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CLASS IX BIOLOGY

CHAPTER – 6

TISSUES (Module 1) Plant Tissues

Tissues :-

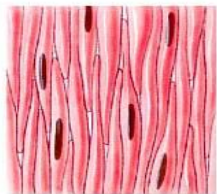
- A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.

Eg :- In human beings the cells of the muscular tissue contract and relax and help in movements.

In plants the cells of the vascular tissue conduct water and food from one part of the plant to the other.

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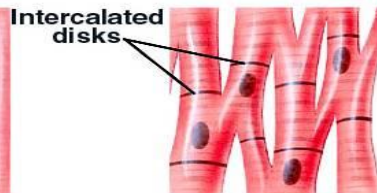
Types of Muscle



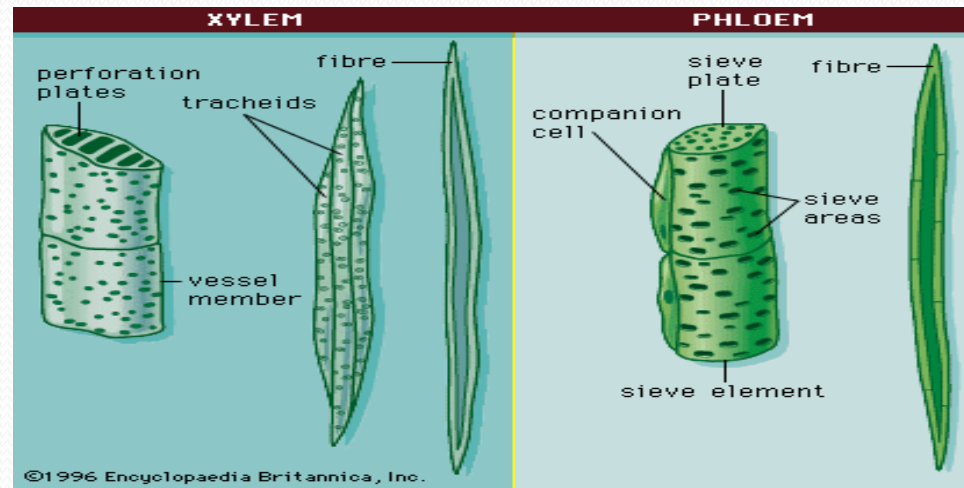
Smooth muscle



Skeletal muscle



Cardiac muscle



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Are Plants and Animals Made of Same Types of Tissues?

a) Plant tissues :-

- i) Plants do not move from place to place. Most of the cells and tissues in plants provide mechanical support and strength. So most of the tissues consists of dead cells because they provide mechanical support and strength to the plant.**
- ii) The growth of plants takes place only in some regions. So plants have tissues called meristematic tissues which divide and help in growth and permanent tissues which do not divide.**
- III) Plants are differently adapted for a sedentary existence, contributing to difference in organ system design.**

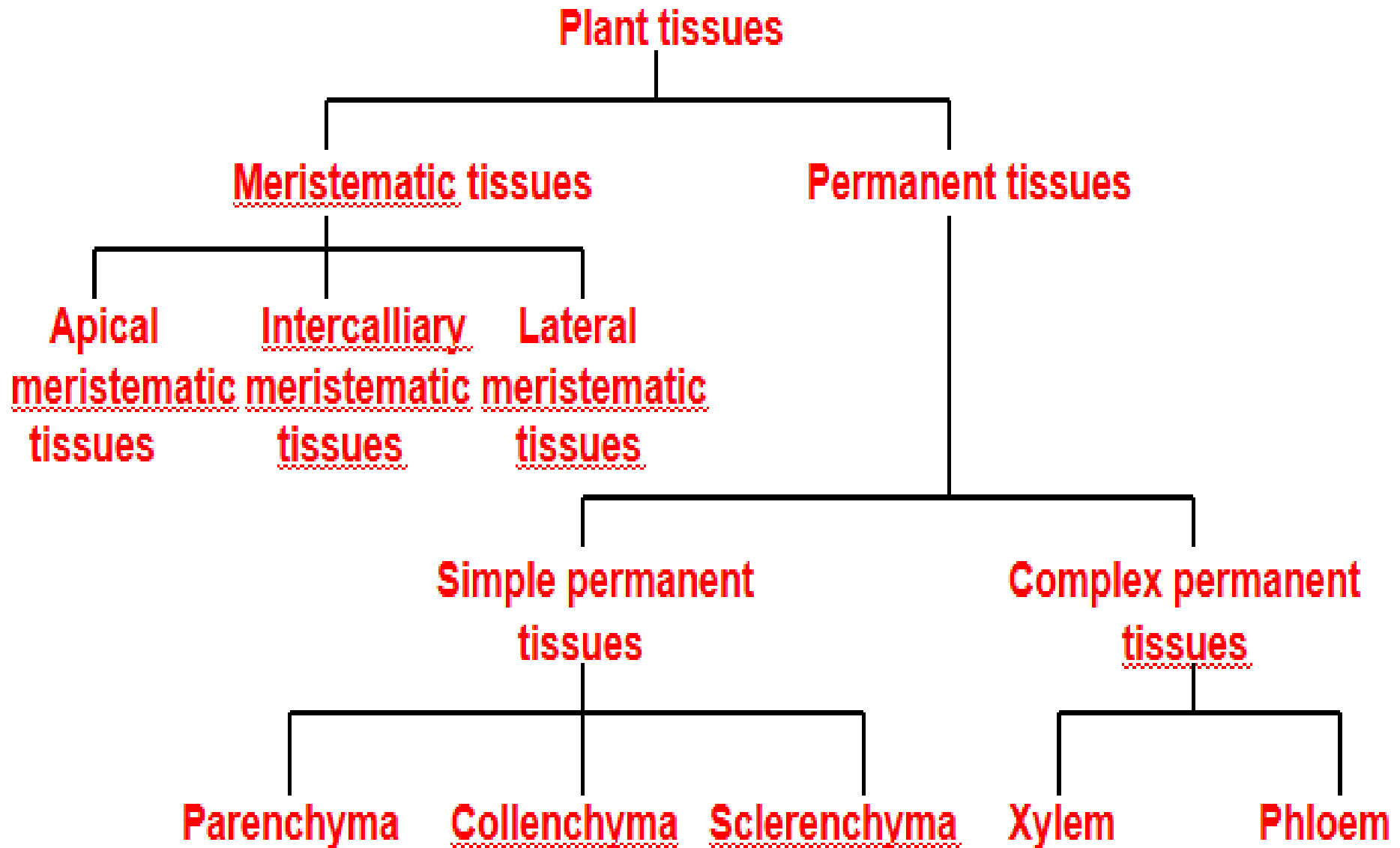
b) Animal tissues :-

- i) Animals move from place to place and need more energy than plants. So most cells and tissues in animals are living cells.**
- ii) The growth of animals is more uniform so animals do not have separate dividing and non dividing cells. Animals have organs having specialised functions. So the organs have specialised tissues.**
- III) Active locomotion by the animals contributing to difference in organ system design.**

ARE PLANTS AND ANIMALS MADE OF SAME TISSUES?

