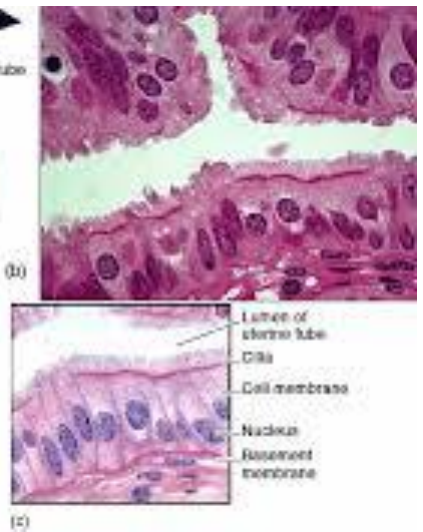
Function :-
- Help in movement of particle.
- Movement of cilia pushes the mucous in tract to clean it



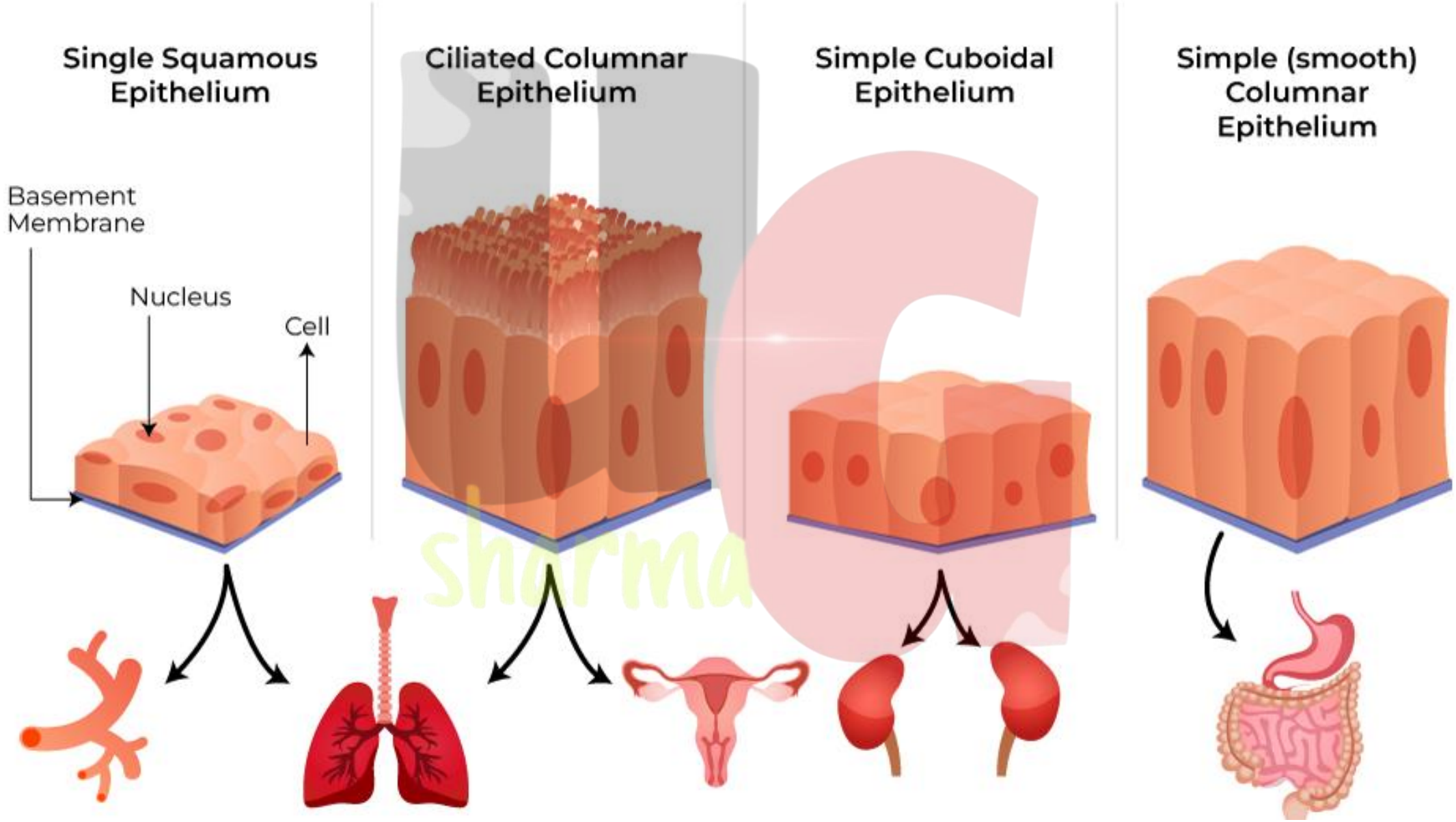






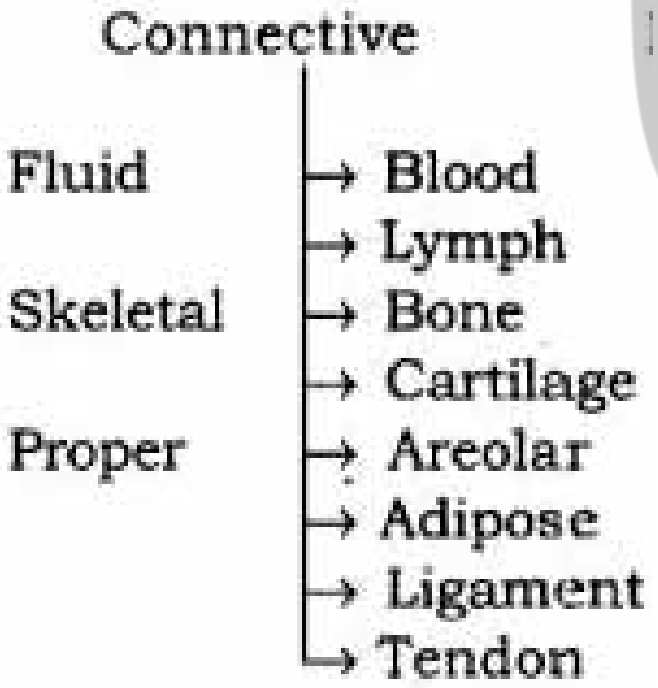


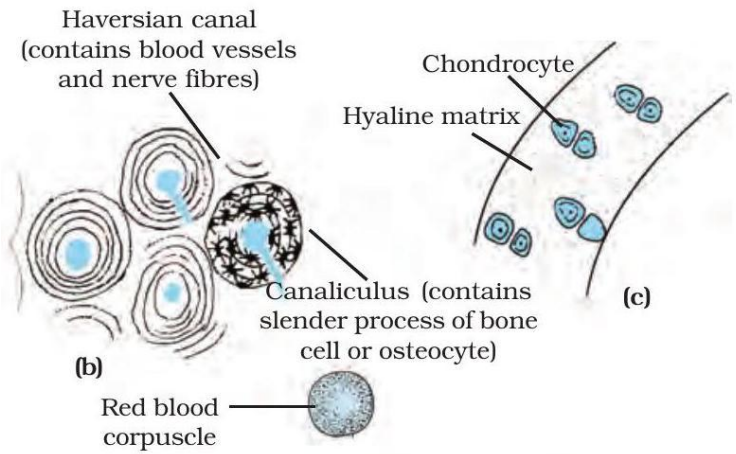
Epithelial Cell

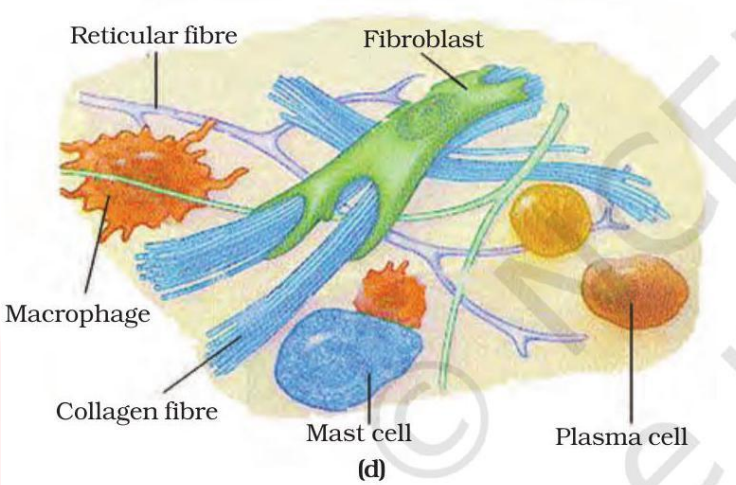


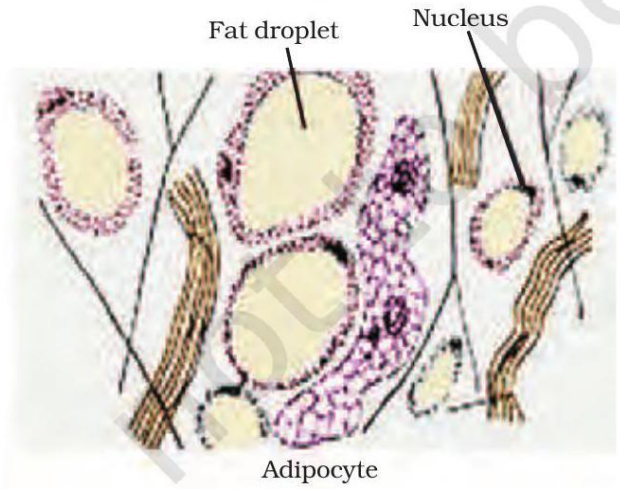
02. CONNECTIVE TISSUE

- The cells of connective tissue are loosely spaced and embedded in an intercellular matrix.
- The matrix may be jelly like, fluid, dense or rigid.
- The mature of matrix decides the function of tissue.
- Their basic function is to provide support to different organs & keeping them in place.



