

Lab-2- The Plant cell. (Prokaryote and Eukaryote cell)

What Are Cells?

All living things are constructed of cells; at least one (unicellular) or many (multicellular). *Cell Theory*, the very basic scientific truths about life and its smallest units, goes as follows:

1. All organisms are composed of one or more cells.
2. Cells are the basic unit of structure and function in organisms.
3. All cells come only from other cells.

Two Types of Cells

All cells fall into one of the two major categories. They are either prokaryotic or eukaryotic.

Prokaryotic Cells

Prokaryotes are evolutionarily ancient. These cells are simpler than eukaryotes and don't contain a nucleus or any other membrane-bound organelles. Modern day bacteria (Eubacteria) and bacteria-like Archaea are prokaryotic organisms.

Eukaryotic Cells

Eukaryotes are more complex, having evolved from an ancestral prokaryote. Eukaryotic cells are the tiny units of life comprise most of the living things we are familiar with, such as animals, plants, fungi and protists (animal-like microbes).

The organelles in Eukaryotic cell. (figure -1-)

Cell Wall. The cell wall encloses and protects the cell contents and plays a vital role in cell division and cell expansion. Composed of overlapping cellulose microfibrils, other polysaccharides and varying amounts of lignin, the cell wall is a relatively rigid structure in mature cells. It may vary in thickness and has pits that function in communication between cells. The region between the primary walls of adjacent cells, the middle lamella, is composed of a cementing substance called pectin. Other substances that may be present in the cell wall are gums, resins, silica, calcium carbonate, waxes and cutin, and both structural protein and enzymes (which are also proteins). There may be intercellular spaces between walls of bordering cells.

Plasma Membrane. A semipermeable membrane encloses the cytoplasm within a cell. It is composed of variable amounts of fat type molecules (lipids) and proteins, and has within it channels for the movement of ions such as potassium (K⁺), calcium (Ca²⁺), and hydrogen (H⁺).

Cytoplasm. The cytoplasm is a liquid, gel like substance and contains several types of organelles; smooth or rough endoplasmic reticulum, rough referring to attached ribosomes on the ER (endoplasmic reticulum) and free ribosomes.

Vacuole. In a mature plant cell, one large vacuole usually occupies most of the space within the cell. It is surrounded by a single-layered membrane, the tonoplast, and contains cell sap composed of water, sugars, and various organic and

inorganic solutes. It may, in some cells such as in beet roots and flower petals, contain water-soluble pigments. The vacuole functions in regulation of osmotic balance and turgidity of the cell, and it stores secondary metabolites.

Nucleus. The nucleus is enclosed by a double membrane that has pores in it to allow communication with the cytoplasm. Within the nucleus are chromosomes, which contain DNA needed to create proteins within the cell. Chromosomes are only visible during cell division. Also present in the nucleus are one or more nucleoli containing RNA. The rest of the nucleus is filled with nucleoplasm. The information needed to create the entire plant is within the nucleus, mitochondria, and chloroplasts of each cell.

Plastids. Plastids are classified by the primary pigment they contain. Young cells have undifferentiated plastids (proplastids), which can multiply by simple division. They develop into the various kinds of plastids characteristic of mature cells.

Chloroplast. This plastid is where photosynthesis takes place. In higher plants it is usually oval-shaped and is surrounded by a double membrane. Within it are sac-like structures (shown cut in half) called thylakoids. A stack of thylakoids is called a granum, and this is where green chlorophyll pigments are located. Chlorophyll and proteins bound to the thylakoids use light energy to make simple sugars from carbon dioxide and water (photosynthesis). Extensions from some thylakoid membranes form interconnections between grana. The thylakoids also contain accessory pigments, carotenoids, and xanthophylls. In the stroma of the chloroplast are DNA, RNA, oil droplets, ribosomes, and other materials such as starch grains, found in chloroplasts of green plant tissues that have been actively photosynthesizing.