ANIMAL TISSUE	PLANT TISSUE
Since animals are mobile so they require more energy, hence more living tissues are required.	Since plants are stationary so they do not require much energy, Hence more living tissues are not required.
Animals move from one place to another in search of food, shelter etc., hence they need more energy and there more tissues are living.	In plants, most tissues provide structural strength. Most of these tissues are dead 9can provide mechanical strength as easily as the living ones and need less maintenance.
Cell growth is uniformly distributed	Growth is limited to certain regions
Structural organisation of organs and organ	Structural organisation of organs is

Plant Tissues: Classification



Plant tissues are of two main types. They are Meristematic tissues and Permanent tissues.

i) Meristematic tissues :- are of three types. They are Apical meristematic tissues, Intercallary meristematic tissues and Lateral meristematic tissues.

ii) Permanent tissues :- are of two types . They are Simple permanent tissues and Complex permanent tissues. Simple permanent tissues are of three types. They are Parenchyma, Collenchyma and Sclerenchyma. Complex permanent tissues are of two types. They are Xylem and phloem

MERISTEMATIC TISSUE

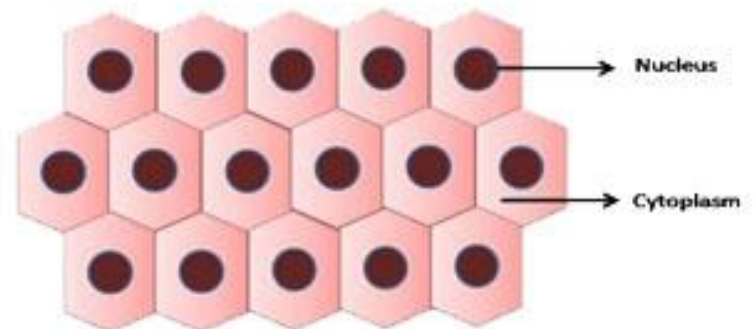
Cells of meristematic tissue are very active, they have dense cytoplasm, thin cellulose walls and prominent nuclei. They lack vacuoles.

- The growth of plants occurs only in certain specific regions because of the presence of the dividing tissue, known as meristematic tissue. **Meristematic tissues are found in the growing regions of the plant like the tips of root, stem and branches. They divide continuously and help in the growth of the plant.**

CHARACTERISTICS OF MERISTEMATIC TISSUE

- They have very small and few vacuoles.
- The meristematic tissue are living and thin-walled.
- The protoplasm of the cells is very dense.
- The cells of the meristematic tissue are young and immature.
- They do not store food.
- They exhibit a very high metabolic activity.
- They possess a single, large and prominent nucleus.

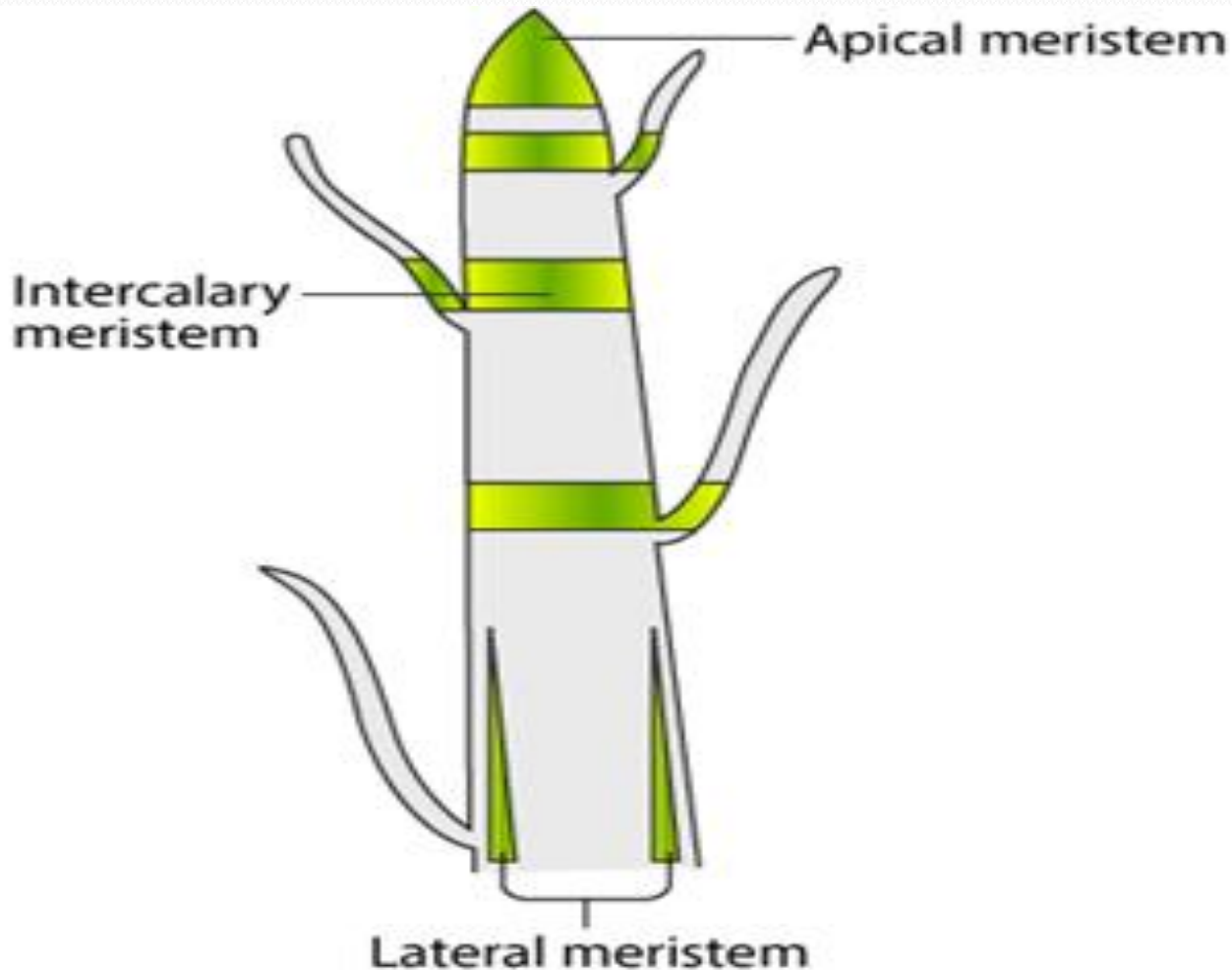
A typical meristematic tissue



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

- Apical meristematic tissues** :- are present in the tips of stems and roots. They help in the growth of stems and roots.
- Lateral meristematic tissues** :- are present in the sides of stems and roots. They help to increase the girth of the stems and roots.
- Intercalary meristematic tissues** :- are present at the base of leaves and internodes and help in the growth of those parts.