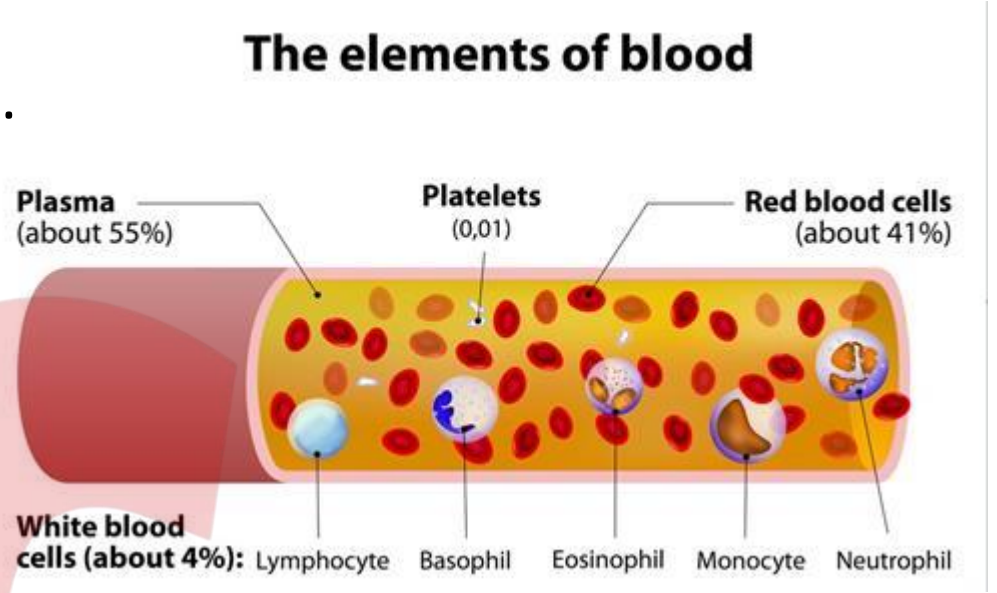






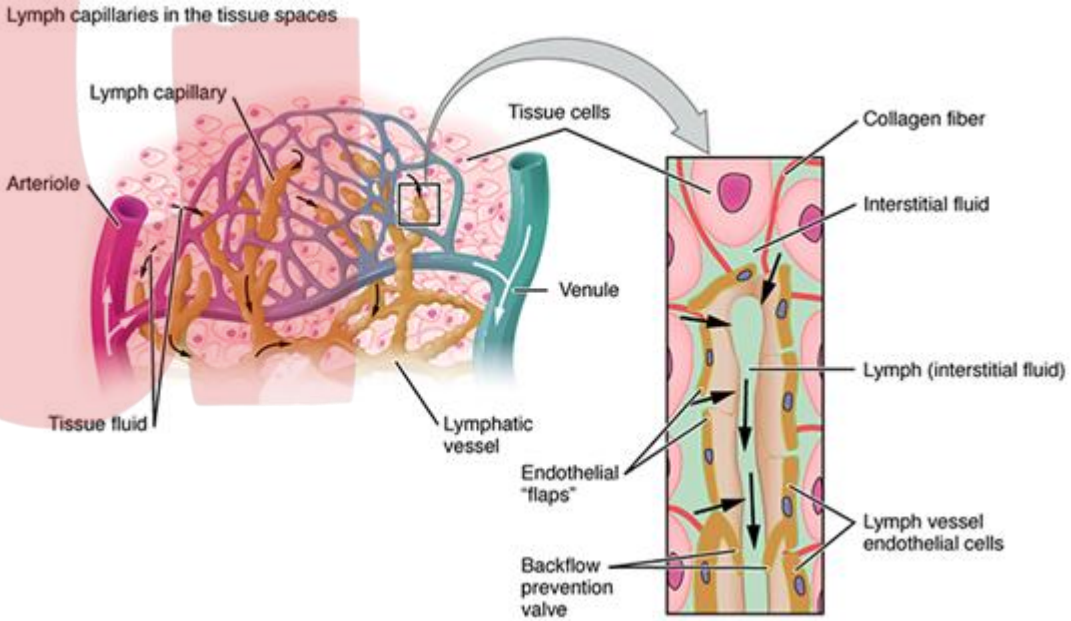
Blood

- Blood composed of fluid matrix called blood plasma.
- Floating cells on plasma is called corpuscles.
- 55% composed of plasma and 45% corpuscles.
- Blood cell are of three types :-
  i. RBCs (Red blood corpuscles)
  ii. WBCs(White blood corpuscles)
  iii. Platelets



Functions :-

- Blood flow and helps in the transportation of various materials such as nutritive substances, gases, excretory products, hormones etc.



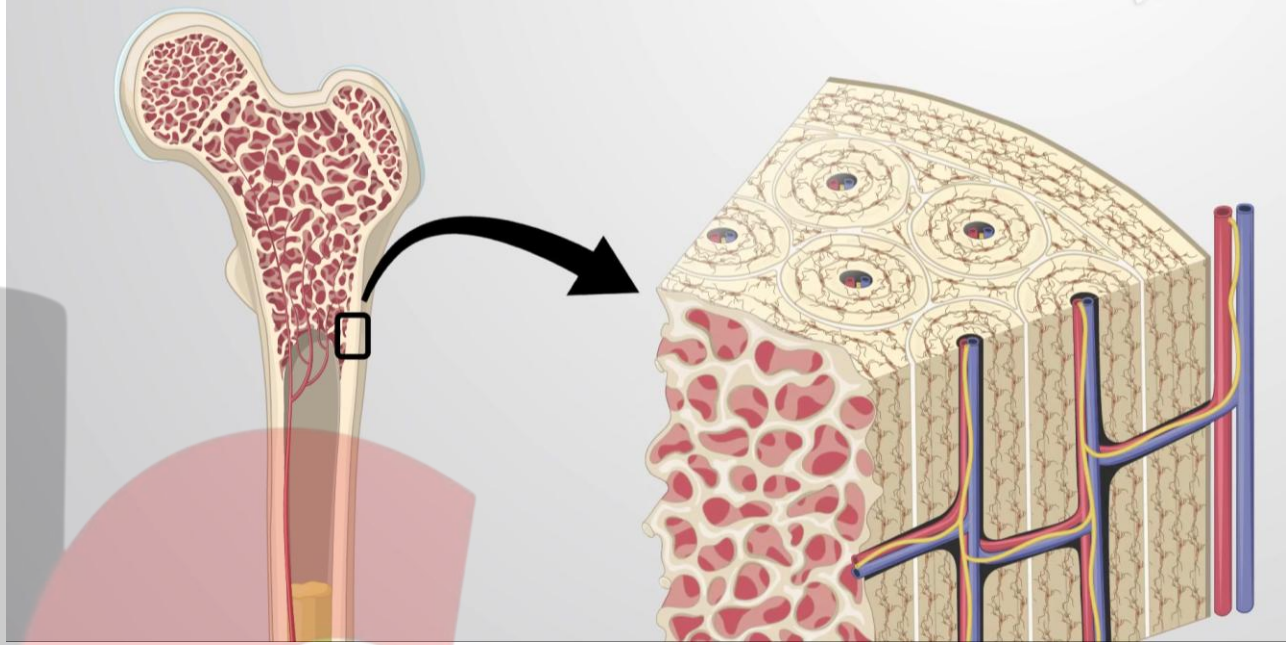
Lymph :- Colourless fluid in which WBCs is present.

