

TISSUES-

PLANT TISSUE

EDUCATION FOR LIFE



ASIAN
INTERNATIONAL
SCHOOL

QUICK REVIEW

- Living organisms in this world comprise of cells.
- There are unicellular as well as multicellular organisms present in this world.
- In unicellular organisms, the only single cell is capable of performing several functions such as Respiration, Digestion and Clearing of the cell.
- In multicellular organisms, there is a division of labor. There are different types as well as groups of cells that perform different functions in a multicellular organism. **For Example**, In animals muscle cells are responsible for causing movement, nerve cells are responsible for carrying messages and signals from one part of the body to another and blood is responsible for transportation of food and oxygen to different parts of the body.
- In plants, there are vascular tissues that are responsible for carrying food and water two different parts of a plant.

THE FORMATION OF TISSUES

- Cells form groups cells that need to perform a single task often group together.
- This grouping of cells together to perform a function efficiently is called a **Tissue**.
- **For Example**, Muscles and Blood.
- The tissue cells have the same structure and they perform the same function.

EXPERIMENT:

Take 2 onions in jars as shown.

Observe the growth of roots for 5 days.

Cut the tips of the roots of onion in jar 2.

Observe the growth of roots for next few days.

Roots in jar 2 stop growing.

When tip of roots are cut, apical meristem present there is lost. So no further growth happens.