Location of meristematic tissue in plant body diagrammatically



PERMANENT TISSUE

- **Permanent tissues are formed from meristematic tissues. They do not divide and have permanent shape and size. They differentiate into different types of permanent tissues. Permanent tissues are of two main types. They are Simple permanent tissues and Complex permanent tissues.**

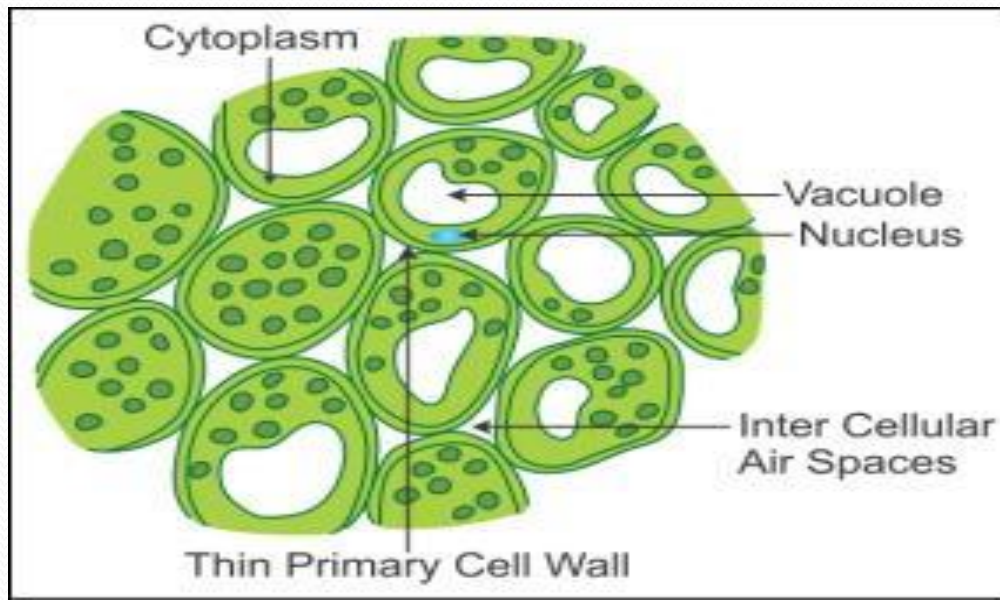


SIMPLE PERMANENT TISSUE

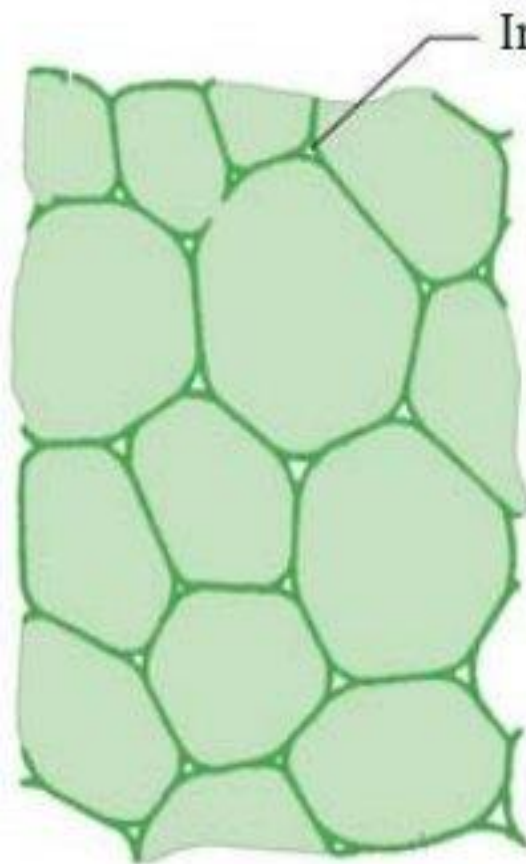
Simple permanent tissues are made up of one type of cells. They are of three types called Parenchyma, Collenchyma and Sclerenchyma.

Parenchyma

- **Parenchyma** 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.