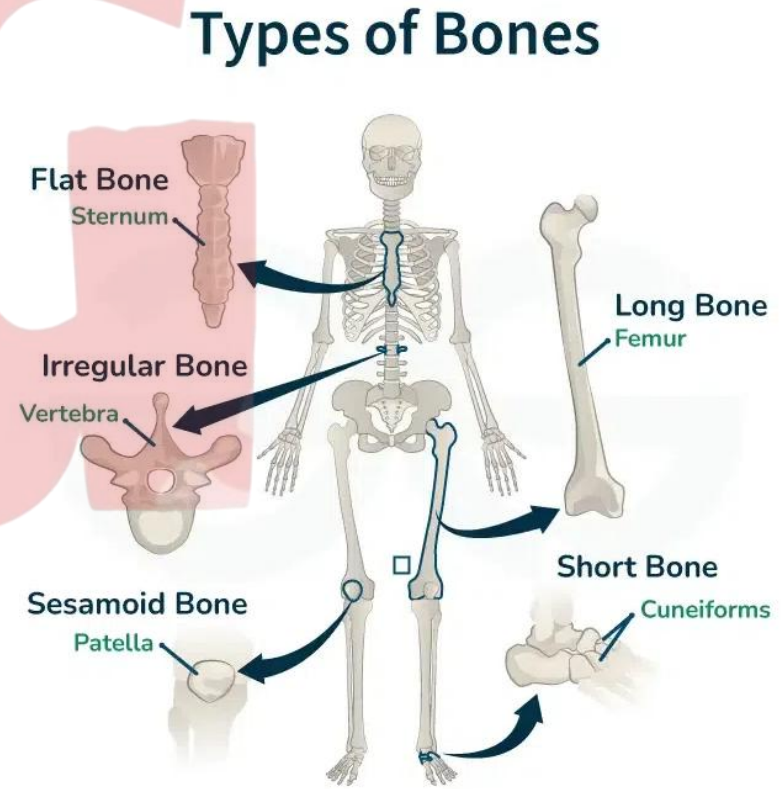
Bone

- Strong & non – flexible tissue
- It is embedded in hard matrix that is composed of calcium and phosphorus compounds.

Function :-

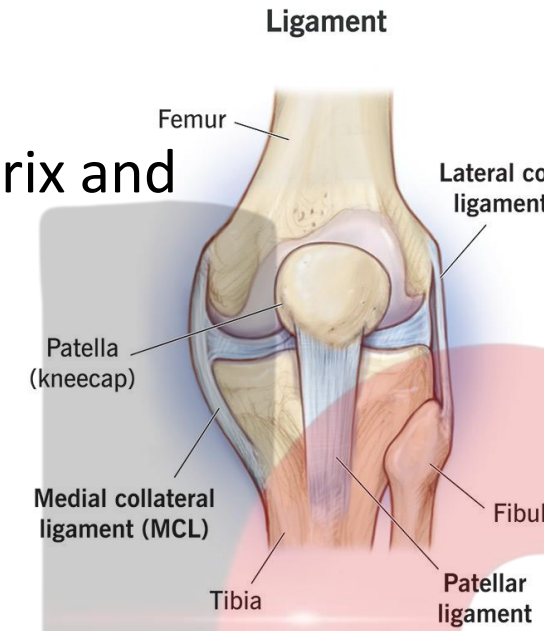
- Form framework that support the body
- Also support the internal organ of the body

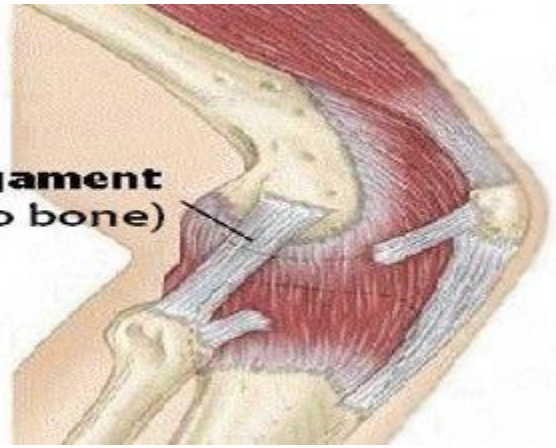




Ligament

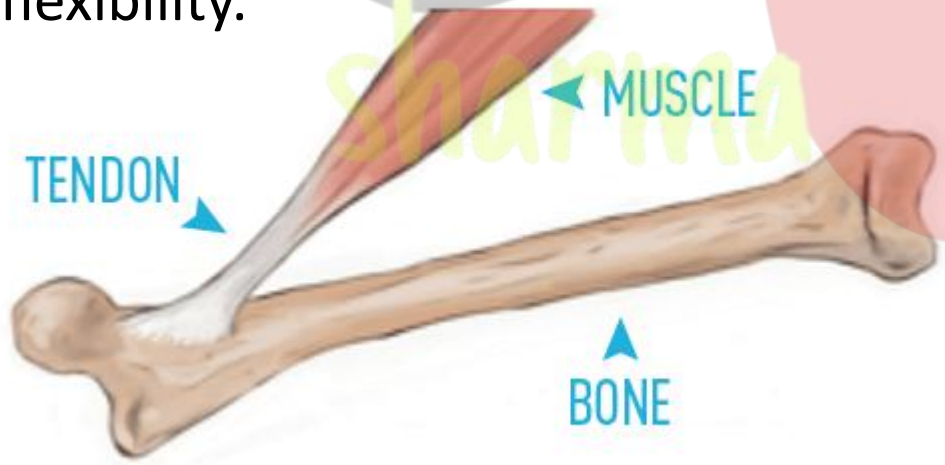
- Ligaments contain very little matrix and connect bones with bones.
- This tissue is very elastic.
- It has considerable strength.

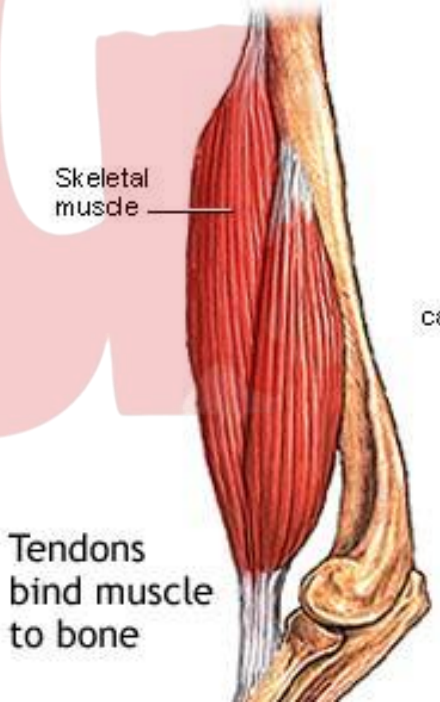


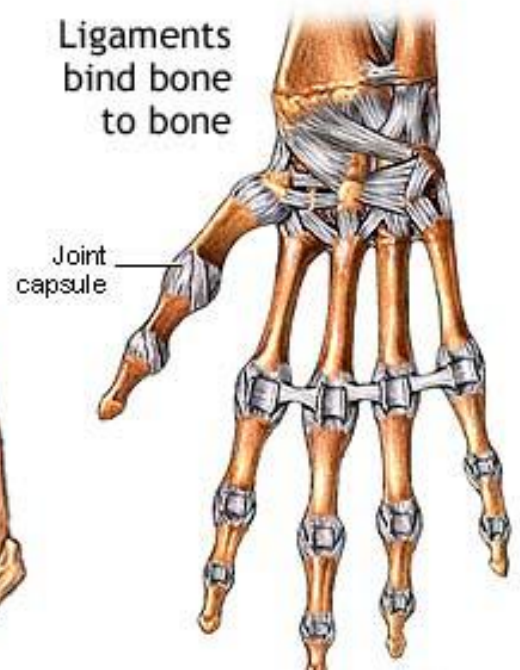


Tendons

- Tendons connect muscles to bones
- Tendons are fibrous tissue with great strength but limited flexibility.