Jar 1

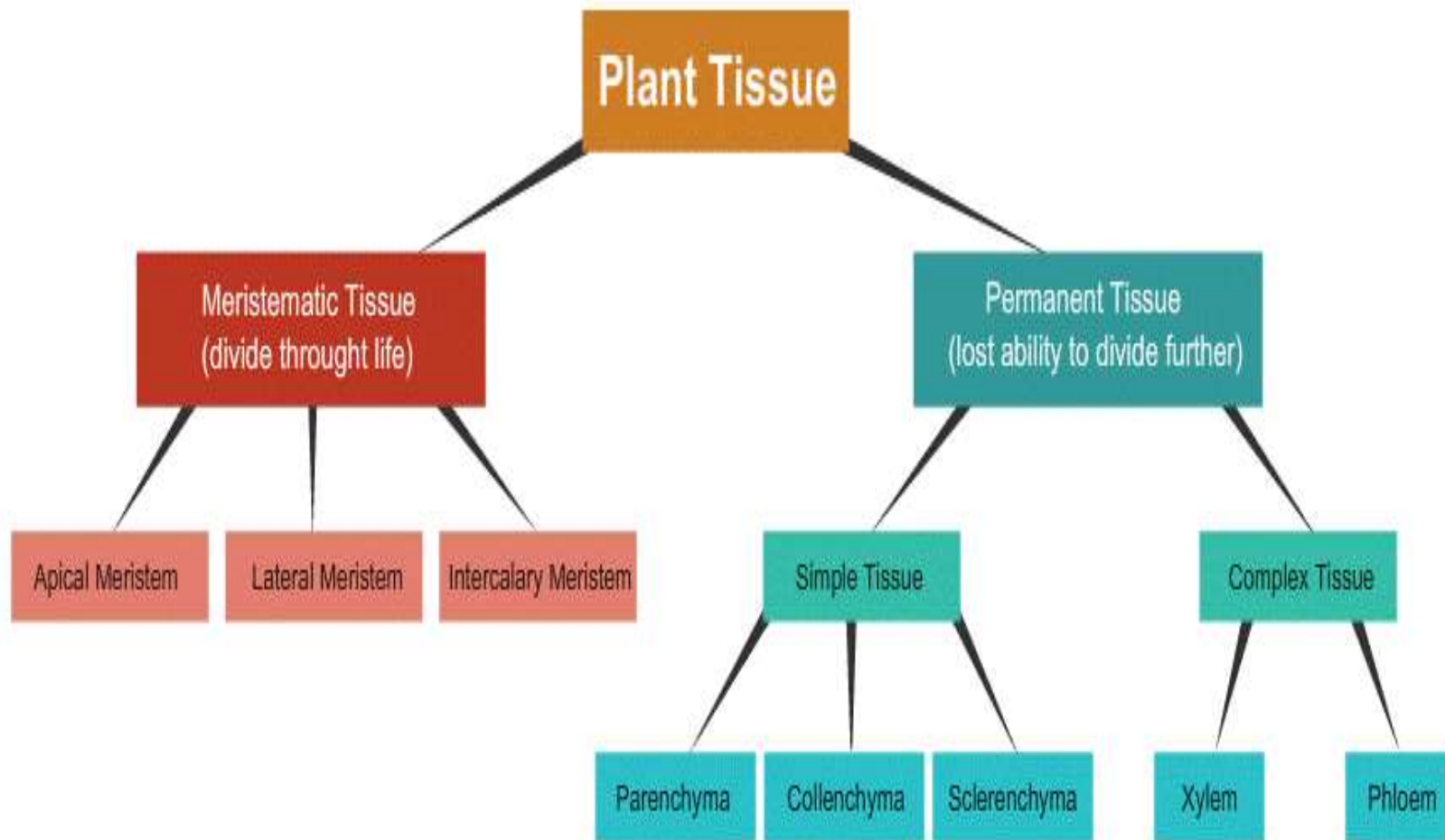


Jar 2

TISSUES OF PLANTS AND ANIMALS

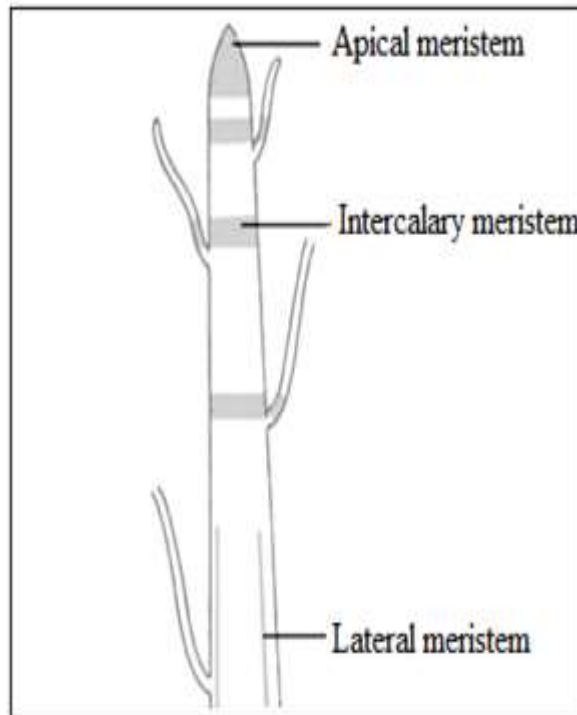
Plant Tissues	Animal Tissues
Plants do not move so their tissues are predominantly the ones that provide support to them so that they can stand erect.	Animals need more energy as compared to plants because they are not stationary. Their tissues are the ones that can support movement.
These tissues are made up of dead cells because dead cells can also provide mechanical strength to the plants and do not require much maintenance.	The tissues in case of animals are made up of living cells so that they can move and perform several functions.
Only certain parts of the plant can grow. The tissues present in such regions of and divide themselves and form new tissues.	Cells in animals grow uniform early 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

- ❖ Only certain parts of a plant tend to grow. The tissues located in such parts are called meristematic tissues.
- ❖ They have the capability to divide themselves and form new tissues. They have thin cell wall made of cellulose. Also have dense nucleus and cytoplasm but lack vacuoles.
- ❖ They can further be classified differently based on the areas of the plants where they are located -
 - ❖ Apical
 - ❖ Lateral
 - ❖ Intercalary



•Why there are no vacuoles in the intercalary meristem?

- Vacuoles are responsible for storage of food in water. The intercalary tissues do not store them. They are rather responsible for manufacturing them.
- Moreover, vacuoles contain sap which provides rigidity to a cell. This property of vacuoles may not allow the intercalary tissues to divide and manufacture new cells. Hence vacuoles are not present in them.

Apical Meristem	Lateral Meristem	Intercalary Meristem
•They are responsible for the growth of stems and roots in the plants •They are found on the tips of the roots and stems.	•They are responsible for increasing the circumference of the middle part of the stem and hence are found there.	•These tissues are present at internodes or stem regions between the places at which leaves attach.

PERMANENT TISSUE

- The cells that are formed by the meristematic tissues often have to take a certain role in the plant and thus, they lose their ability to divide and form more cells. They then become the permanent tissues of the plants.

