

## Light Reactions | Dark Reactions

Plants use the energy from sunlight to convert carbon dioxide and water into food. This process is called photosynthesis. Photosynthesis has two main parts. One part requires light, and the other one doesn't. The second part of photosynthesis doesn't require dark, it's just that it happens independently of how much light is available to the plant at the time. Both parts of photosynthesis occur in the chloroplast.

In the first step, sunlight is captured by the chloroplasts when molecules of chlorophyll absorb energy (in the form of sunlight). Water molecules are split into hydrogen and oxygen, and the oxygen is released back out into the atmosphere. The energy is stored in molecules called Adenosine Triphosphate (ATP), which are created in the plant cell. A second product from this first stage, NADPH, helps fuel the reactions that take place in the second stage of photosynthesis.



The second step in photosynthesis was discovered by a scientist named Melvin Calvin. For this reason, it is referred to as the Calvin Cycle. As mentioned above, this second step does not require sunlight. The light-independent reactions that take place during the Calvin Cycle happen in the chloroplast stroma. During the Calvin Cycle, carbon dioxide in the air is "fixed" inside the plant as organic compounds which can then be used to make glucose. This carbon fixing takes place in three steps that occur over and over again in a cycle. The products from the first step (ATP and NADPH) provide the energy and electrons needed in order to convert the fixed, stored carbon into food the plant can use for energy.

The process of photosynthesis uses a lot of energy and materials, comparatively, for the net results it achieves. Although viewed as a chemical equation it seems terribly inefficient (it has only .6% efficiency), it is the only known way for an organism to use CO<sub>2</sub> to make sugars.