Cartilage

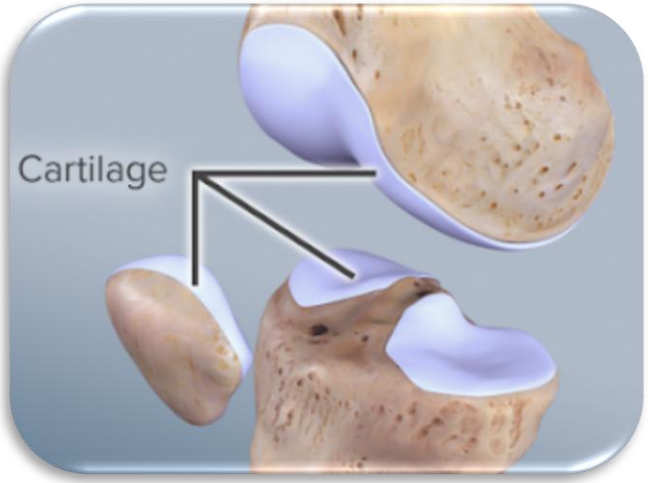
- The solid matrix is composed of proteins and sugars.
- It has wide space between the cell.

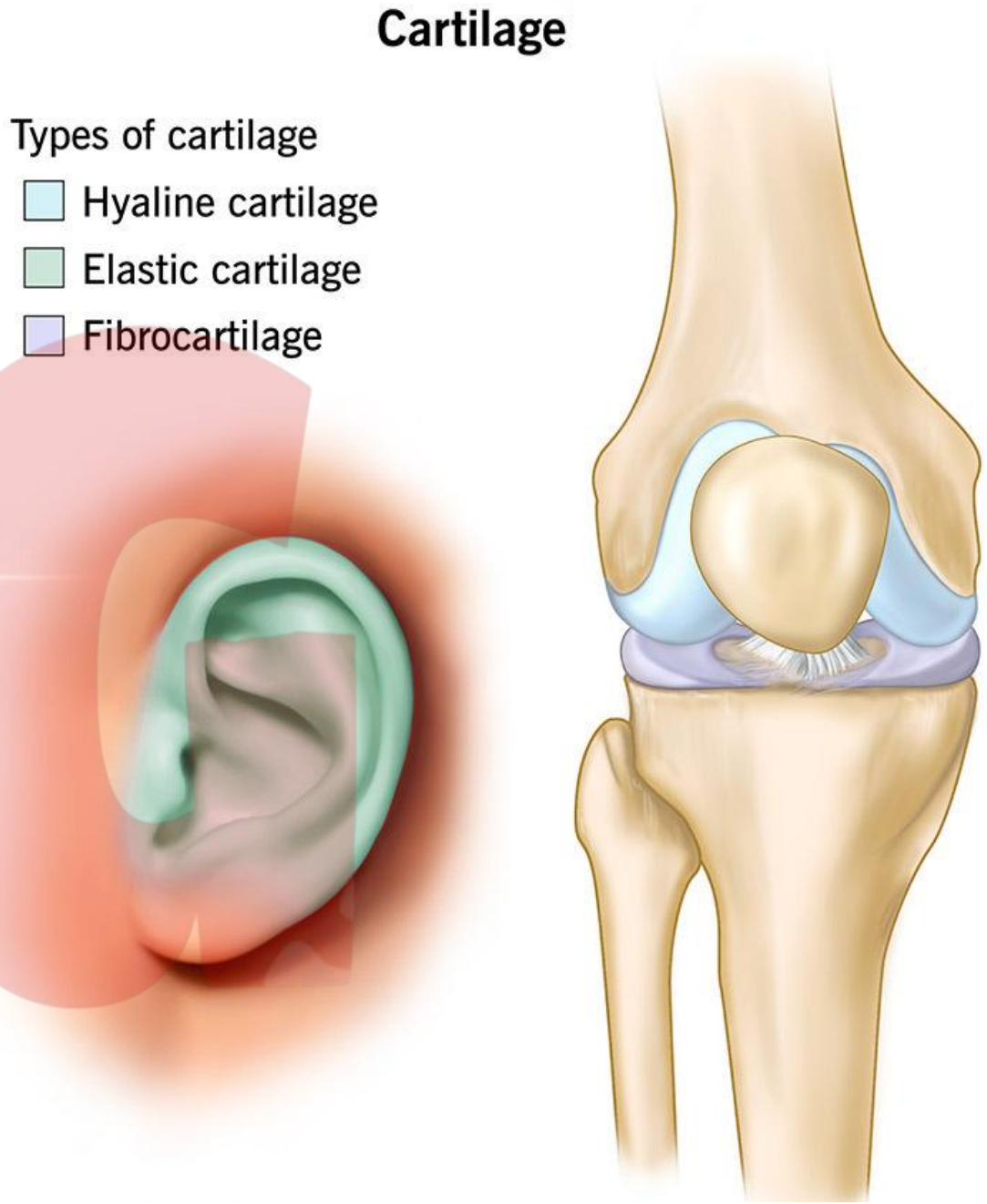
Location :-

Bone surfaces at joints, Nose tip, Ear, trachea and larynx.

Functions :-

- Cartilage smoothens bone surfaces at joints
- It provides flexibility and great tensile strength.



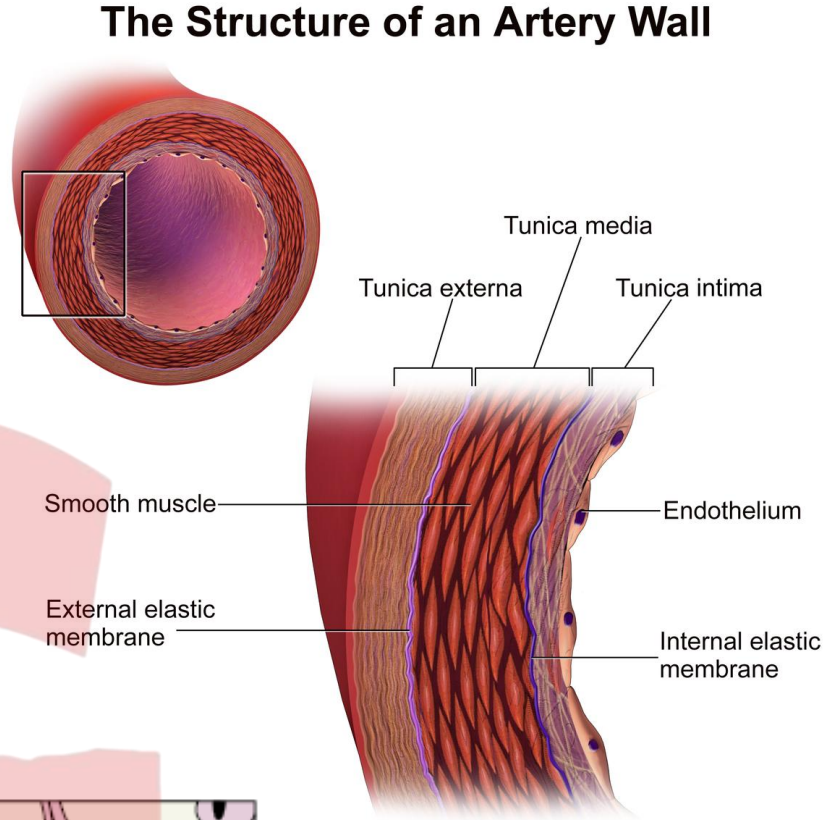


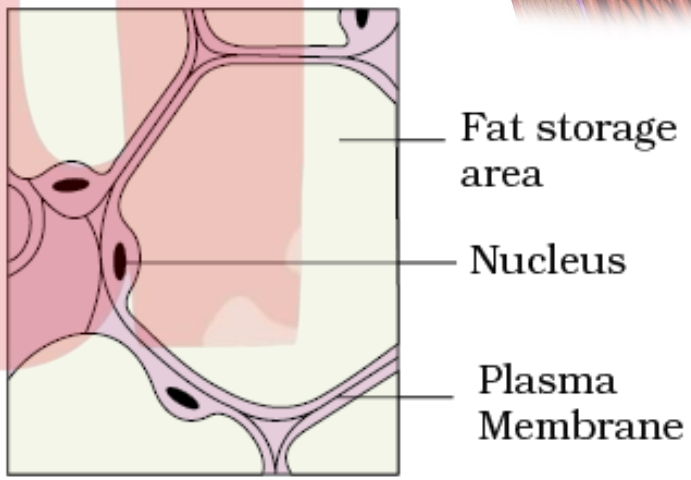
Areolar connective Tissue

- Found b/w muscles & skin, around blood vessels, nerves and bone marrow.

Function :-

- Fill the gap inside the organ
- supports internal organs
- help in repairing of tissue.