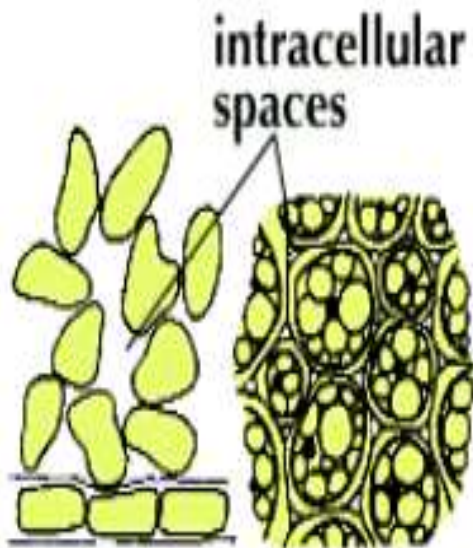
- Differentiation** - The process by which cells of the meristematic tissues convert themselves into a permanent tissue by taking a fixed shape, size and function is called differentiation.

- Types of Permanent Tissues:**

- Simple Permanent Tissues
- Complex Permanent Tissues

- Simple Permanent Tissues are of five types:**

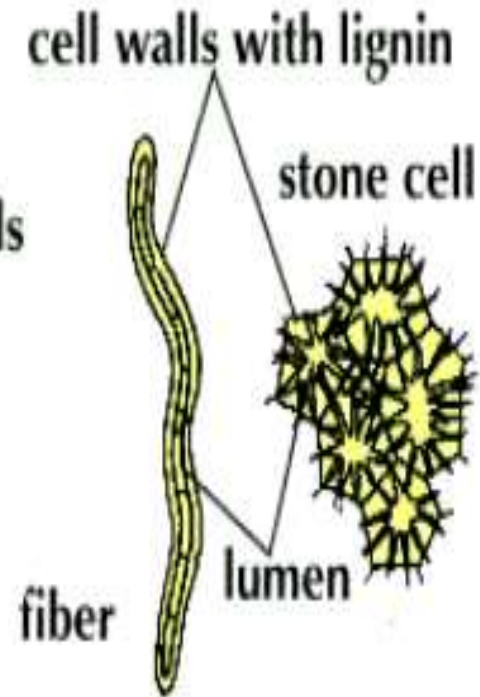
- Parenchyma
- Chlorenchyma
- Aerenchyma
- Collenchyma
- Sclerenchyma



Parenchyma Tissue



Collenchyma Tissue



Sclerenchyma Tissue

Parenchyma	Collenchyma	Sclerenchyma
These tissues are responsible for photosynthesis, storage of food, gaseous exchange and floating of plants.	These tissues are responsible for providing flexibility to the plants so that they can bend easily.	These tissues are responsible for making plants hard and rigid.
They are a group of living cells with cell wall made of cellulose.	They are a group of living cells with cell wall made of cellulose and pectin.	They are made up of dead cells having cell wall made of lignin.
The parenchyma cells have large intercellular spaces between them.	They have a little intercellular space in between them.	The cells do not have any intercellular spaces.
There are thin walls that surround each cell.	The cells present in these tissues are broad and irregularly thick at corners.	The cells have a long structure with thick walls.
They are found in leaves and newly formed branches.	They are present in leaves and stems of a plant.	They are found in stems, veins of the leaves and coverings of nuts and seeds.

CHLORENCYMA

- ❖ These tissues are similar to that of parenchyma but they also contain chlorophyll in them.
- ❖ Due to the presence of chlorophyll, they are capable of performing the process of photosynthesis in plants.

AERENCHYMA

- ❖ They are found in aquatic plants.
- ❖ They are also similar in structure to that of the parenchyma but they have large air cavities in them.
- ❖ These cavities allow the aquatic plants to float in water.