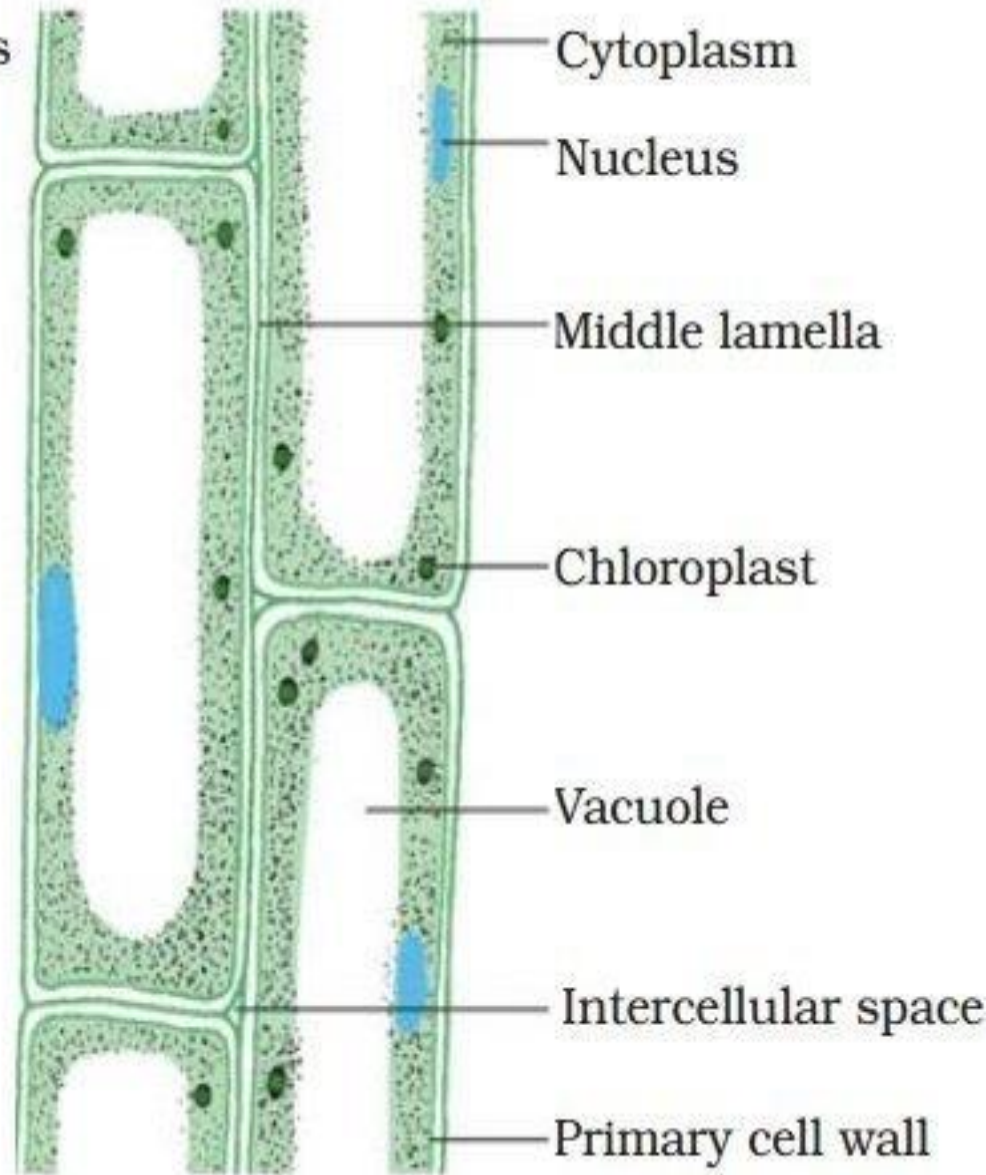


Parenchyma



Intercellular spaces

Transverse section



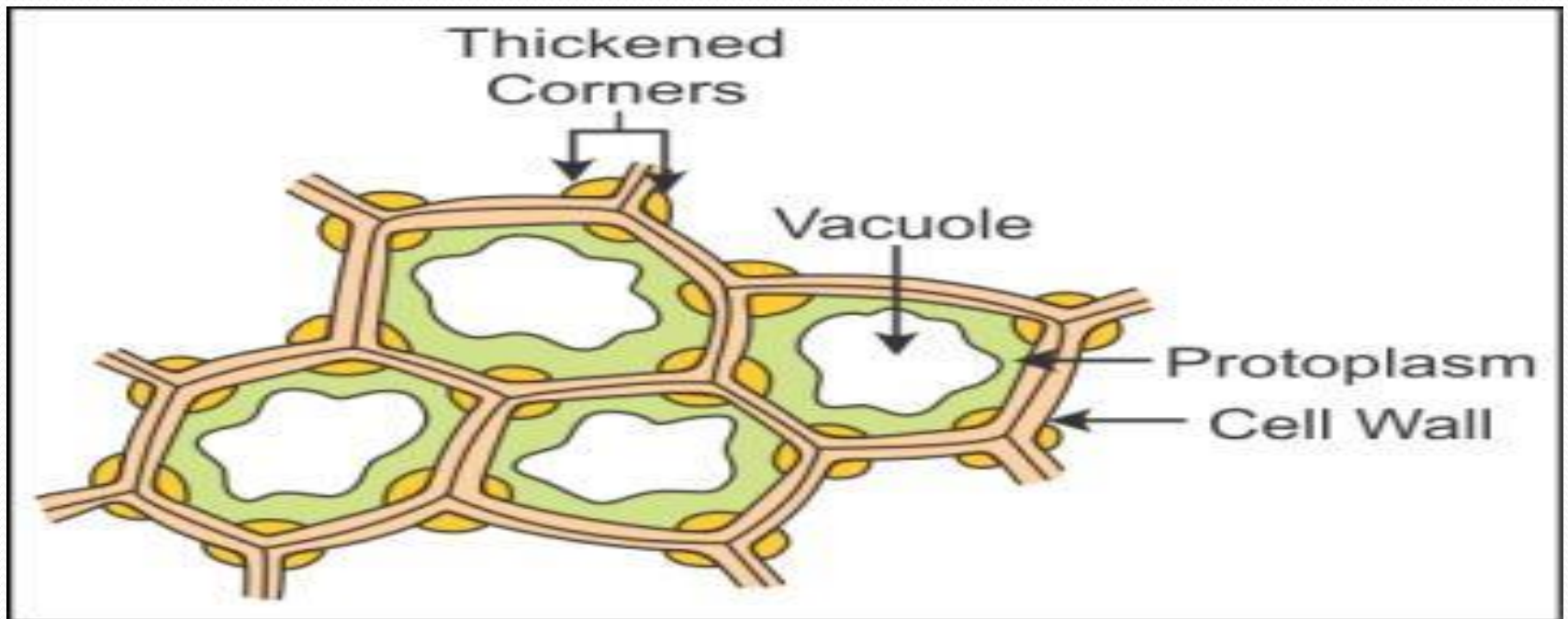
Longitudinal section

Functions of parenchyma

- 1.To store materials like starch, proteins, hormones etc.
And waste product such as tanins, resins etc**
- 2.The Parenchyma cells perform the metabolic activities of the cell.**
- 3.Some parenchyma cells in leaves contain chloroplast and prepares food by photosynthesis.**
- 4.Some parenchyma cells have large air cavities (arenchyma) which help the plant to float on water.**
- 5. Some parenchyma cells of roots and stem store water and minerals.**