Adipose Tissue

- The cells of this tissue are filled with fat globules.
- These are oval and round cells.

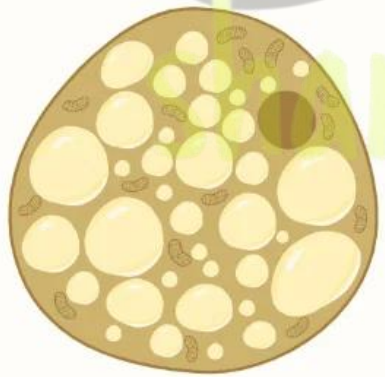
Location :-

- Found below the skin and between internal organs

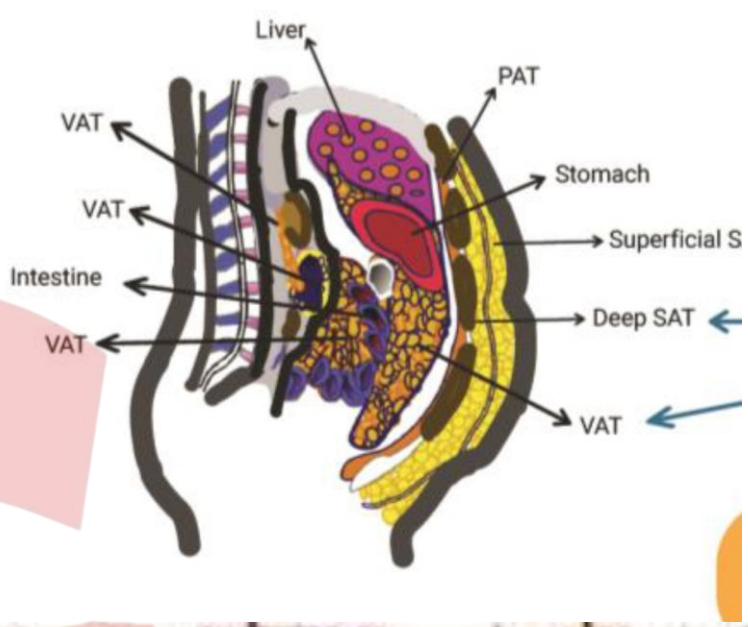
Function :-

- Store fats
- Acts as an insulator and prevents loss of heat from the body.

White adipose tissue



Brown adipose tissue



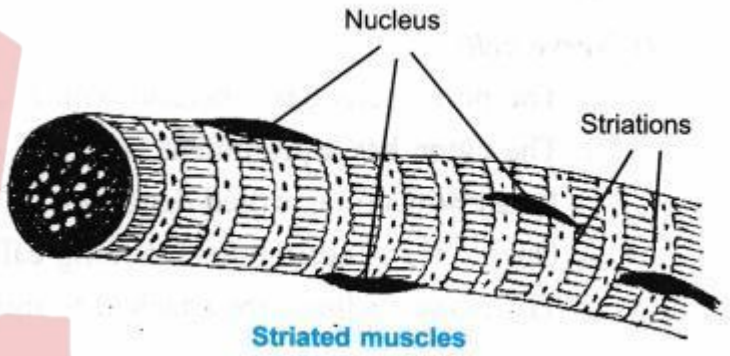
03. MUSCULAR TISSUE

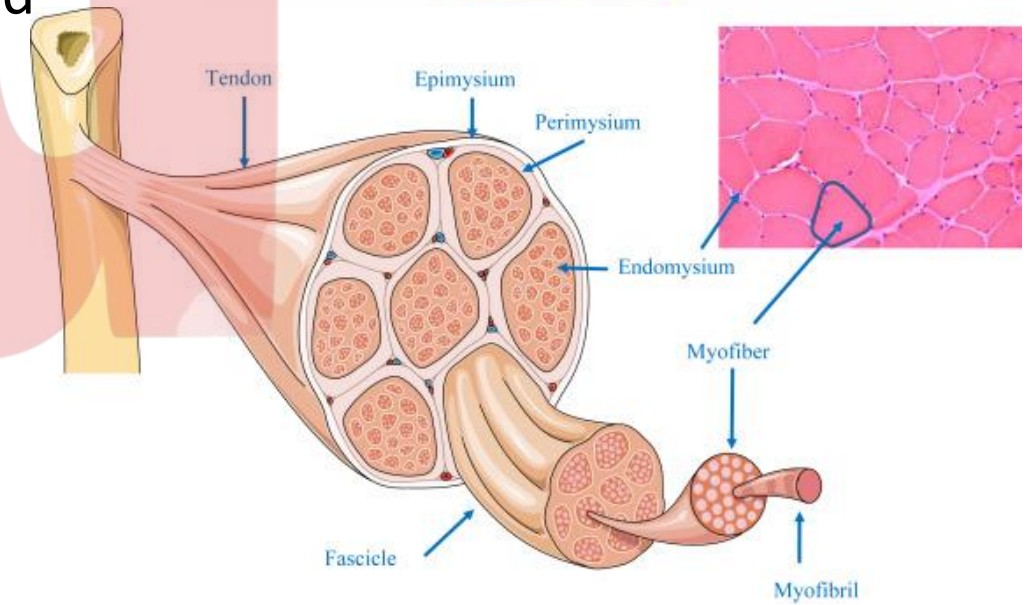
- Muscular tissue consists of elongated cells, also called muscle fibres.
- Responsible for movement in our body.
- Muscles contain special protein called contractile proteins, which contract and relax to cause movement

Types of Muscular Tissue

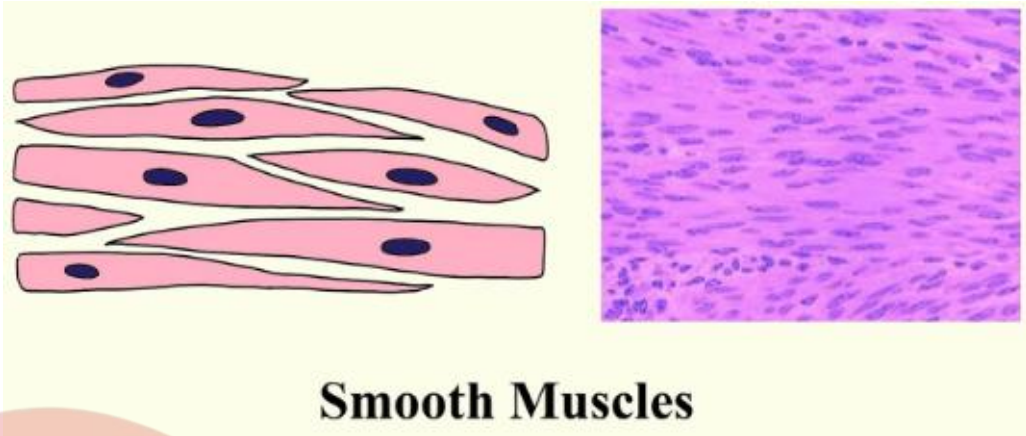
i. Striated muscles (Skeletal Muscles)

- **Structure:** Cells are long, cylindrical, unbranched, and multinucleate (contain multiple nuclei).
- **Location :** They are found mostly attached to bones
- **Function :** control voluntary movement (under our control) and locomotion such as walking and writing.

