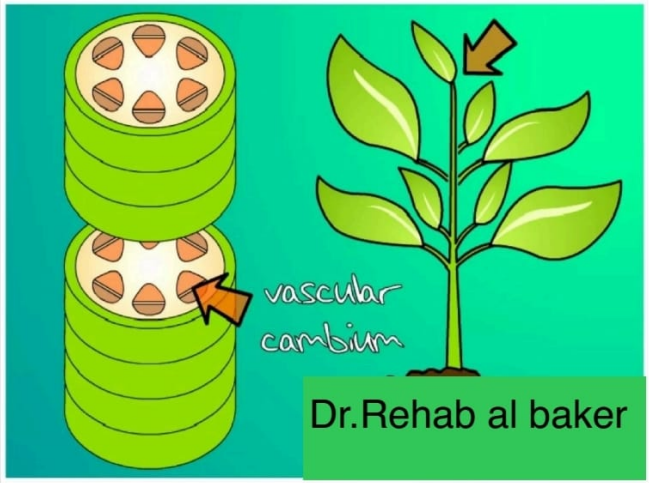
BIO-WORLD

Plant Tissues



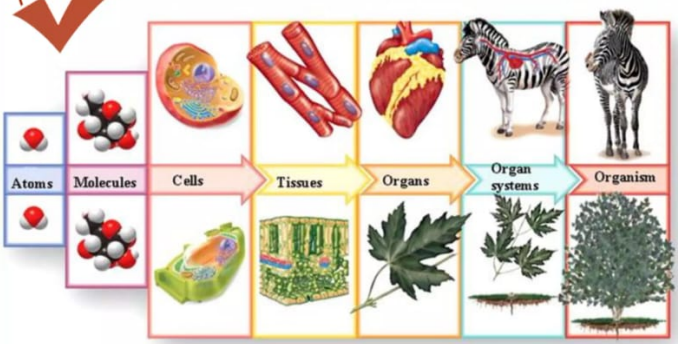
Dr.Rehab al baker

Tissues – "The Team of Workers"

- Tissue is a cellular organizational level between cells and a complete organ.
- A tissue is an ensemble of similar cells and their extracellular matrix from the same origin that together carry out a specific function.
- The English word is derived from the French *tissu*, meaning something that is woven, from the verb *tisser*, "to weave".
- The study of human and animal tissues is known as histology or, in connection with disease, histopathology.

RECAP

The level of organization



Plant Tissue - Types

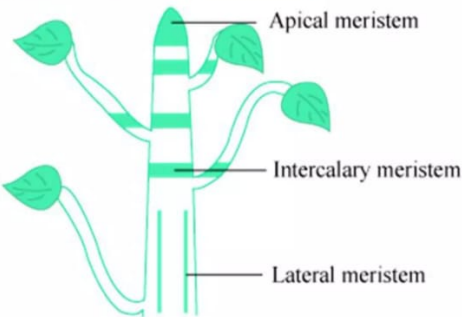
PLANT TISSUE

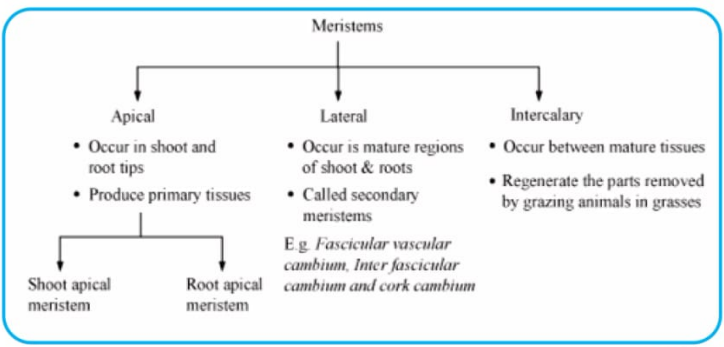
- **Meristematic tissue**
  - Apical meristem
  - Lateral meristem
  - Intercalary meristem
- **Permanent tissue**
  - **Simple**
    - **Parenchyma**
    - **Collenchyma**
    - **Sclerenchyma**
      - Fibres
      - Sclereids
  - **Complex**
    - **Xylem**
      1. Tracheids
      2. Vessels (Tracheae)
      3. Xylem parenchyma
      4. Xylem fibres
    - **Phloem**
      1. Sieve tubes
      2. Companion cells
      3. Phloem parenchyma
      4. Phloem fibres