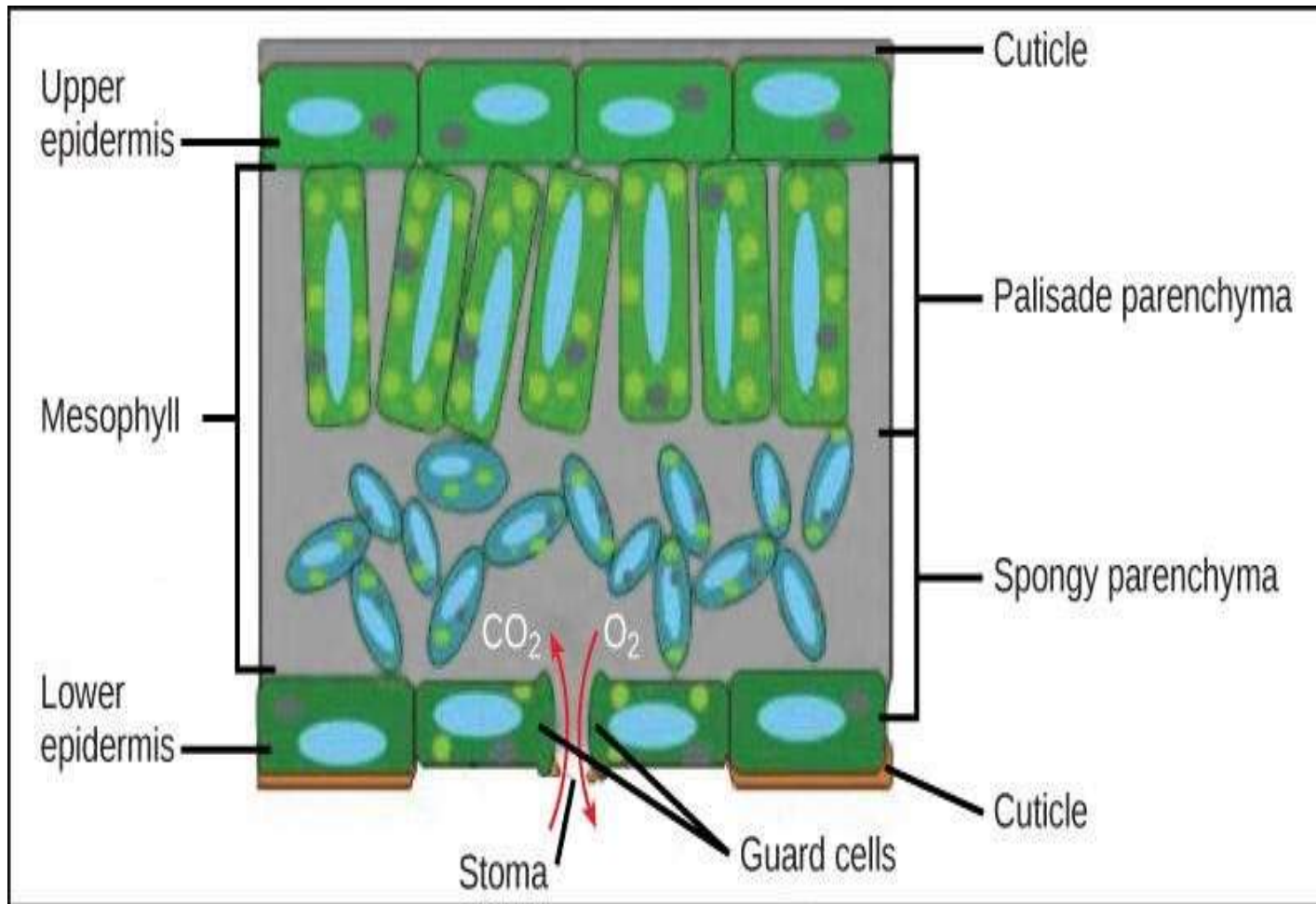
WHAT IS LIGNIN?

- ❖ The cell walls of dead cells have a substance called lignin in them which provides rigidity to the cells. Lignin acts as the cement for the cells.

EPIDERMIS

- The outermost layer of the cell is known as the **Epidermis**.
- It covers the entire plant.
- It is a thin layer of single cells but in places with less water, the epidermis of the plants can become thick in order to avoid frequent water loss.
- The cells are flat and they have no intercellular spaces between them.
- The outer walls of the epidermal cells are thick and the inner walls are thin.
- The epidermal cells often have long hair-like structures in roots which facilitate the absorption of water.
- The main function of the epidermis is to protect the plants from fungi, water loss and any injuries by secreting a wax-like water-resistant substance called as **Cuticle** on the surface of the plants which protects the plants.