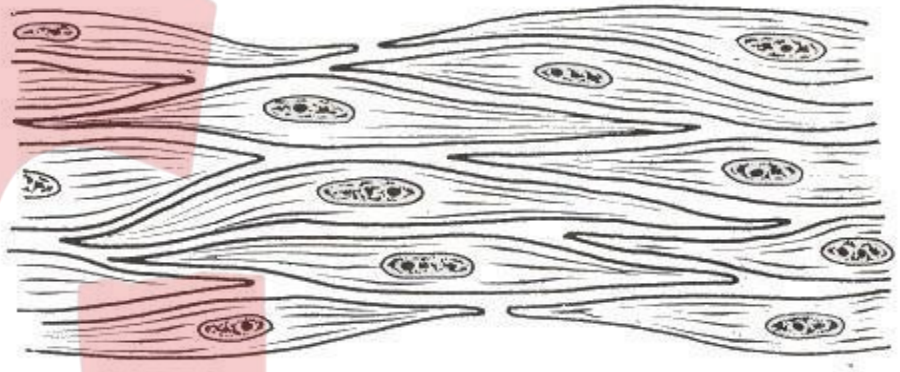


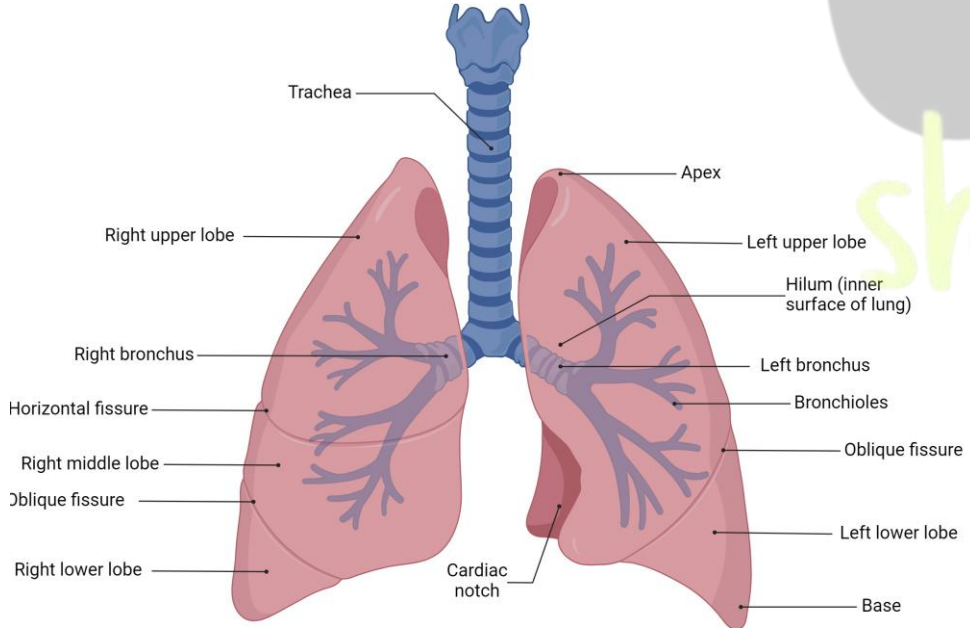


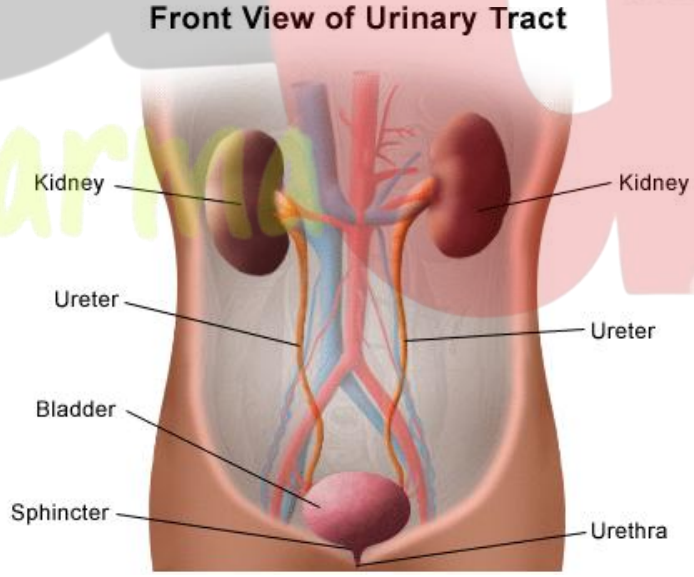
ii. Unstriated muscles (Smooth Muscles)

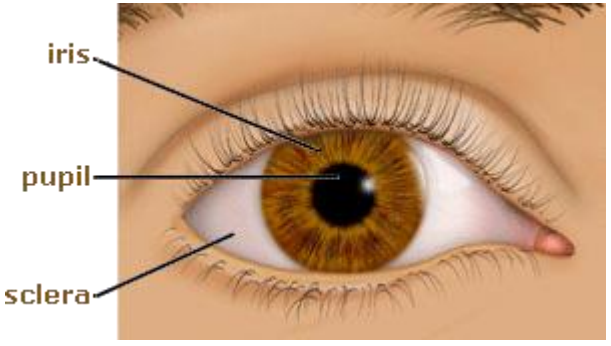


- **Structure:** Cells are long with pointed ends and are uninucleate (have a single nucleus).
- **Location :** Found in iris of eye, ureters, bronchi of the lungs, digestive tract and other internal organs
- **Function :** control involuntary movement (not under our control)
- E.g :- movement of food in elementary canal.
- Also, known as involuntary movement.