Meristematic Tissue / Meristem

- Meristematic (Gk. *meristos* = divisible) tissue is defined as a mass of young, immature and undifferentiated cells, which remain young forever and divide throughout the life of the plant.
- **Classification of Meristems :**

(a) Based on position in the plant body





Meristematic Tissue / Meristem

(b) Based on the origin of formation

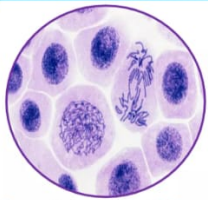
1. Promeristems
   - Meristematic tissue that has existed in the plant since the embryonic level.
   - Location : Extreme tip of stem and root.
   - Function : Forms primary meristem later the primary structure of the plant body.
2. Primary meristems
   - Meristematic tissue found in adult plant and still actively does cell division.
   - Location : Seen just below promeristem.
   - Function : Forms the primary structure of the plant body.
3. Secondary meristems
   - Meristematic tissue that originated from primary permanent tissues [Some of the primary permanent tissues regain meristematic activity and becomes secondary meristem].
   - Location : Laterally placed in stem and root.
   - Function : Responsible for secondary growth of the plant.
   - Example : Inter fascicular cambium and cork cambium of stem, cambium of root.

We have a definite growth pattern and growth stops at certain stage or age. But plant growth is indefinite due to the presence of meristems.

Meristematic Cells

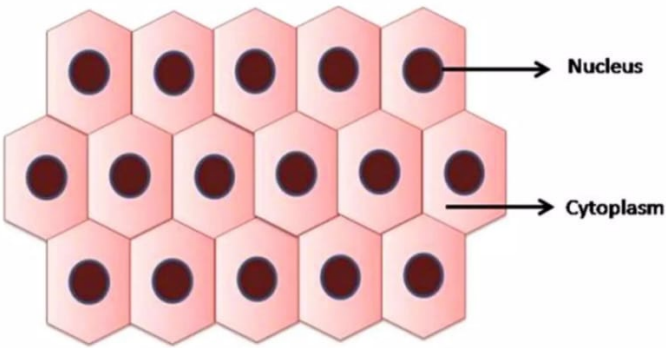
Characteristics :

- Cells are small.
- Cells are usually cubical.
- Cell wall is thin.
- Nuclei are large.
- Vacuoles almost absent.
- Cells tightly packed with almost no intercellular spaces.



Root Meristem of Onion

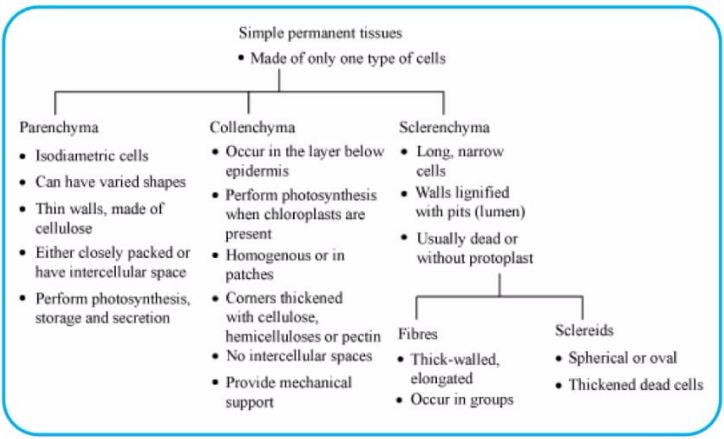
A Typical Meristematic Tissue



The cells actively divide adding new cells to the plant. New cells thus produced are transformed into mature permanent tissues.

