

# Teacher **Treesources**

## PHOTOSYNTHESIS

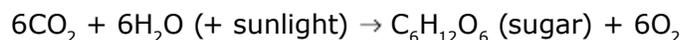
Photosynthesis is the process by which plants use solar energy from the sun to turn carbon dioxide from the atmosphere into food (sugar). Photosynthesis can be one of the more difficult life science processes to teach at any grade level. Simple concepts such as living things, gases, food and energy in lower grade levels help students build a foundation to apply to more difficult processes in upper grades.

- In the lower grades students learn that living things have basic needs that are met by obtaining materials from their physical environment. Energy flows through an ecosystem in one direction, from photosynthetic organisms to consumers – herbivores, omnivores or carnivores – to decomposers.
- In middle school students are taught that the use of light energy to make food is called photosynthesis. Formulas including atoms and molecules and cellular organelles including chloroplasts are introduced.
- In high school students study the details of cellular processes such as photosynthesis, chemosynthesis and cellular respiration.

## Background

Animals and plants obtain energy in different ways. Animals are known as heterotrophs or consumers, meaning that they obtain their energy by eating other organisms, be they plants or other animals. Plants, on the other hand are known as autotrophs or producers, meaning they can make food using energy from sunlight in a process called photosynthesis. Therefore, consumers (heterotrophs) often make their living by consuming the producers (autotrophs). The majority of plant photosynthesis occurs in the leaves, where the plant cells capture solar radiation using the green pigment chlorophyll. The other ingredients needed for photosynthesis to occur are carbon dioxide, taken from the air through the leaf's [stomata](#); and water, taken

from the soil through the plant's roots. Through a light-activated reaction, energy from the sunlight is stored in a chemical called ATP. In another reaction called the [Calvin cycle](#), the energy in the ATP is then used to combine water molecules and the carbon from carbon dioxide in order to make glucose, a type of sugar. The energy stored in glucose can be used to help the plant grow. By consuming these plant sugars, heterotrophs (e.g. animals and fungi) obtain the energy they need to grow. Animals also heavily depend on a by-product of photosynthesis: oxygen. The overall chemical reaction taking place in photosynthesis is this:



## Activities

[Acting Out Photosynthesis](#) (Grades 7-12) – Students act out the chemical reactions that take place throughout photosynthesis.

[Evidence of Photosynthesis](#) (Grades 5-12) – By submerging a plant in an indicator solution, students observe plants creating oxygen through photosynthesis. Includes a worksheet.

[Light and Plants](#) (Grades 4-8) – Students use the scientific method to experiment with a plant's

reaction to light.

[Photosynthesis: SMART Board Lessons](#) (Grades K-12) – SMART Board lessons for all age groups.

[The Food Chain Game](#) (Grades 2-8) – Simulate a forest food chain in a physical game to teach about energy flow between plants and animals. This resource focuses on Asian animals, but North American species can be substituted.

## Resources

### Web sites:

[Online Photosynthesis Games](#) – Play online game, watch videos or make a slide presentation related to photosynthesis.

[Photosynthesis Animation](#) – Click through an animated tour of the process of photosynthesis.

[Let's Eat!](#) – An informational page for kids about how plants make food.

[Photosynthetic Reactions](#) – A great overview of all the complex chemical reactions involved with photosynthesis with many diagrams.

### Video:

[Bill Nye the Science Guy: Plants](#) – The first part of the Bill Nye Plant episode focuses on photosynthesis.

[The Discovery of Photosynthesis](#) – Bill Nye narrates a short video about the discovery of photosynthesis.