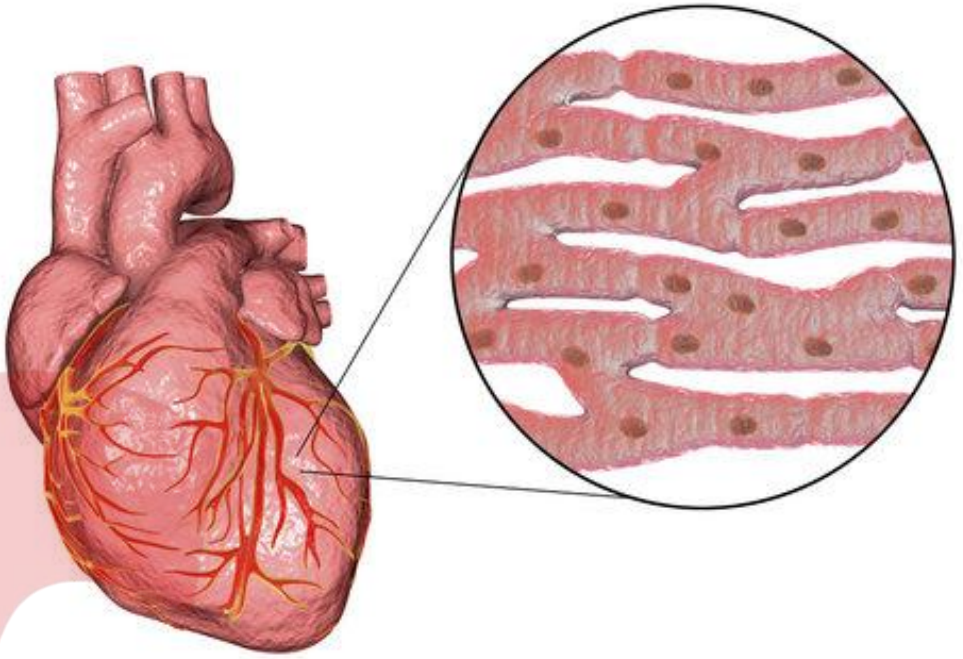


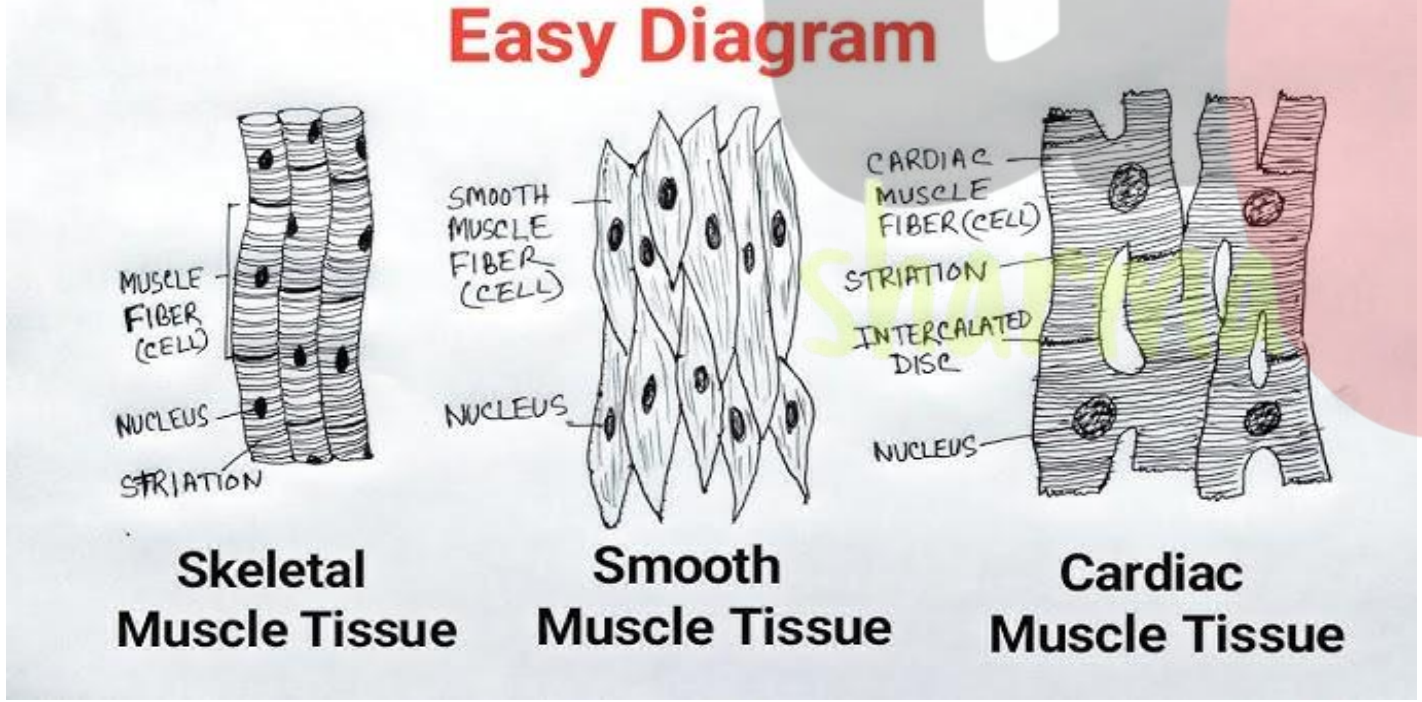


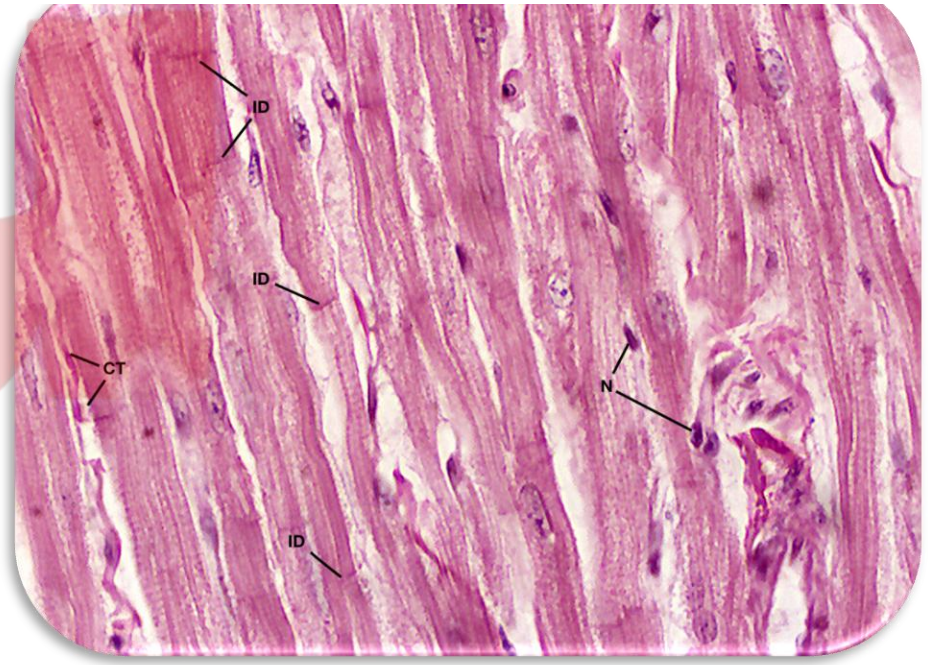


iii. Cardiac Muscles

- **Structure:** Cells are cylindrical, branched, and uninucleate.
- **Location :** Found only in the wall of heart.
- **Function :** Control involuntary rhythmic contraction and relaxation of cardiac muscle help to pump and distributed the blood to various parts of body

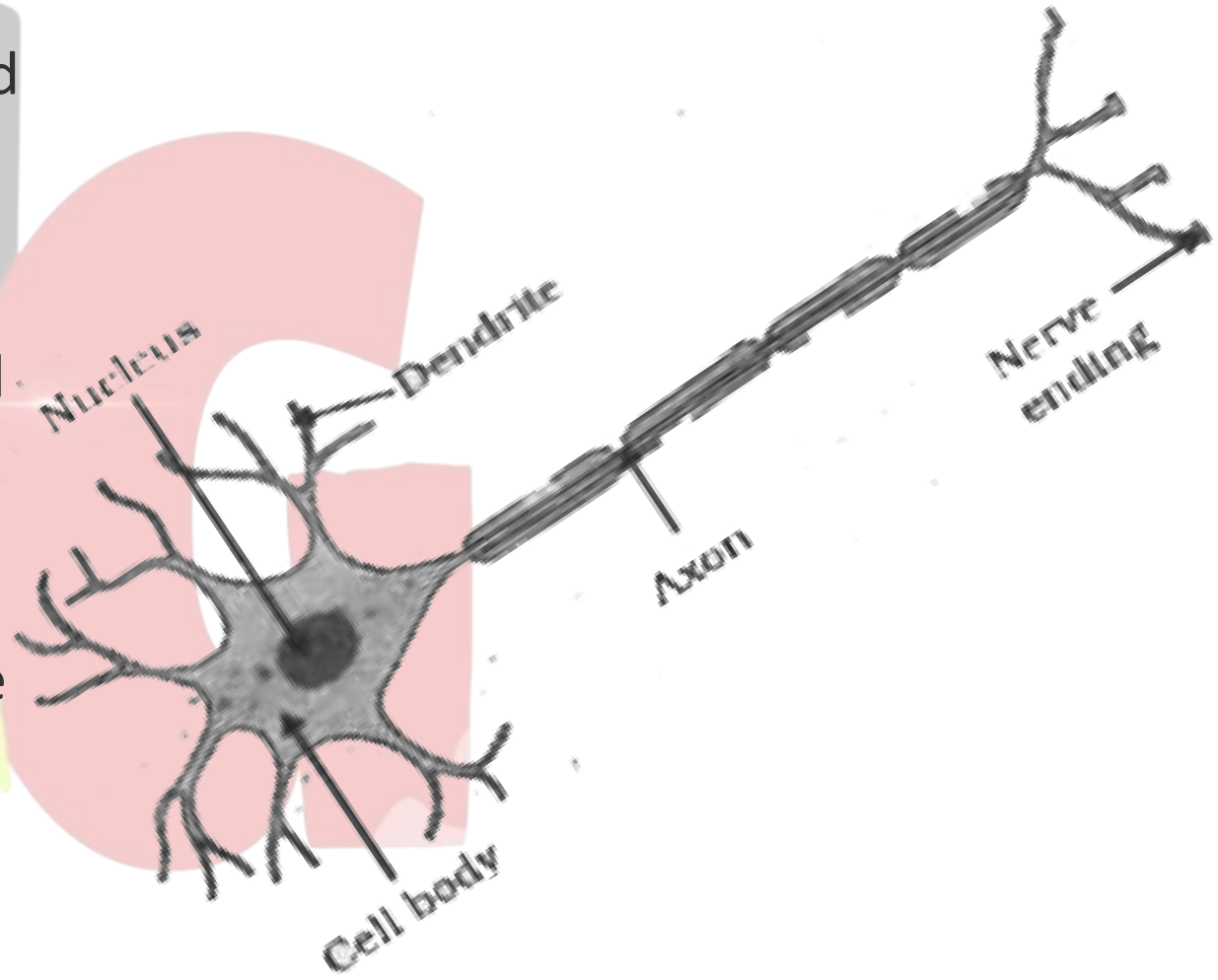






03. NERVOUS TISSUE

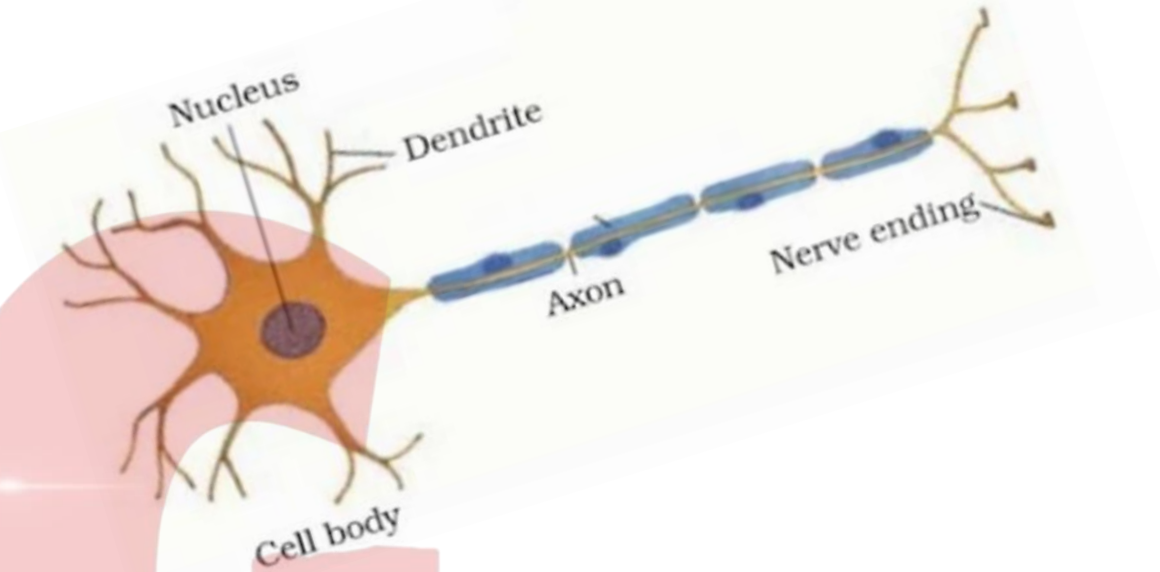
- They are highly specialized tissue due to which the animals are able to perceive and respond to the stimuli.
- Their functional unit is called as nerve cell or neuron.
- Nerve cell or neuron cell is the longest cell of the body.
- Cell body is called cyton which is covered by plasma membrane.
- It receive signal from different parts of the body and transmit very rapidly towards brain.