Permanent Tissue

- These tissues arise from the meristematic tissue.
- The cells of this tissue gradually loose their power to divide and acquire a definite shape, size and function.
- These tissues may be living or dead.
- There are 2 types of permanent tissues :
  1. Simple permanent tissue
  2. Complex permanent tissue
- **Simple Permanent Tissue :**
  - This tissue comprises of same type of cells which perform the same function and all arise from the same origin.
  - These are three categories of simple permanent tissues: Parenchyma, Collenchyma, & Sclerenchyma.



Parenchyma

Structure :

It is the fundamental tissue composed of thin walled, living cells whose cell wall is composed of cellulose. Small intercellular spaces are present between the cells.

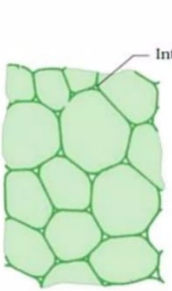
Location & Function :

It occurs in all soft parts of plants and is meant for storage of food and to provide turgidity to softer parts of plants. Parenchyma tissue in stem and roots store nutrients and water.

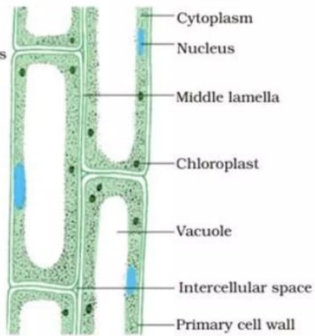
Types :

Chlorenchyma - Certain parenchymatous tissue contain chloroplast and synthesize food by the process of photosynthesis.

Aerenchyma - In aquatic plants parenchymatous cells have air cavities between them to store air, such a tissue is called Aerenchyma. It provides buoyancy to the aquatic plants so that they can float in water.



Transverse section



Longitudinal section

Collenchyma

Structure :

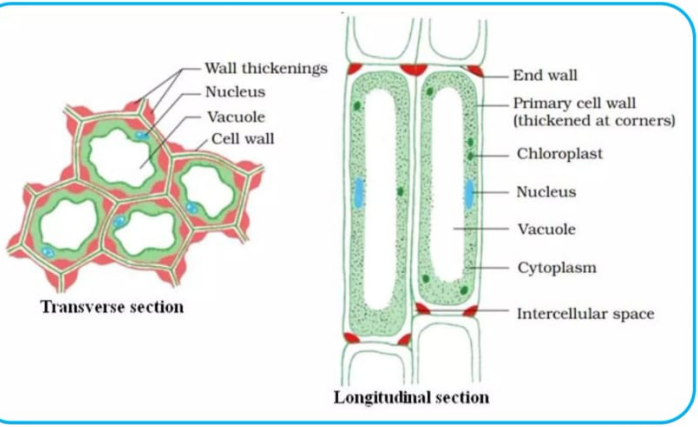
This tissue is composed of somewhat elongated cells with cell walls that are irregularly thickened at corners due to deposition of cellulose or pectin. They may be oval, circular or polygonal. Very little intercellular spaces are present.

Location :

It occurs below the epidermis of stem and petiole (stalk of the leaf) and around veins.

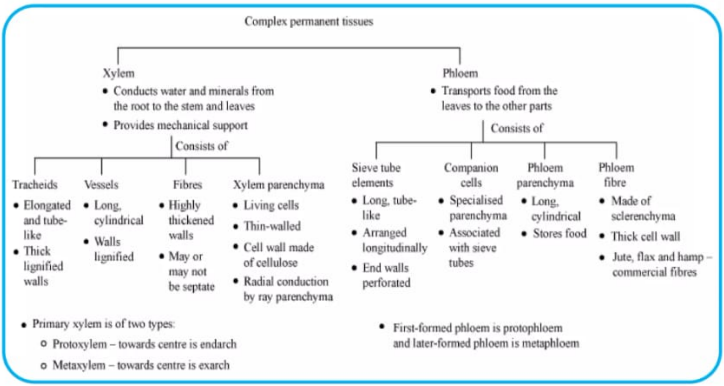
Function :

This tissue provides mechanical support and flexibility and in some cases it may possess chloroplasts to perform Photosynthesis. The stem and leaves are able to bend easily and then come back to their original position due to the presence of collenchyma.