Collenchyma

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

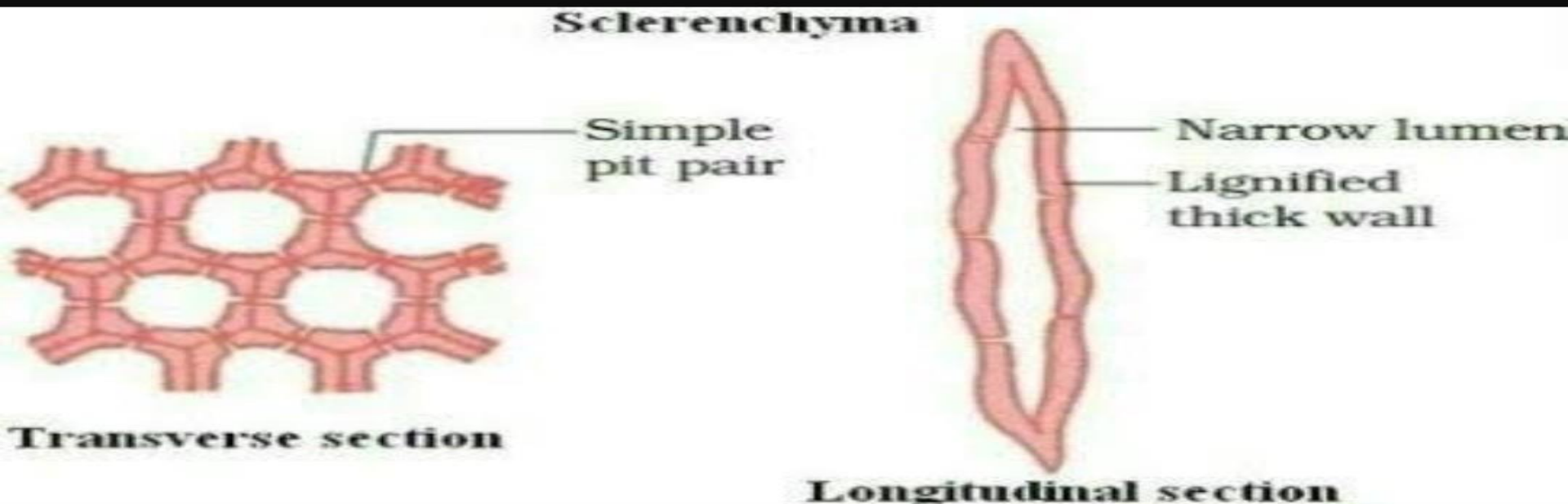


Functions of Collenchyma :-

- 1. They give flexibility and allows easy bending of different parts like stem, leaf etc.**
- 2. They also give mechanical support to the plant.**

Sclerenchyma tissue

The cells of sclerenchyma tissue are dead. They are long and narrow as the walls are thickened due to lignin. Often these walls are so thick that there is no internal space inside the cell. **The cell walls contain lignin a chemical substance which act like cement and hardens them**

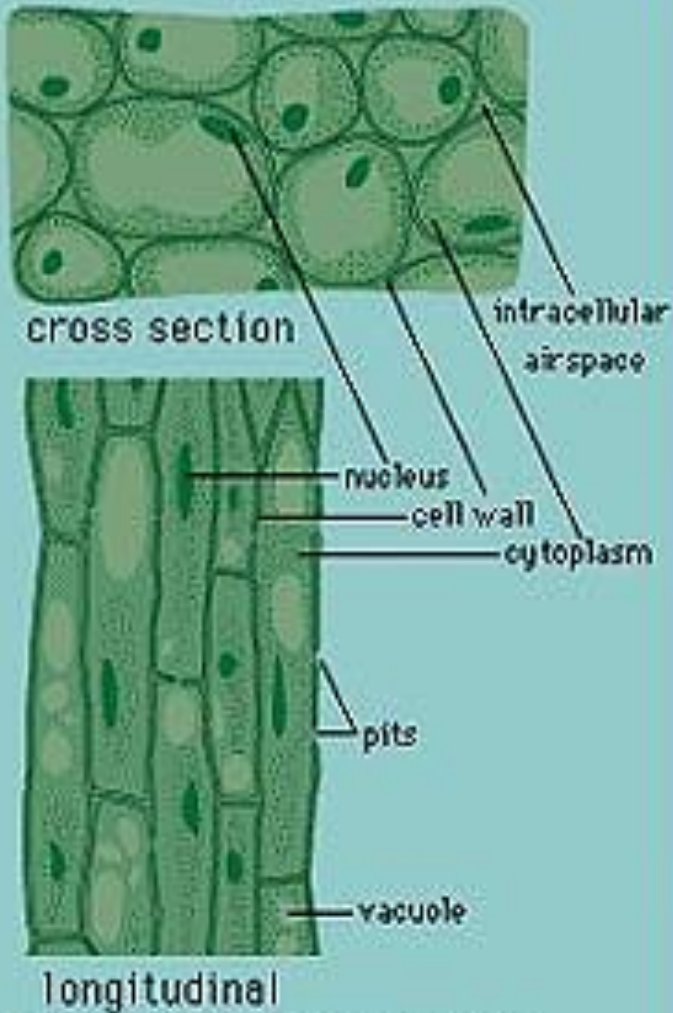


Functions of Sclerenchyma

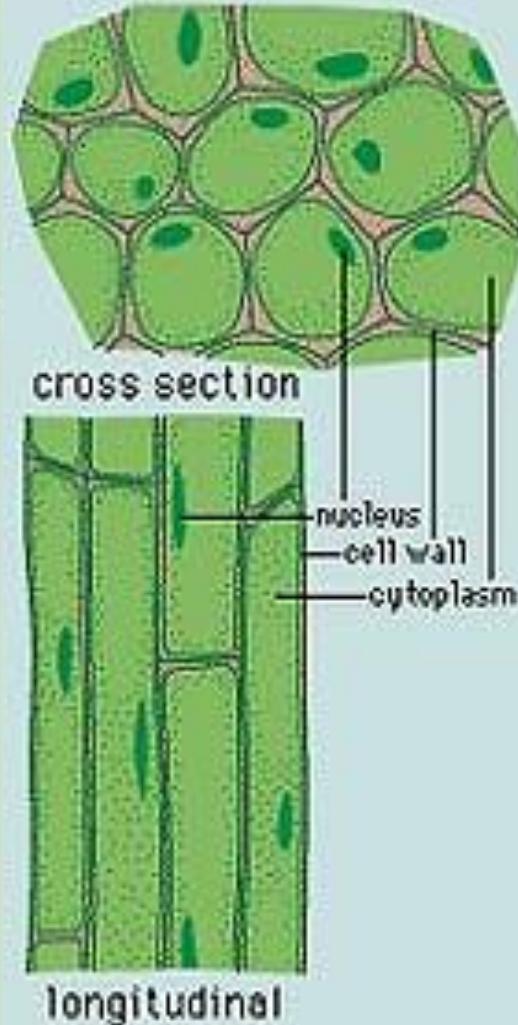
- 1.Sclerenchyma cells provide mechanical support to the plant and allows the organs to withstand bending, shearing, compression and pull caused due to environmental factors.**
- 2.It also supports transportation of water and nutrients to the plants.**
- 3.The rigidity provided by the sclerenchyma also prevents leaves of the plant to collapse due to wilting.**
- 4.Forms a major part of fruit pitshard outer shells of nuts.**

Comparison of parenchyma, collenchyma and sclerenchyma tissue.