Leucoplast. Such colorless plastids contain storage products, which include oils, protein bodies, or starch grains. In plant parts with a high starch content, such as potato tubers or rice grains, a leucoplast that contains starch grains is called an amyloplast.

Chromoplast. These plastids are colored red, orange, or yellow, depending on the pigments they contain. In the changing colors of ripening fruit such as a tomato or a red pepper, the chloroplasts (green) differentiate into chromoplasts (orange to red). As fruit color changes, so do plastid structure, pigment types, and content.

Mitochondria. These organelles are surrounded by a double membrane. The inner of these two membranes has infoldings, called cristae, that protrude into the cavity within. Mitochondria are the primary sites of enzymes controlling cell respiration (a chemical release of energy from sugar or other metabolites). They can replicate by simple division and, like chloroplasts, they contain DNA.

Ribosomes. Ribosomes contain ribosomal RNA and function in protein synthesis. They are also found in cytoplasm, and associated with the endoplasmic reticulum in the cytoplasm.

Dictyosomes (Golgi Bodies). These organelles appear as a stack of flattened sacs and associated vesicles. Dictyosomes produce and secrete cell wall polysaccharide precursors and complex carbohydrate substances that are

secreted out of root cap cells. This results in less injury to the growing root as it penetrates the soil.

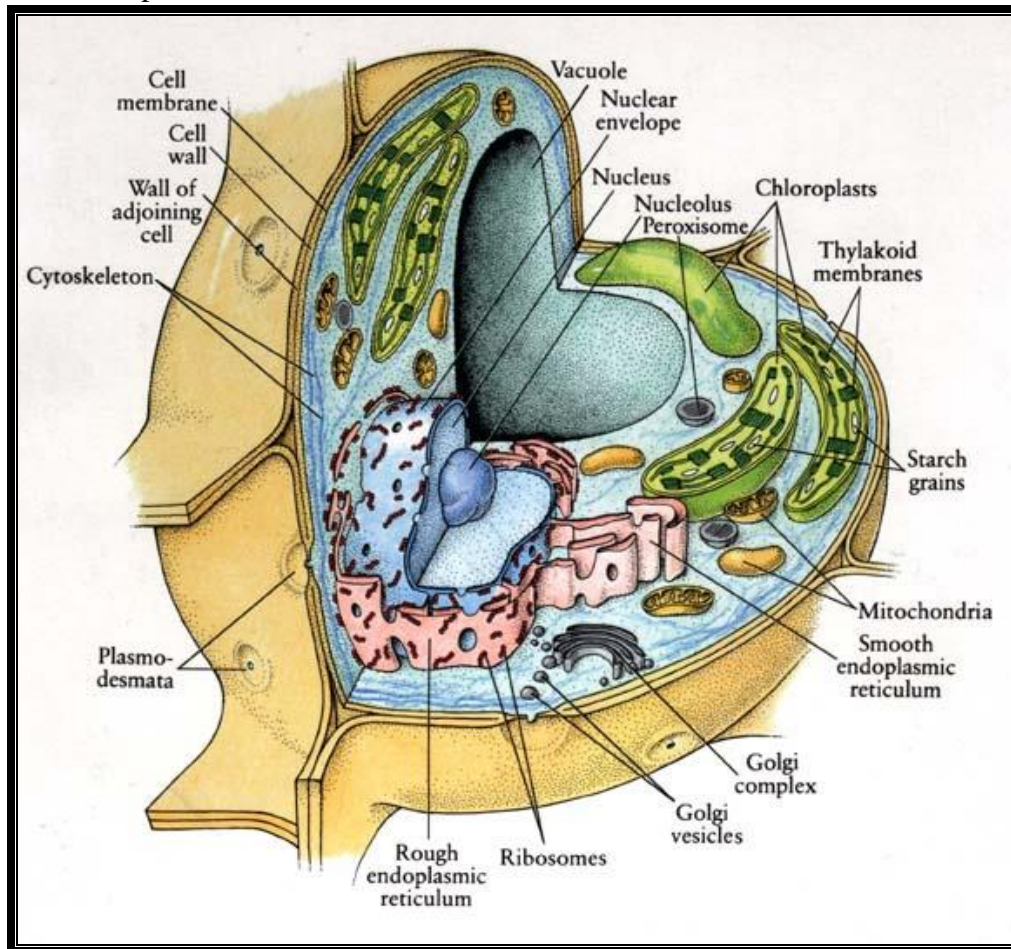
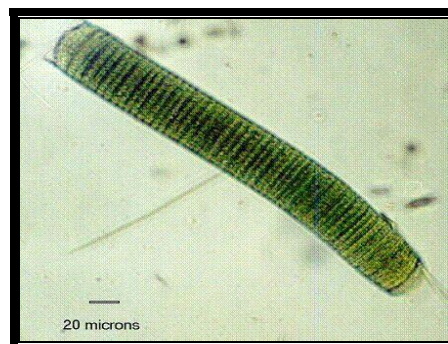
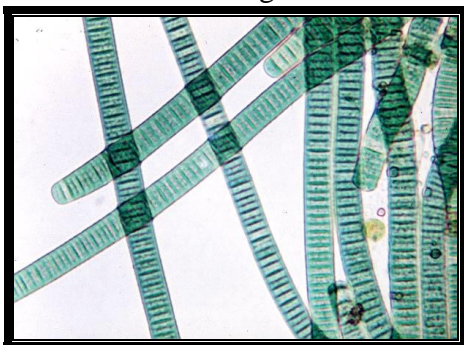


