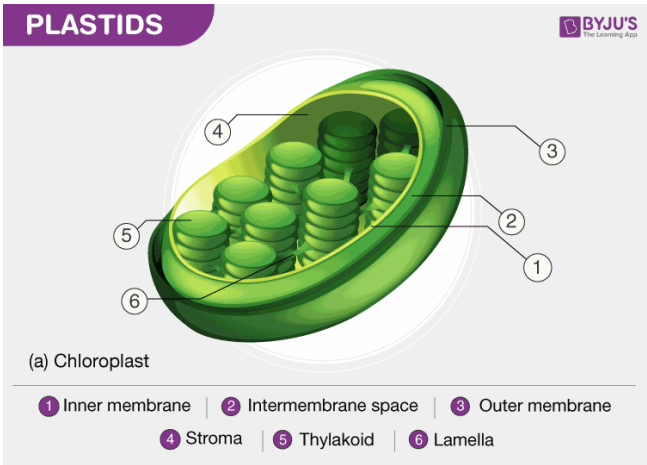
What are Plastids?

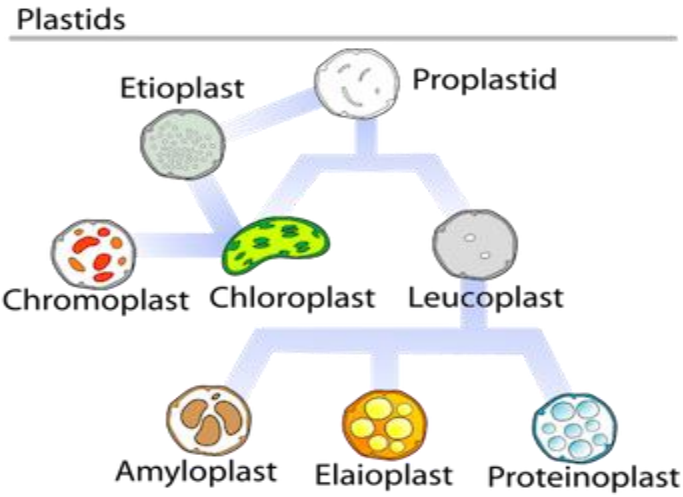
Plastids are double-membrane organelle which are found in the cells of plants and algae. Plastids are responsible for manufacturing and storing of food. These often contain pigments that are used in photosynthesis and different types of pigments that can change the colour of the cell.



Types of Plastids

There are different types of plastids with their specialized functions. Among which few are mainly classified based on the presence or absence of the Biological pigments and their stages of development.

- Chloroplasts
- Chromoplasts
- Gerontoplasts
- Leucoplasts



Chromoplasts

"Chromo" comes from Greek word meaning color.

- Chromoplasts are brightly colored plastids that act as the site of pigment accumulation. They are typically found in the fleshy fruits, flowers as well as various other pigmented parts of the plant such as leaves.

- Chromoplasts is the name given to an area for all the pigments to be kept and synthesized in the plant. These can be usually found in flowering plants, aging leaves and fruits. Chloroplasts convert into chromoplasts. Chromoplasts are carotenoid pigments that allow different colours that you see in leaves and fruits. The main reason for its structure and the colour for attracting pollinators.

Gerontoplasts

These are basically chloroplasts that go with the aging process. Geronoplasts refers to the chloroplasts of the leaves that helps the beginning to convert into different other organelles when the leaf is no longer using photosynthesis usually in an autumn month.

Leucoplasts

These are the non-pigmented organelles which are colourless. Leucoplasts are usually found in most of the non-photosynthetic parts of the plant like roots. They act as a storage sheds for starches, lipids, and proteins depending on the needs of the plants. They are mostly used for converting amino acids and fatty acids.

Leucoplasts are of three types:

- **Amyloplasts** – Amyloplasts are greatest among all three – Amyloplasts, proteinoplasts and elaioplasts and are easily charged with storing starch.
- **Proteinoplasts** – Proteinoplasts helps in storing the proteins that a plant needs and can be typically found in seeds.
- **Elaioplasts (lipoplast)-**Elaioplasts helps in storing fats and oils that are needed by the plant.