FIGURE OF EPIDERMIS



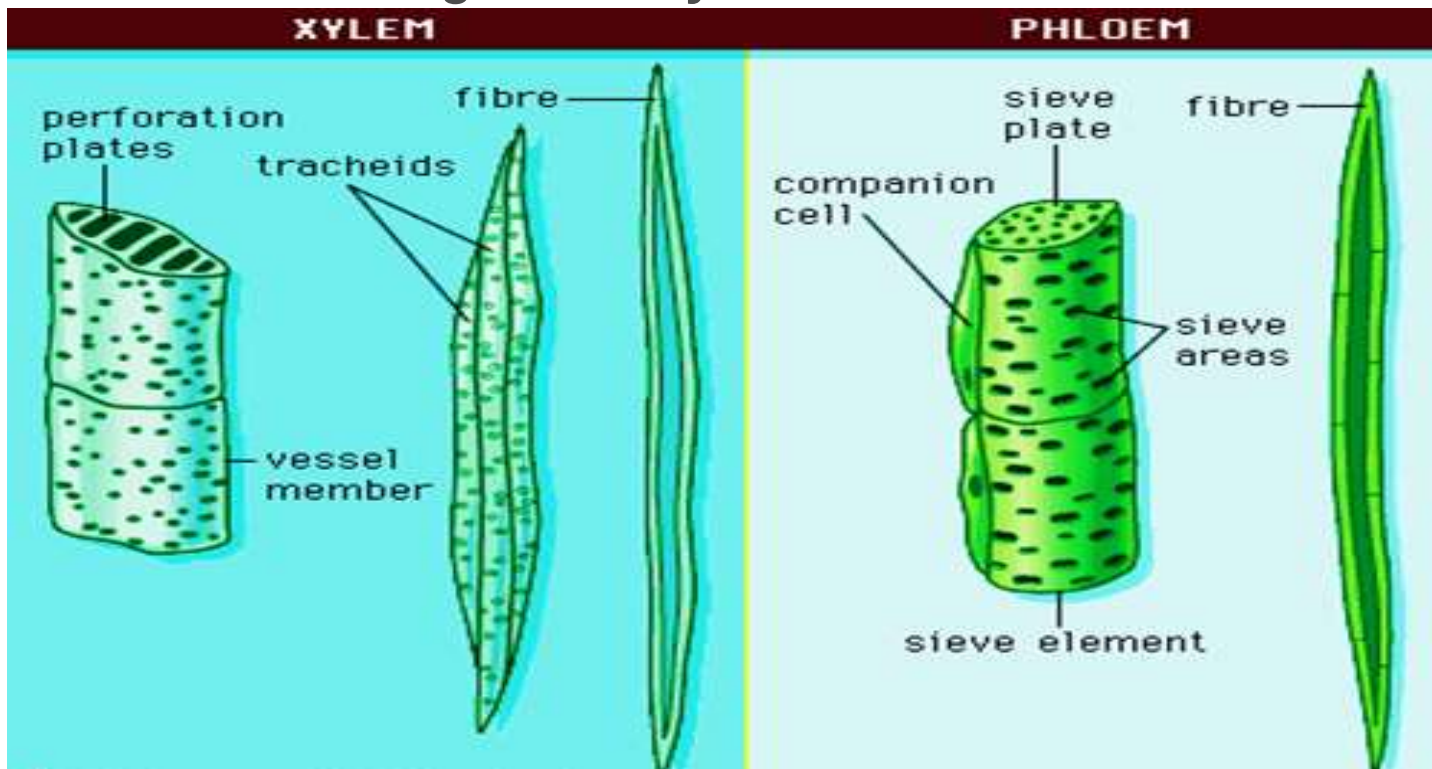
STOMATA

- Stomata are pore-like structures that are present in the epidermis of the leaves.
- These pores are enclosed by two cells that have a similar shape as a kidney. These are called **Guard Cells of Stomata**. Guard cells are modified epidermal cells.
- Guard cells are responsible for the exchange of gases and transpiration.

Complex Permanent Tissues

Complex Permanent Tissues comprise of different kinds of cells. These different types of cells coordinate with each other and perform a common function in these tissues. Two Complex Permanent Tissues are - **Xylem** and **Phloem**.

Figure of Xylem and Phloem



Similarities between Xylem and Phloem

- Their main function is to carry food and water in the plant.
- Both have a vascular bundle which is a conductive tissue in plants that helps them survive in different environmental conditions.

Xylem

Xylem is made up of dead cells having a thick cell lining. It consists of following elements-

- **Tracheids and Vessels** – They have broad tubular structure so that we can allow transportation of food and water in the plants vertically.
- **Xylem Parenchyma** – It stores food and helps in transportation of water horizontally in the plants.
- **Xylem Fibers** – They support transportation

Phloem

Phloem is made up of living cells and it allows the movement of food from leaves to other parts of the plant. It has the following elements –

- **Sieve Tubes** – Broad shaped cells with porous walls
- **Companion Cells** – They facilitate the functions of the sieve tubes
- **Phloem Fibers** – Provide flexibility to the phloem
- **Phloem Parenchyma** – Stores starch and proteins

	Xylem	Phloem
Made of	Dead Cells	Living Cells
Cell wall thickness	Thick	Thin
Cell wall material	Lignin (rigid)	Celluloses
Permeability	Impermeable	Permeable
Cytoplasm	None	Cytoplasm lining
Transports...	Water & minerals	Food
Carried to....	Leaves	Growing parts & storage organs
Direction of flow	Upwards	Up & down
Tissue also has ...	Fibres	Companion cells

