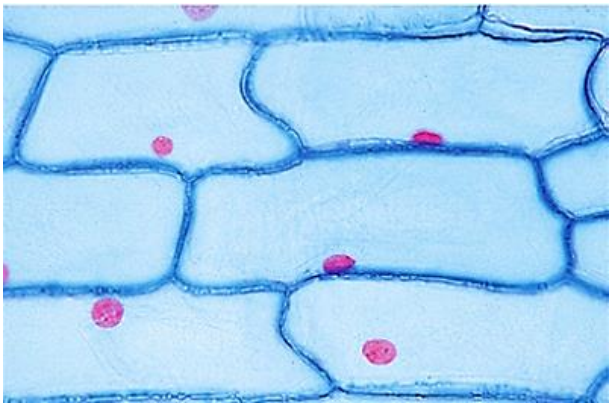
Shape of plant cells

- Plant cells are eukaryotic cells, or cells with a membrane-bound nucleus.
- plant cells also contain other membrane-bound organelles (tiny cellular structures) that carry out specific functions necessary for normal cellular operation.
- Plant cells are generally larger than animal cells. While animal cells come in various sizes and tend to have irregular shapes, plant cells are more similar in size and are typically rectangular or cube shaped.
- A plant cell also contains structures not found in an animal cell. Some of these include a cell wall, a large vacuole, and plastids. Plastids, such as chloroplasts, assist in storing and harvesting needed substances for the plant.



Types of Plant Cells

1- PARENCHYMA CELLS

- Parenchyma cells are usually depicted as the typical plant cell because they are not very specialized.
- These cells synthesize (by photosynthesis) and store organic products in the plant. Most of the plant's metabolism takes place in these cells.
- Parenchyma cells compose the middle layer of leaves as well as the outer and inner layers of stems and roots.
- The soft tissue of fruits is also composed of parenchyma cells.

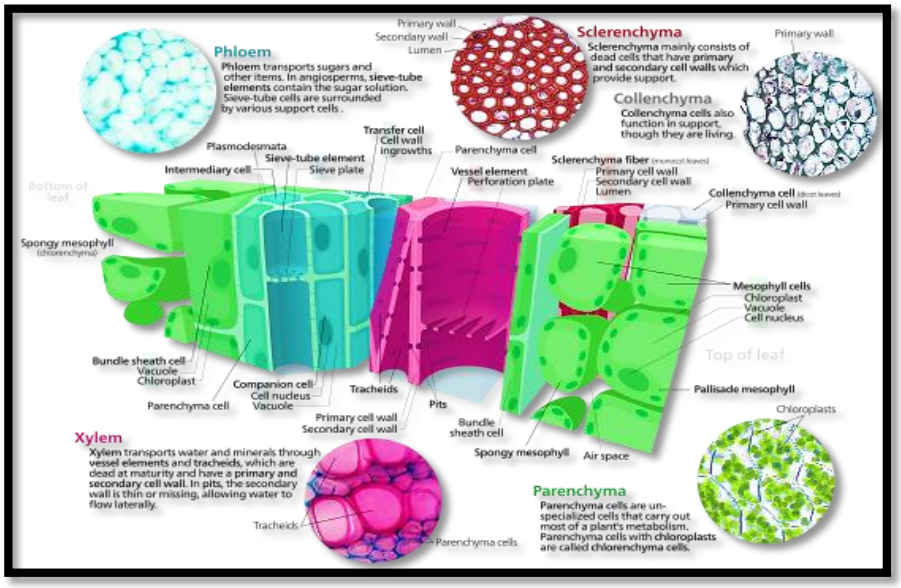
- Parenchyma cells are living cells that have functions ranging from storage and support to photosynthesis and phloem loading (transfer cells).
- Parenchyma cells have thin, permeable primary walls enabling the transport of small molecules between them, and their cytoplasm is responsible for a wide range of biochemical functions such as nectar secretion, or the manufacture of secondary products that discourage herbivory.

2- COLLENCHYMA CELLS

- Collenchyma cells have a support function in plants, particularly in young plants.
- These cells help to support plants while not restraining growth due to their lack of secondary cell walls and the absence of a hardening agent in their primary cell walls.
- Collenchyma cells are alive at maturity and have only a primary wall.
- The wall is most commonly thickest at the corners, where three or more cells come in contact, and thinnest where only two cells come in contact, though other arrangements of the wall thickening are possible.

3- SCLERENCHYMA CELLS

- Sclerenchyma cells also have a support function in plants, but unlike collenchyma cells, they have a hardening agent and are much more rigid.
- These cells are thick and contain various shapes.
- Sclerenchyma cells form the hard outer shell of nuts and seeds. They are found in stems, roots, and leaf vascular bundles.
- Sclerenchyma cells are typically dead at functional maturity, and the cytoplasm is missing, leaving an empty central cavity.



(Cross section of a leaf showing various plant cell types)

Tissue types :

The major classes of cells differentiate from undifferentiated meristematic cells (analogous to the stem cells of animals) to form the tissue structures of roots, stems, leaves, flowers, and reproductive structures.

Xylem cells:

- Are elongated cells with lignified secondary thickening of the cell walls.
- Xylem cells are specialized for conduction of water, and first appeared in plants during their transition to land in the Silurian period more than 425 million years ago .
- The possession of xylem defines the vascular plants or Tracheophytes.

Phloem:

- Is a specialized tissue for food transport in higher plants.
- Phloem cells mainly transport sucrose along pressure gradients generated by osmosis. This phenomenon is called translocation.

- Phloem consists of two cell types, the sieve tubes and the intimately associated companion cells.
- The sieve tube elements lack nuclei and ribosomes, and their metabolism and functions are regulated by the adjacent nucleate companion cells.
- Sieve tubes are joined end-to-end with perforate end-plates between known as *sieve plates*, which allow transport of photosynthetic between the sieve elements.
- The companion cells, connected to the sieve tubes via plasmodesmata, are responsible for loading the phloem with sugars.

Plant epidermal cells:

- Are specialized parenchyma cells covering the external surfaces of leaves, stems and roots.
- The epidermal cells of aerial organs arise from the superficial layer of cells known as the *tunica* (L1 and L2 layers) that covers the plant shoot apex, whereas the cortex and vascular tissues arise from inner most layer of the shoot apex known as the *corpus* (L3 layer).
- The epidermis of roots originates from the layer of cells immediately beneath the root cap.

The epidermis of all aerial organs, but not roots, is covered with a cuticle made of the polyester cutin and/or the hydrocarbon polymer cutan with a superficial layer of epicuticular waxes.

- The epidermal cells of the primary shoot are thought to be the only plant cells with the biochemical capacity to synthesize cutin.
- Several cell types may be present in the epidermis. Notable among these are the stomatal guard cells, glandular and clothing hairs or trichomes, and the root hairs of primary roots.
- In the shoot epidermis of most plants, only the guard cells have chloroplasts. Chloroplasts contain the green pigment chlorophyll, which is needed for photosynthesis.