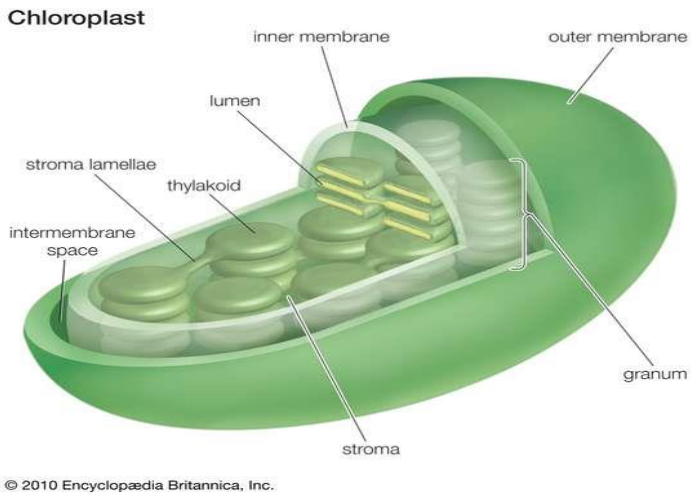
Inheritance of Plastids

There are many plants which are inherited from the plastids from just a single parent. Angiosperms inherit plastids from the female gamete while there are many gymnosperms that inherit plastids from the male pollen. Algae inherit plastids from one parent only. The inheritance of the plastids DNA seems to be 100% uniparental. In hybridisation, the inheritance of plastid seems to be more erratic.