Complex Permanent Tissue

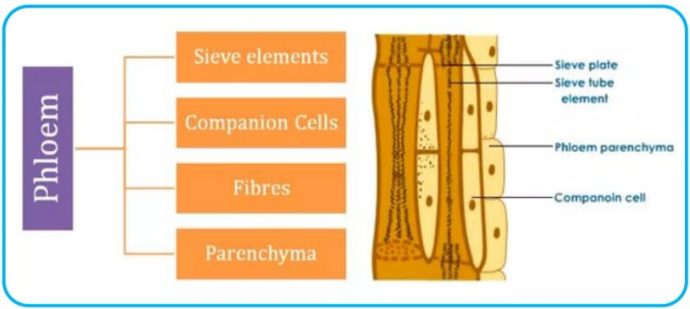
- A tissue made up of more than one type of cells functioning as a unit is called complex tissue.
- There are two types of complex tissues - Xylem and Phloem.
- They are called vascular or conducting tissues.
- Xylem helps to transport water and minerals from roots to all part of the plant.
- Phloem helps to transport food (sugar) from leaves to all other parts of the plant.



Simple tissue	Complex tissue
i) It is made up of only one type of cells. ii) All cells of this tissue work as individual units to perform a particular function. Eg. parenchyma, collenchyma and sclerenchyma tissues.	i) It is made up of more than one type of cells. ii) Cells of this tissue work together as one single unit to bring about a particular function. Eg. xylem and phloem tissues.

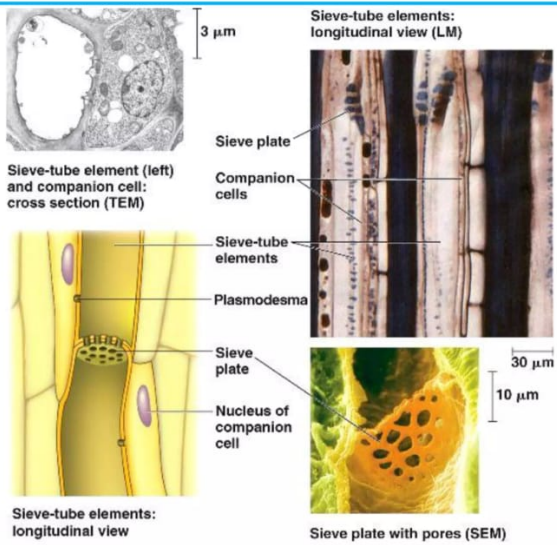
Phloem

- Phloem is a complex permanent tissue, which is specialized for the conduction of food and other organic substances.
- Phloem is also a heterogenous tissue, made up of four different types of cellular elements, namely,



- Of these, the sieve tubes and the companion cells are directly involved in the translocation of the organic substances. Hence, they are commonly described as essential elements.
- Phloem parenchyma and phloem fibers are described as associated elements since they play only a supporting role in the process.
- The sieve tubes, the companion cells and the phloem parenchyma represent the living components of the tissue while phloem fibres represent the only nonliving component of the tissue.
- Phloem is commonly described as a living, complex permanent tissue.

Phloem Components



Phloem Fibres :

- Phloem fibres are represented by the dead sclerenchyma fibres that are found in between the sieve tubes.
- They are meant only for providing mechanical support.

Phloem Parenchyma :

- Phloem parenchyma is represented by a group of living parenchyma cells that are found in-between the sieve tubes.
- They are meant only for storage of organic food.

Xylem vs. Phloem

Characteristic	Xylem	Phloem
Conduction	Water and minerals from root to body parts	Prepared Food from leaves to body parts
Strength	Provides mechanical strength	Donot provide mechanical strength
Elements live	Xylem parenchyma only	Sieve tubes, companion cell and phloem parenchyms
Conduction direction	Unidirectional	Bidirectional
Conducting channel	Tracheids	Sieve tubes