

## Photosynthesis

Photosynthesis is the process where producers, primarily plants and algae take in carbon dioxide and water and produce oxygen and a carbohydrate. The general equation is usually written something like this:



The carbohydrate produced is often shown as glucose, a 6 carbon sugar. This is an absolutely essential process for animal forms of life on this planet. We all rely on producers. 98% of Earth's oxygen comes from producers. Carbon dioxide is converted from an inorganic form to a usable organic form by plants. Even carnivores need plants to produce oxygen and to nourish their prey.

Photosynthesis involves two separate sets of reactions, the light reactions which are responsible for the capture or transformation of light energy to produce ATP and reducing power (NADPH) and the light-independent or dark reactions (Calvin Cycle). The Calvin Cycle or dark reactions/light independent reactions use the ATP and NADPH produced in the light reactions to power the enzymes that make carbohydrates. All of these reactions happen within the chloroplast.

The chloroplast is an organelle found within the photosynthetic cells of eukaryotic producers. The chloroplast is surrounded by a double membrane. Within this envelope is a jelly-like substance called the stroma. The stroma contains the enzymes and cofactors needed for the Calvin Cycle. The stroma is where carbohydrates are produced. Chloroplasts also have a single circular chromosome housed within the stroma. This means that chloroplasts are self-replicating. If a plant cell finds itself in a situation where it needs more carbohydrates or it needs to harness more energy, the chloroplast has the ability to replicate itself. Suspended within the stroma is another membrane system called the thylakoid. The thylakoid membranes are the reason plant leaves are green; the thylakoid membrane have the primary photosynthetic pigment chlorophyll embedded in them. The thylakoid membranes and the photosynthetic apparatus are responsible for capturing light energy, producing oxygen (photolysis, the lysis of water), producing ATP (chemiosmosis) and the production of reducing NADPH (reducing power).

This module includes a number of activities that examine plant leaf structure, plant pigments and photosynthesis.