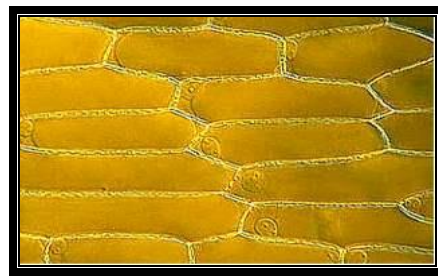
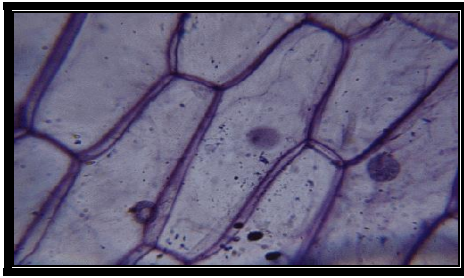
Figure -1- The typical plant cell.

Procedure

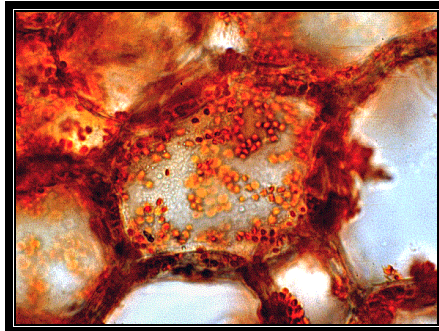
- 1- Examine and draw a prokaryotic cell in **Oscillatoria** (Blue green algae).
Observed the vegetative and dead cell.



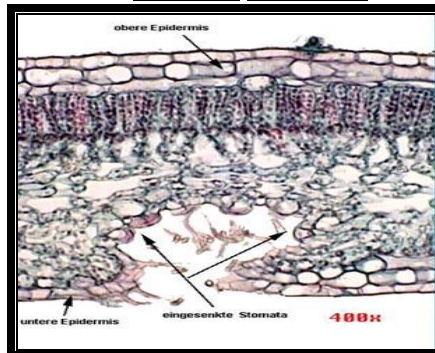
- 2- Prepare a surface view of onion (**Allium cepa**) epidermis and examine the cell wall, cytoplasm, and nucleus.



- 3- Prepare and examine the chromoplast in Tamatos fruit (Lycopersicon) by using squash method.



- 4- Examine the C. S. of leaf of Nerium oleander ,show the chloroplast .



- 5- Examine the C. S. of Tilia stem to observed the druses crystal.



- 6- Prepare and examine the grain starch in Potato (Solanum tuberosum) by using squash method.

