



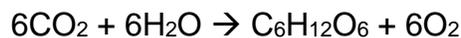
Overview of Photosynthesis

Plants are **autotrophs** (“self-feeders”), meaning they make their own food without using organic molecules derived from outside sources. Because plants cells capture light energy from the sun and convert it to chemical energy, they are specifically referred to as **photoautotrophs**.

Heterotrophs on the other hand utilize organic material through the consumption of other plants and animals (hetero means “other”)

- Photoheterotrophs – obtain ATP energy from light but make organic molecules from outside sources
- Chemoheterotrophs - obtain energy from chemical reactions to generate ATP but produce organic molecules from other organisms

All green parts of plants (leaves, plant stems etc.) have chloroplasts in their cells and can therefore carry out photosynthesis. Through the process of photosynthesis, plants are able to convert CO₂ and H₂O into their own organic molecules (sugars, starch, cellulose etc.) and release O₂ as a by-product. The following equation summarizes the overall reaction of photosynthesis:



Stages of Photosynthesis:

Photosynthesis takes place in two steps, the first being *dependent* on light and the second being *independent* on light but dependent on the by-products of the first reaction.

Stage 1: Light-dependent Reaction

The light reaction takes place in the thylakoid membranes of the chloroplast and includes the steps to convert light energy to chemical energy to produce O₂. Light energy is absorbed by **chlorophyll**, a light-absorbing pigment that excites an electron and ultimately aids in the generation of ATP and NADPH. These power molecules can then drive forward the next step in photosynthesis.

Stage2: Light-independent Reaction (Calvin Cycle)

The Calvin cycle occurs in the stroma of the chloroplast. The ATP and NADPH of the light-dependent reaction are used in combination with diffused CO₂ to generate an energy rich three-carbon sugar, glyceraldehyde-3-phosphate (G3P). The plant then uses G3P to make glucose and other organic molecules as required.



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Summary of the chemical processes of photosynthesis

