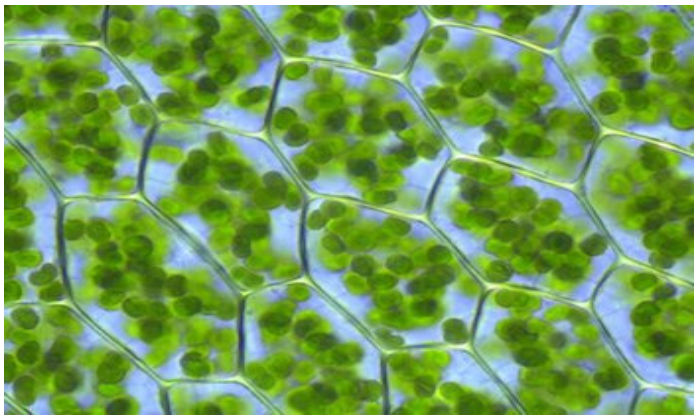
Definition:-

Chloroplast is the combination of two biological terms, plastid (an organelle in a plant cell), and chloros, which means green.A chloroplast is an organelle within the cells of plants and certain algae that is the site of photosynthesis, which is the process by which energy from the Sun is converted into chemical energy for growth. A chloroplast is a type of plastid (a saclike organelle with a double membrane) that contains chlorophyll to absorb light energy.

Photosynthetic cyanobacteria are free-living close relatives of chloroplasts; endosymbiotic theory posits that chloroplasts and mitochondria (energy-producing organelles in eukaryotic cells) are descended from such organisms.



Features of Chloroplasts:-

- Chloroplasts are one of the many unique organelles in the body, and are generally considered to have originated as endosymbiotic cyanobacteria.
- Chloroplasts are a type of plastid—a round, oval, or disk-shaped body that is involved in the synthesis and storage of foodstuffs.Chloroplasts are roughly 1–2 μm (1 μm = 0.001 mm) thick and 5–7 μm in diameter.
- Chloroplasts are distinguished from other types of plastids by their green color, which results from the presence of two pigments, chlorophyll *a* and chlorophyll *b*.A function of those pigments is to absorb light energy.
- In plants, chloroplasts occur in all green tissues, though they are concentrated particularly in the parenchyma cells of the leaf mesophyll.
- Chloroplasts capture light energy from the sun to produce the free energy stored in ATP and NADPH through a process called photosynthesis.

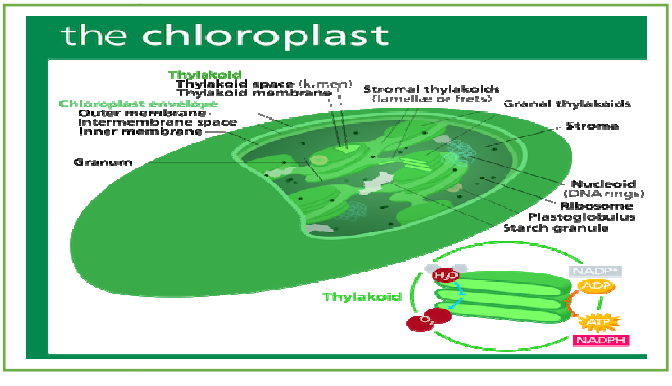
- Chloroplasts absorb sunlight and use it in conjunction with water and carbon dioxide gas to produce food for the plant.

Structure of Chloroplasts:-

- Chloroplasts found in higher plants are generally biconvex or planoconvex shaped.
- Chloroplasts can be found in the cells of the mesophyll in plant leaves.
- In different plants chloroplasts have different shapes, they vary from spheroid, filamentous saucer-shaped, discoid or ovoid shaped.
- They are vesicular and have a colorless center.
- Some chloroplasts are in shape of club, they have a thin middle zone and the ends are filled with chlorophyll.
- In algae a single huge chloroplast is seen that appears as a network, a spiral band or a stellate plate.
- The size of the chloroplast also varies from species to species and it is constant for a given cell type.
- In higher plants, the average size of chloroplast is 4-6 Âµ in diameter and 1-3 Âµ in thickness.

Parts of Chloroplasts:-

- **Outer membrane** – It is a semi-porous membrane and is permeable to small molecules and ions, which diffuses easily. The outer membrane is not permeable to larger proteins.
- **Intermembrane Space** – It is usually a thin intermembrane space about 10-20 nanometers and it is present between the outer and the inner membrane of the chloroplast.
- **Inner membrane** – The inner membrane of the chloroplast forms a border to the stroma. It regulates passage of materials in and out of the chloroplast. In addition of regulation activity, the fatty acids, lipids and carotenoids are synthesized in the inner chloroplast membrane.
- **Stroma**- Stroma is a alkaline, aqueous fluid which is protein rich and is present within the inner membrane of the chloroplast. The space outside the thylakoid space is called the stroma. The chloroplast DNA chlroplast ribosomes and the thylakoid sytem, starch granules and many proteins are found floating around the stroma.
- **Thylakoid System**- The thylakoid system is suspended in the stroma. The thylakoid system is a collection of membranous sacks called thylakoids. The chlorophyll is found in the thylakoids and is the sight for the process of light reactions of photosynthesis to happen. The thylakoids are arranged in stacks known as grana. Each granum contains around 10-20 thylakoids.



Functions of Chloroplast:-

- Absorption of light energy and conversion of it into biological energy.
- Production of NAPDH2 and evolution of oxygen through the process of photosys of water.
- Production of ATP by photophosphorylation. NADPH2 and ATP are the assimilatory powers of photosynthesis. Transfer of CO2 obtained from the air to 5 carbon sugar in the stream during dark reaction.
- Breaking of 6-carbon atom compound into two molecules of phosphoglyceric acid by the utilization of assimilatory powers.
- Conversion of PGA into different sugars and store as stratch. The chloroplast is very important as it is the cooking place for all the green plants. All heterotrophs also depend on plasts for this food.
- In plants all the cells participate in plant immune response as they lack specialized immune cells.
- The chloroplasts with the nucleus and cell membrane and ER are the key organelles of pathogen defense.
- The most important function of chloroplast is to make food by the process of photosynthesis.
- Food is prepared in the form of sugars. During the process of photosynthesis sugar and oxygen are made using light energy, water, and carbon dioxide.
- Light reactions takes place on the membranes of the thylakoids.
- Chloroplasts, like the mitochondria use the potential energy of the H+ ions or the hydrogen ion gradient to generate energy in the form of ATP.
- The dark reactions also known as the Calvin cycle takes place in the stroma of chloroplast.
- Production of NADPH2 molecules and oxygen as a result of photolysis of water.
- By the utilization of assimilatory powers the 6-carbon atom is broken into two molecules of phosphoglyceric acid.

Role in Photosynthesis-

The role of chloroplasts in photosynthesis is mainly to contain most of the reaction during photosynthesis. The plant will pump water into the leaves, and the leaves will also absorb carbon dioxide. All of the thylakoids, chlorophyll, water, carbon dioxide, etc. are available inside the chloroplast. The entire process of photosynthesis starts and completes inside of the chloroplast. The chloroplast essentially works as the 'powerhouse' for the cell, similar to the mitochondria, except that it creates its own food that then gets used to power the plant.

To use a more realistic human scenario, you can think of the chloroplast as the kitchen in your home or a restaurant. All the materials are brought to the kitchen (chloroplast) to cook with.

They are then placed into the oven (thylakoids) to bake, and after a while, out comes your food. Chloroplasts are similar in a sense to a kitchen; raw materials in, cooked food out.