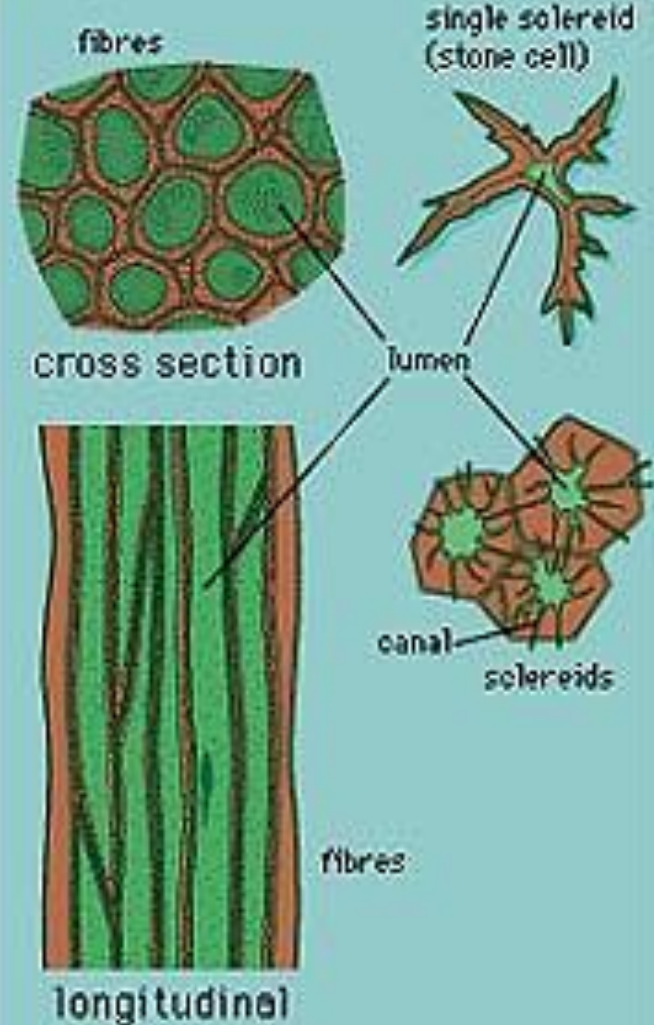
parenchyma tissue



collenchyma tissue



sclerenchyma tissue



COMPARISON BETWEEN PARENCHYMA, COLLENCHYMA AND SCLERENCHYMA

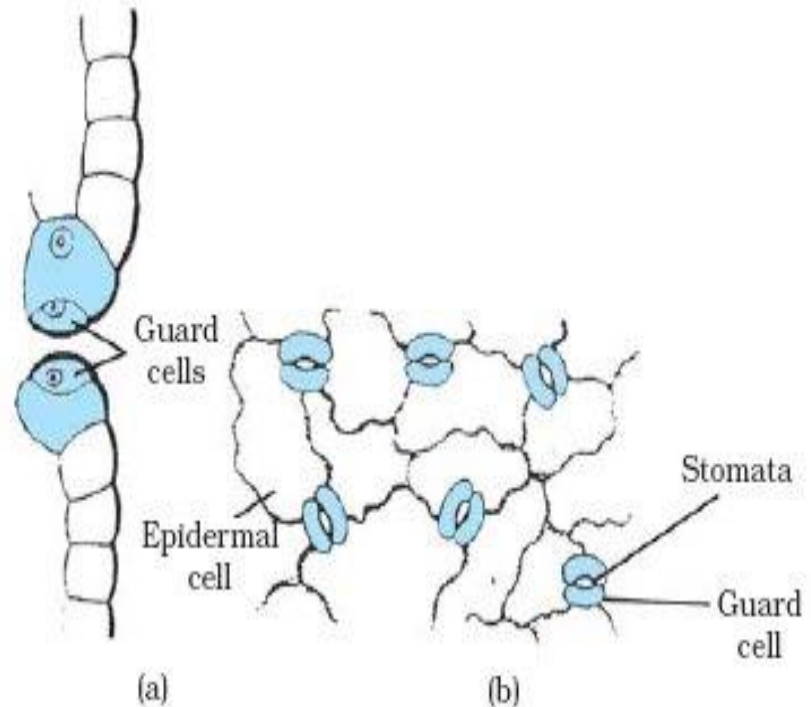
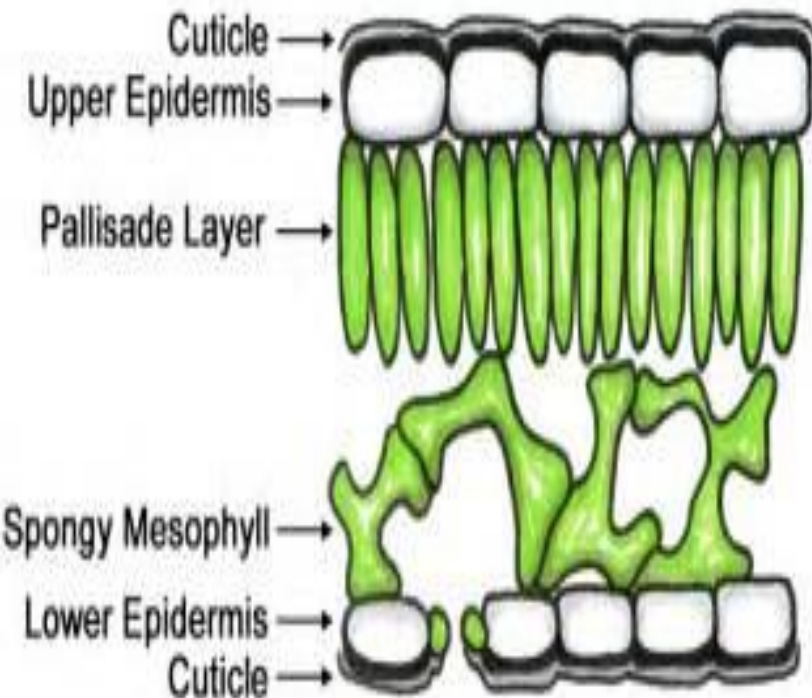
Parenchyma	Collenchyma	Sclerenchyma
Made up of cells having very thin cell wall. Consists of living cells at maturity.	They are plant tissues that consist of living elongated cells with unevenly thickened walls. Consists of living cells at maturity.	Made up of a thick and rigid cell wall. Consists of dead cells at maturity and thus why protoplast is absent.
Usually isodiametric in shape, however they can still have other various shapes.	Cells are usually polygonal in shape.	Cells are tubular in shape.
Cell wall is made up of cellulose.	Cell wall is made up of pectin and hemicelluloses.	Cell wall is made up of waterproofing lignin.
Cells are loosely packed.	Cells have little space between cells.	Cells have no intercellular spaces present between them, cells are tightly packed.
Plays a major role in gas exchange, storage of food	Plays a role in providing mechanical support to the	Cells provide mechanical support to the plant. It also supports transportation of

Epidermis

- Epidermis is the outermost layer. The epidermis is usually made of a single layer of cells. The entire surface of a plant has an outer covering epidermis. Since it has a protective role to play, cells of epidermal tissue form a continuous layer without intercellular spaces. Most epidermal cells are relatively flat. Often their outer and side walls are thicker than the inner wall.

