

## Plant Cells

### I. Cell Wall

A. Characteristics - produced by protoplast; non-living; supports & determines shape of cell & structure.

B. Parts

1. **Primary Wall** - very plastic; made of cellulose, hemicellulose, & cutin.
2. **Secondary Wall** - found only in older cells; thicker; adds strength; strengthened with lignin.
3. **Primary Pit Fields** - permeable area on Primary Wall.
  - a. **Simple Pits** - found only when secondary wall is present.
  - b. **Bordered Pits** - found only when secondary wall is present.
4. **Plasmodesmata** - cytoplasmic strands through cell walls connecting the protoplast of adjacent cells.
5. **Middle Lamella** - layer of cementing substance between adjacent primary walls; made of pectin.

II. **Protoplast** - unit consisting of protoplasm; is alive.

A. **Ectoplast** - plasma membrane; always next to wall; controls passage (& rate) of materials into and out of cell.

B. **Cytoplasm** - viscous material inside ectoplast but outside nucleus.

1. **Cyclosis** - cytoplasmic streaming.

C. **Organelles** - contained in Cytoplasm; membrane bound.

1. **Plastids**

a. **Chloroplasts**

(1) **Chlorophyll** - green; photosynthetic.

(2) **Carotene** - orange; precursor to vitamin A; prevents photooxidation; accessory to photosynthesis.

(3) **Xanthophyll** - yellow-green; same function as carotene but no vitamin A synthesis.

b. **Chromoplasts** - lacks chlorophyll but has carotenoid pigments.

c. **Leucoplasts** - no pigments; colorless.

(1) **Amyloplasts** - stores starch; hilum & starch layers.

(2) **Elaioplasts** - stores oils.

2. **Mitochondria** - cellular respiration.

3. **Endoplasmic Reticulum**

a. **Smooth E.R.** - lipid & membrane synthesis.

b. **Rough E.R.** - ribosomes attached; protein synthesis.

4. **Golgi Body** - secretion of cell wall materials.

5. **Microbodies** - very small.

a. **Peroxisomes** - photorespiration.

b. **Glyoxysomes** - convert fats to sugars.

c. **Lysosomes** - contains hydrolytic enzymes, breaks down molecules in presence of water.

6. **Sphaerosomes** - stores lipids.

7. **Vacuoles** - in higher plants it stores dissolved nutrients; in algae it is a contractile vacuole that pumps water out of cell.

a. **Central Vacuole** - stores proteins, salts, pigments, etc.

8. **Nucleus** - normally round; in young cells it is located in the center of cell; as cell matures, it is pushed to the side; universally present in plant cells except food conducting cells.

a. **Nuclear Membrane** - two of them.

b. **Chromatin** - chromosomal material; made of DNA & histones.

(1) **DNA** - Deoxyribonucleic Acid; consists of nucleotides.

(a) **Pentose Sugar**

(b) **Nitrogenous Bases**

i) **Cytosine**

ii) **Guanine**

iii) **Thymine**

iv) **Adenine**

A-T, G-C

(c) **Phosphate**

(2) **RNA** - different pentose sugar than DNA; **Uracil** nitrogen base instead of Thymine.

c. **Nucleoplasm** - material inside nucleus that is not chromatin; contains ribosomes, enzymes, proteins that regulate the acidity of the cell.

d. **Nucleolus** - synthesis of nuclear material & R\_RNA.

D. **Particles in Cytoplasm** - things without membranes.

1. **Ribosomes** - protein synthesis.

2. **Microtubules** - spindle fibers, cilia, flagella.

III. **Ergastic Substances** - non-living products of the cell.

A. **Starch Grains**

B. **Crystals** - calcium oxalate is very common.

1. **Raphides** - in vacuoles; tooth pick shaped.

2. **Druse** - conglomeration of many crystals.

3. **Rhombohedral** - extremely small.

4. **Pyramidal**

5. **Prismatic**

6. **Styloid**

C. **Proteins**

D. **Globules**

E. **Tannins**

F. **Resins**

G. **Gums**

H. **Mucilage**