

# Photosynthesis

## Reflect

All organisms require food to survive. Some organisms, such as animals, are **heterotrophs**, which means they rely on other organisms for food and nutrients. Others, such as plants, are **autotrophs**, which means they use the natural resources around them to make their own food and energy. Plants produce their own food through a process known as photosynthesis. How does photosynthesis work and why is this an important process? What allows some organisms to photosynthesize, but not others?



All life depends on plants.



**heterotroph:**  
an organism that depends on other organisms for food and energy

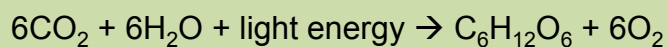


**autotroph:**  
an organism that can make its own food

### What Is Photosynthesis?

Photosynthesis is the process of converting carbon dioxide ( $\text{CO}_2$ ), water ( $\text{H}_2\text{O}$ ), and energy from the Sun into glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) and oxygen ( $\text{O}_2$ ).

To run this chemical process, required inputs use energy to transform into outputs (or byproducts). Gas exchange occurs through the stomata of the plant leaves, taking carbon dioxide in and breathing oxygen out. Water is absorbed, taken up through the roots, and distributed to all parts of the plant through an internal system of tissues. Sunlight is absorbed on the leaf's surface and into photoreceptor cells found within the chloroplasts of the cell. Chloroplasts are the organelles where photosynthesis takes place. The absorbed sunlight is the energy that allows this process to occur. These molecules,  $\text{CO}_2$  and  $\text{H}_2\text{O}$ , are then transformed into two byproduct molecules: glucose, which is the food source the plant will use for nutrients, and oxygen, which is the gas given back to the atmosphere.



## Reflect

### Why Is Photosynthesis Important?

The process of photosynthesis is of utmost importance to all life on Earth, both plants and animals. Plants, the autotrophs, are the producers of food webs. The organisms that eat the producers, the heterotrophic animals, are the primary consumers. Therefore, all organisms rely on autotrophic organisms to capture the Sun's energy and convert it into a food source, which is the process of photosynthesis. Autotrophic organisms are the foundation of all food webs on Earth.

Also, plants and other autotrophs are able to convert the carbon dioxide in the atmosphere to a useable form: oxygen. This is very important for the many organisms that require oxygen for their existence.

## Look Out!

### Venus Flytrap

A unique plant, known as the Venus flytrap, captures its food with the use of tiny hairs that are triggered on the plant. When the prey, such as small insects and spiders, walk on the surface, the tiny hairs trigger the trap to close. Enzymes within the plant begin to break down the prey and ingest the nutrients from the insects. Although Venus flytraps obtain nitrogen from the insects they catch, they still require photosynthesis for other nutrients. Even though this plant is carnivorous, it is still an autotroph.



Venus flytrap catching its prey.

### Who Can Photosynthesize?

Photosynthesis occurs in the chloroplast, an organelle found within a cell. Therefore, any organism with chloroplasts has the ability to photosynthesize! We usually think of just the green plants around us when we think of photosynthesis; however, algae and some bacteria can also run this process.



Bacteria



Algae



Plants

# Photosynthesis

## Try Now

### What Do You Know?

Fill in all the empty spaces with one of the terms below. Words may be used more than once or not at all.

Word Bank			
Photosynthesis	Carbon Dioxide	Light Energy	Chemical Energy
Sun Oxygen	Plant	Chlorophyll	$C_6H_{12}O_6$
Water	$CO_2$	$H_2O$	$O_2$

+  +  →  +

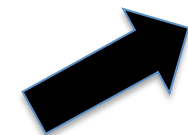
Process of:













## Connecting With Your Child

### Effects of Light on Photosynthesis

Many experiments and activities can be done at home to demonstrate photosynthesis at work. To help your child learn more about photosynthesis, try the following experiment.

#### Experiment

##### Question of Inquiry:

*What effect will variations of light sources have on a plant's ability to photosynthesize and grow?*

##### Materials

- A variety of light sources (suggestions include one of each: black light, sunlight, no light or shaded area, and a colored bulb)
- One plant per light source
- One scale or weighing device
- One ruler

##### Instructions:

1. Before the experiment, have your child record the heights, weights, and physical descriptions of the plants (such as color, number of petals, etc.) on a sheet of paper.
2. Place one plant under each light source.
  - Use the same species of plant for each light source to minimize external variables.
  - Light sources should be separated from each other, ideally in separate rooms.
3. After one or two weeks, have your child again record the heights, weights, and physical appearance of the plants.
4. Review the data to see what changes occurred.

Here are some questions to discuss with child:

- Were there any significant increases or decreases in the heights and weights of your plants?
- Do you think the light source played a role in the changes? If so, how?
- What kind of light source is required for photosynthesis to occur?
- How does plant growth prove that photosynthesis has occurred?