Epidermal cell in leaves and Stomata

Cross section of a typical dicot leaf:



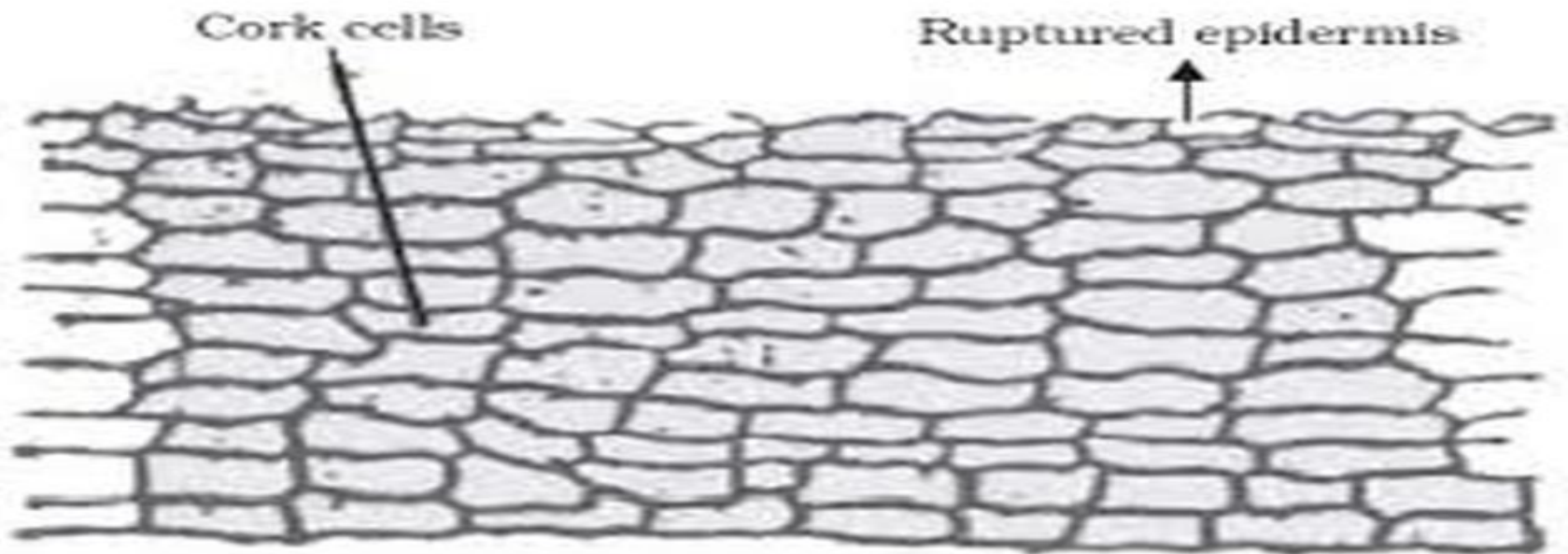
Guard cells and epidermal cells: (a) lateral view, (b) surface view

Functions of Epidermis

1. The Epidermis and its waxy cuticles provides a protective a protective barrier against mechanical injury, water loss and infection .
- 2.It protects the underlying tissues.
3. It regulates gaseous exchange through stomata.
- 4.It secretes metabolic compounds.
- 5.It absorbs water and mineral nutrients.

Cork Cells

As plants grow older, the outer protective tissue, epidermis is lost and is replaced by Cork cells. Cells of cork are dead and compactly arranged without intercellular spaces. They also have a substance called suberin in their walls that makes them impervious to gases and water.