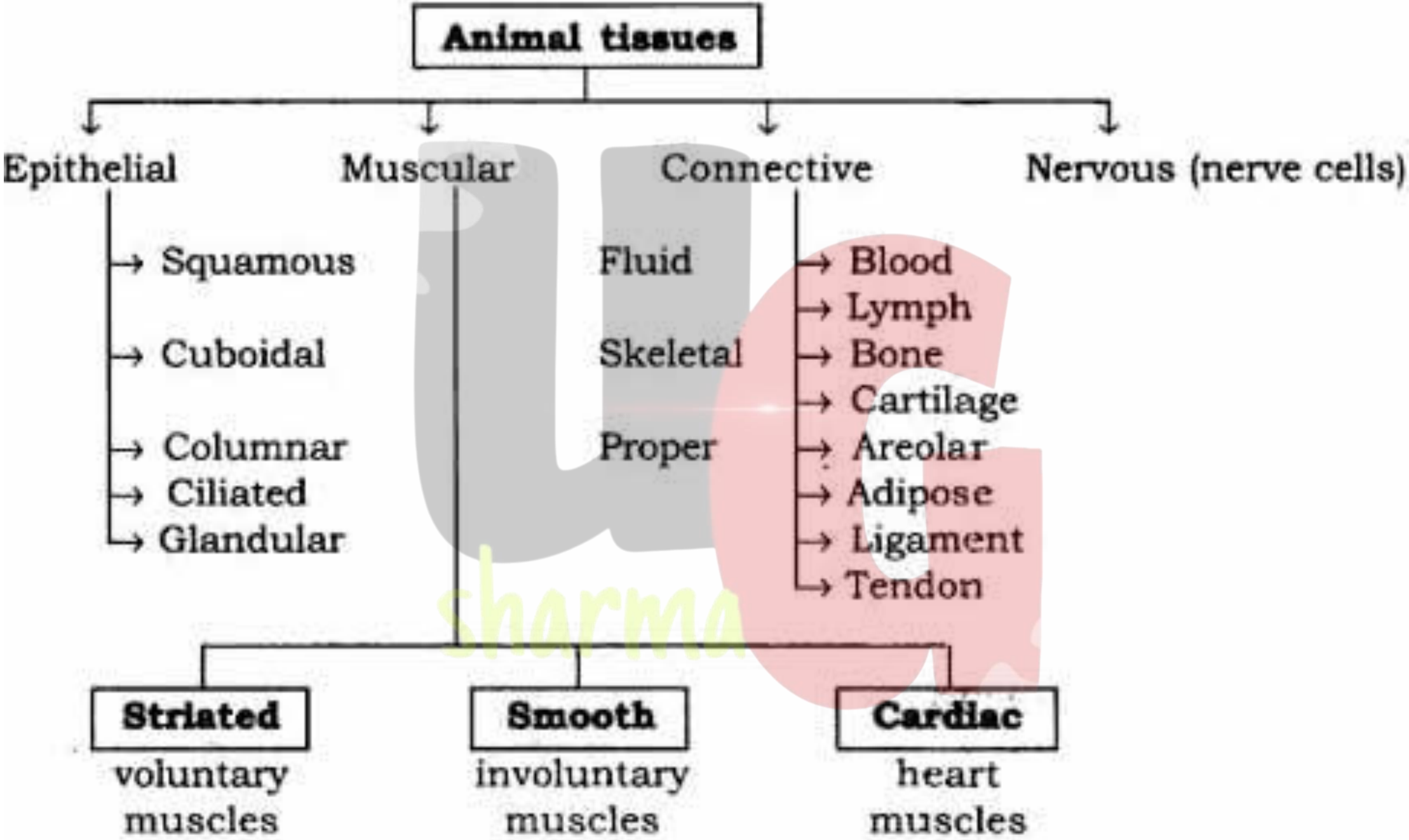
Location :- Brain, spinal cord and neurons.

A single neuron consist of :-

i. Cell body :- It has nucleus and cytoplasm
ii. Axon :- It transmits impulse away from the cell.
iii. Dendrites :- It carry information from their tips towards axon.



The signal that passes along the nerve fibre is called a nerve impulse.


Animal tissues
Epithelial
Muscular
Connective
Nervous (nerve cells)
→ Squamous
→ Cuboidal
→ Columnar
→ Ciliated
→ Glandular
Fluid
Skeletal
Proper
→ Blood
→ Lymph
→ Bone
→ Cartilage
→ Areolar
→ Adipose
→ Ligament
→ Tendon
Striated
voluntary muscles
Smooth
involuntary muscles
Cardiac
heart muscles

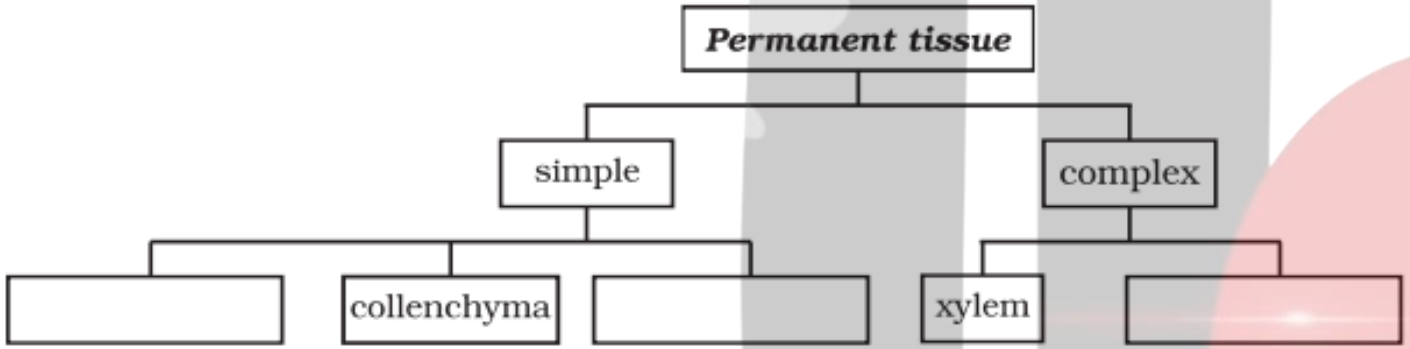
Questions

1. *Name the tissue responsible for movement in our body.*
2. *What does a neuron look like?*
3. *Give three features of cardiac muscles.*
4. *What are the functions of areolar tissue?*

Exercises

1. Define the term “tissue”.
2. How many types of elements together make up the xylem tissue? Name them.
3. How are simple tissues different from complex tissues in plants?
4. Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall.
5. What are the functions of the stomata?
6. Diagrammatically show the difference between the three types of muscle fibres.
7. What is the specific function of the cardiac muscle?
8. Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body.
9. Draw a labelled diagram of a neuron.
10. Name the following.
    (a) Tissue that forms the inner lining of our mouth.
    (b) Tissue that connects muscle to bone in humans.
    (c) Tissue that transports food in plants.
    (d) Tissue that stores fat in our body.
    (e) Connective tissue with a fluid matrix.
    (f) Tissue present in the brain.
11. Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule, vascular bundle.

12. Name the regions in which parenchyma tissue is present.
13. What is the role of epidermis in plants?
14. How does the cork act as a protective tissue?
15. Complete the following chart:



sharma

sharma