Chloroplast

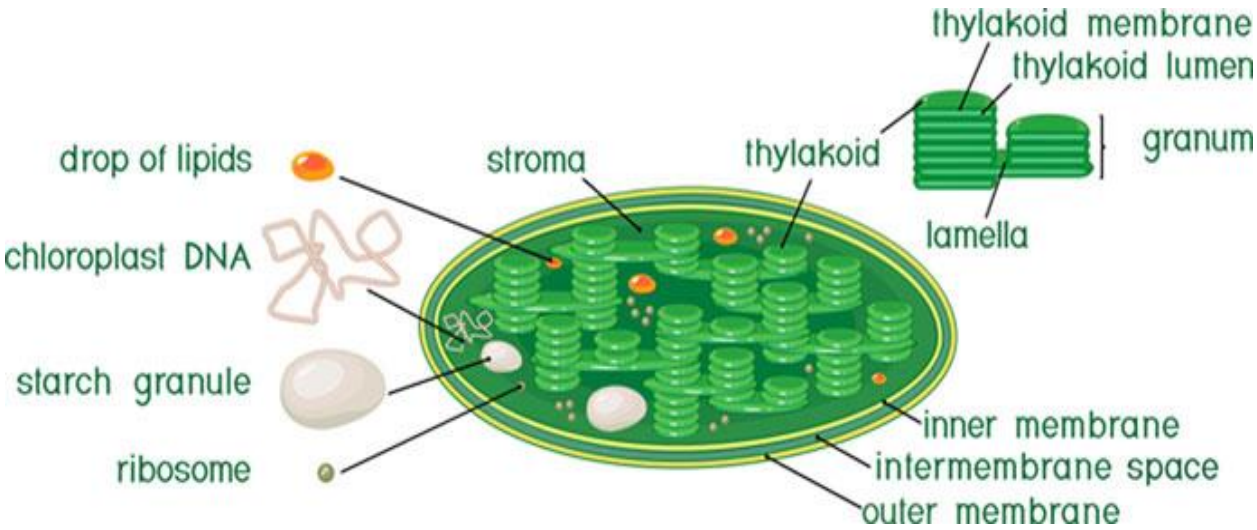
Definitions

1. The chloroplast, found only in algal and plant cells, is a cell organelle that produces energy through photosynthesis. The word chloroplast comes from the Greek words *khloros*, meaning “green”, and *plast*, meaning “formed”. It has a high concentration of chlorophyll, the molecule that captures light energy, and this gives many plants and algae a green color. Like the mitochondrion, the chloroplast is thought to have evolved from once free-living bacteria.
2. **Chloroplasts** are organelles that conduct photosynthesis, where the photosynthetic pigment chlorophyll captures the energy from sunlight, converts it, and stores it in the energy-storage molecules ATP and NADPH while freeing oxygen from water in plant and algal cells. They then use the ATP and NADPH to make organic molecules from carbon dioxide in a process known as the Calvin cycle.



Characteristic

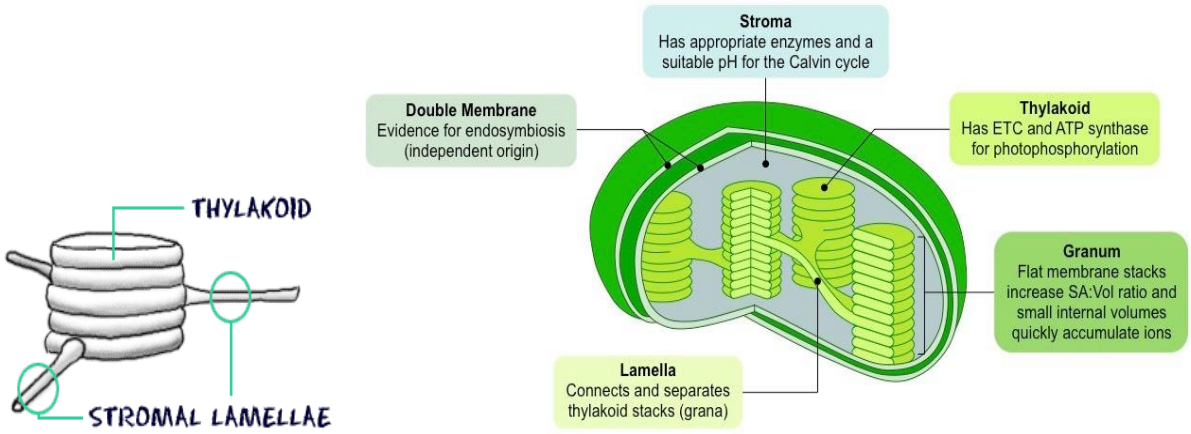
- Chloroplasts are a type of plastid—a round, oval, or disk-shaped body that is involved in the synthesis and storage of foodstuffs.
- Chloroplasts are distinguished from other types of plastids by their green colour, which results from the presence of two pigments, chlorophyll *a* and chlorophyll *b*.
- Chloroplasts are roughly 1–2 μm (1 μm = 0.001 mm) thick and 5–7 μm in diameter.
- They contain DNA, RNA, and ribosomes and hence they can replicate themselves and they are termed as "semi-autonomous organelles".



Parts/structure 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. **Grana** is made up of stacks of disc-shaped structures known as thylakoids. The grana of the chloroplast consists of chlorophyll pigments and are the functional units of chloroplasts



Chlorophyll molecules sit on the surface of each thylakoid and capture light energy from the Sun. As energy rich molecules are created by the light-dependent reactions, they move to the stroma where carbon (C) can be **fixed** and sugars are synthesized.

Chloroplast Function

Following are the important chloroplast function:

- The most important function of the chloroplast is to synthesize food by the process of photosynthesis.
- Absorbs light energy and converts it into chemical energy.

- Chloroplast has a structure called chlorophyll which functions by trapping the solar energy and used for the synthesis of food in all green plants.
- Produces NADPH and molecular oxygen(O_2) by photolysis of water.
- Produces ATP – Adenosine triphosphate by the process of photosynthesis .
- The carbon dioxide (CO2) obtained from the air is used to generate carbon and sugar during the Calvin Cycle or dark reaction of photosynthesis.