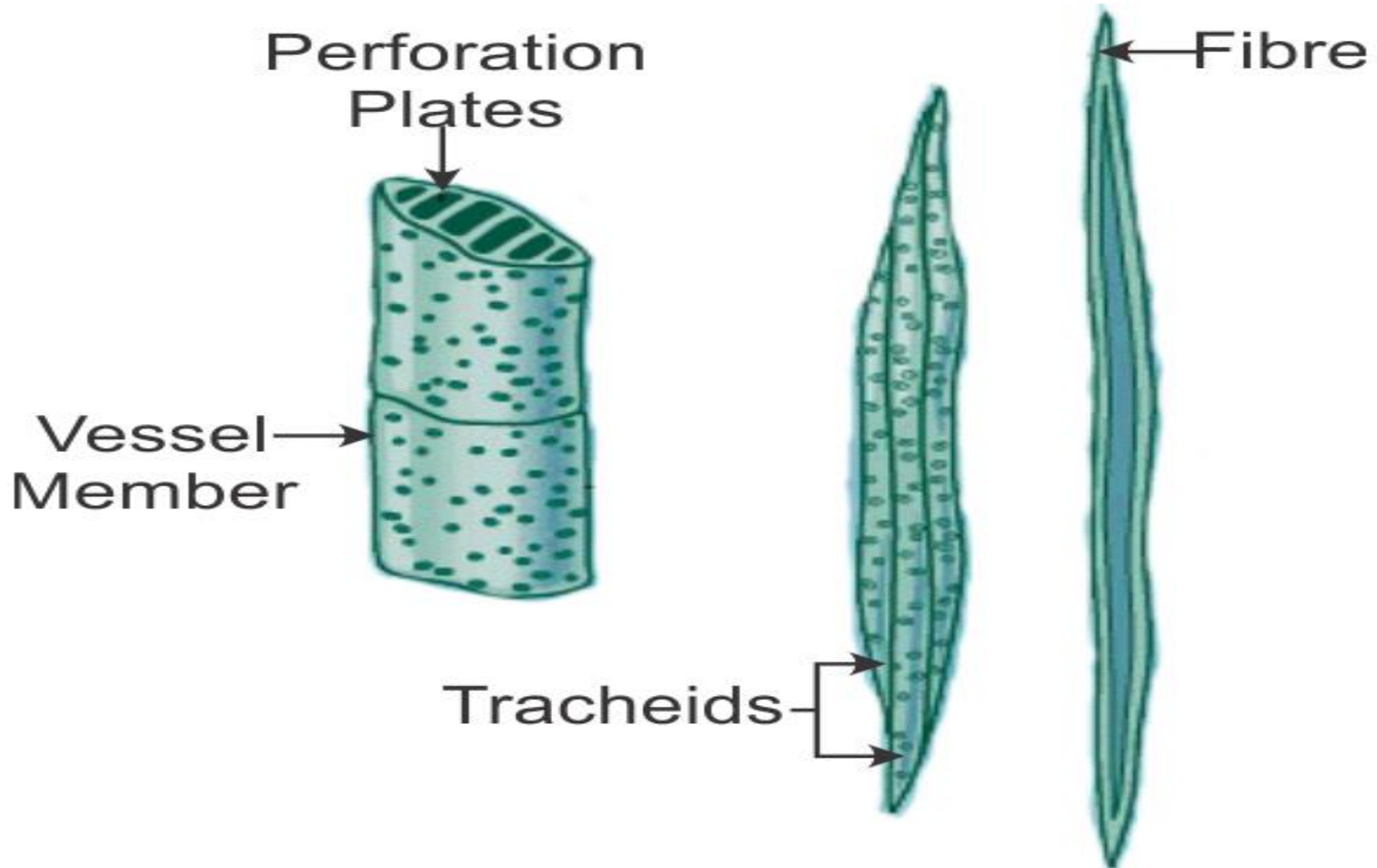
Complex permanent tissues

- **Complex permanent tissues are made up of more than one type of cells.**
- **There are two types of complex tissues. They are Xylem and Phloem.**
- **They are called vascular or conducting tissues.**

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.**

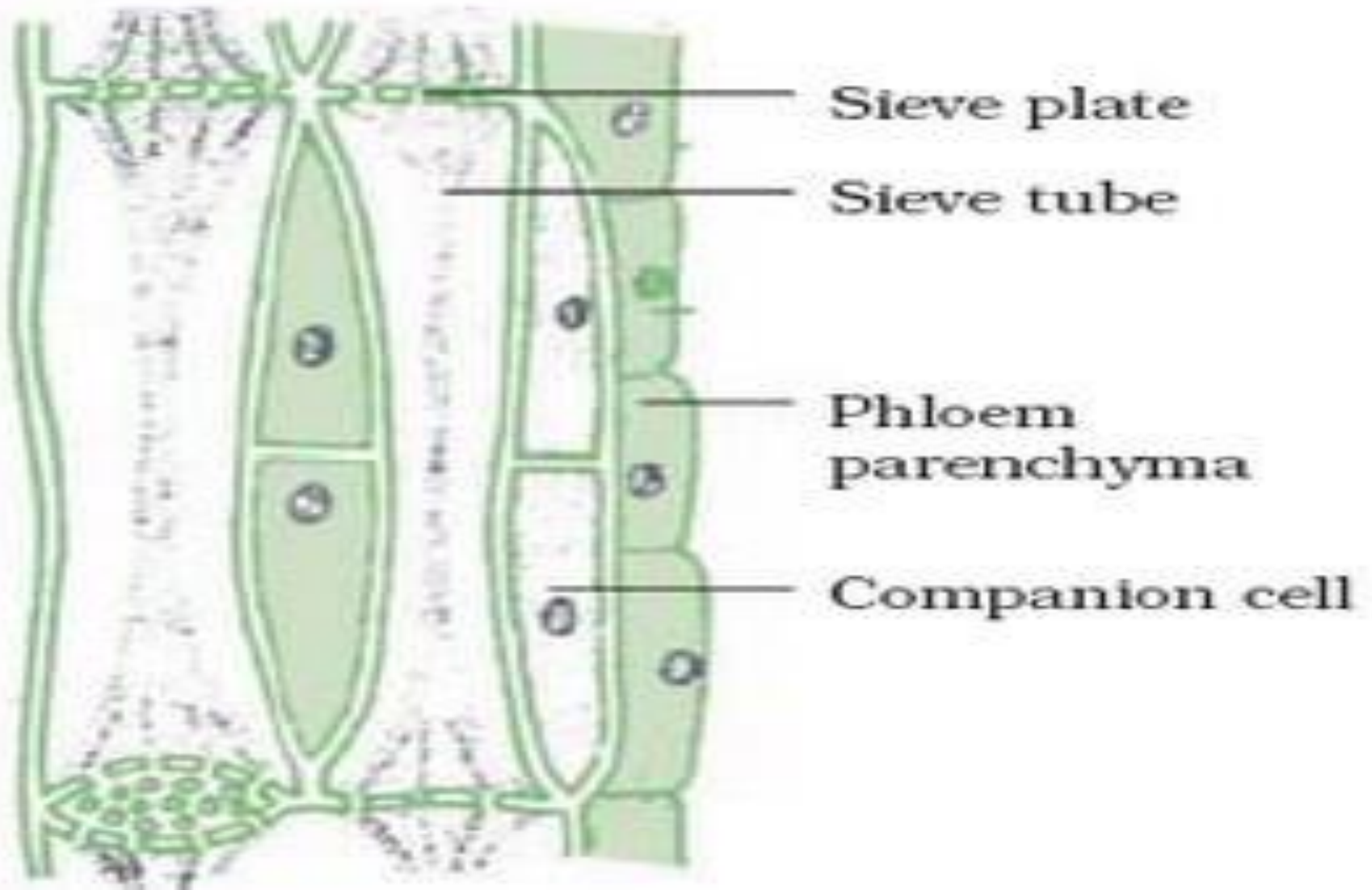
Xylem Elements



Phloem

- ❖ Phloem consists of sieve tubes, companion cells, phloem parenchyma and phloem fibres
- ❖ Sieve tubes are tubular cells with perforated walls. The sieve tubes and companion cells transports food from leaves to all parts of the plant.
- ❖ Phloem parenchyma stores food and fibres help in support.
- ❖ Except phloem fibres, other phloem cells are living cells.

Phloem



Difference between Xylem And Phloem.

Xylem	Phloem
It helps in the transportation of water from the soil to the roots and to the leaves of the plant.	It transports food and water to all parts of the plant.
Its movement of water is only in upward direction.	Its transportation is in all directions.
Xylem consist of tracheids, vessels, xylem parenchyma and xylem fibres	Phloem consist sieve tubes, companion cells, phloem fibres and phloem parenchyma
Only Xylem parenchyma is	Only Phloem fibres are dead

That's all for today students, let's recap what we have learnt

- ❖ Tissue is a group of cells similar in structure and function.
- ❖ Plant tissues are of two main types – meristematic and permanent.
- ❖ Meristematic tissue is the dividing tissue present in the growing regions of the plant.
- ❖ Permanent tissues are derived from meristematic tissue once they lose the ability to divide. They are classified as simple and complex tissues.
- ❖ Parenchyma, collenchyma and sclerenchyma are three types of simple tissues.
- ❖ Xylem and phloem are types of complex tissues.



THANK YOU
HAVE A GREAT
DAY