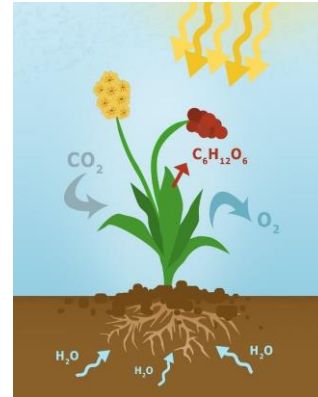
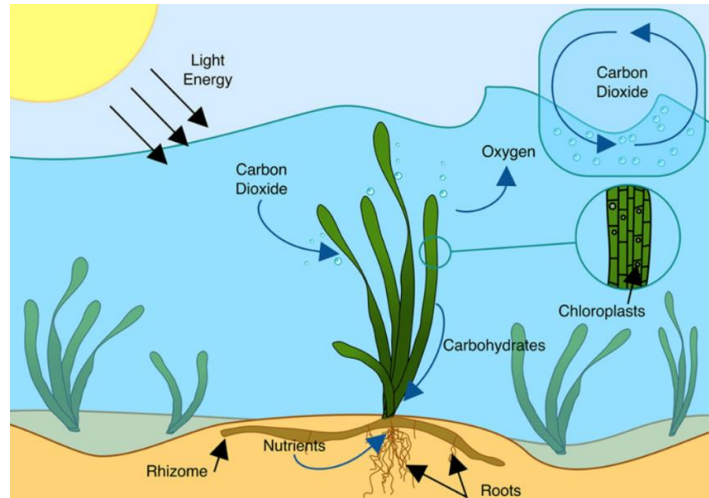


PHOTOSYNTHESIS

Photosynthesis is the process that allows green plants to use sunlight to make their own food. The word **photosynthesis** means light (*photo*) used to make something (*synthesis*). This process is absolutely necessary for life on Earth. Green plants use light energy to change water and carbon dioxide into oxygen and nutrients.

Photosynthesis is also responsible for balancing oxygen and carbon dioxide levels in the atmosphere. Plants absorb carbon dioxide from the air and release oxygen during photosynthesis. Our major sources of energy, including natural gas, coal and oil, were created millions of years ago from the remains of dead plants and animals that got their energy from photosynthesis.



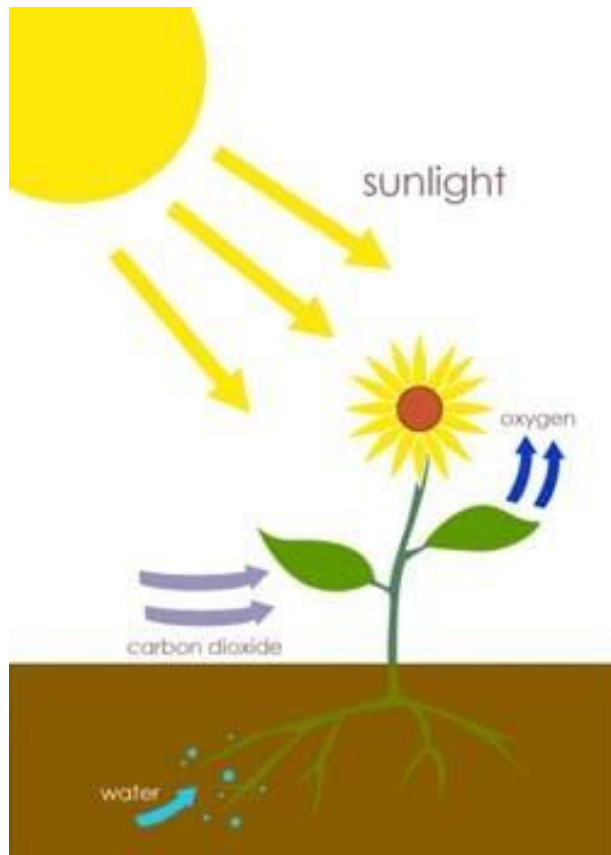
Most living things, including humans, can't survive without photosynthesis. All of our energy for growth, development, and physical activity comes from eating foods from plants and/or animals. Animals get their energy from eating plants, and plants get their energy from the glucose made during photosynthesis.

What do you do when you get hungry?

You ask a grownup for something to eat, don't you? Or you may even go to the kitchen and fix yourself something to eat. Well, plants get hungry, too, but since plants don't have parents (or kitchens), they have to make their own food.

Can you guess how plants make their food? If you guessed the sun, you are right! Here's how it works...





Soaking up some rays

All plants have a chemical in their leaves called **chlorophyll**. The chlorophyll is what makes the leaves of the plant green, but that is not the only job chlorophyll has. Its other job is to soak up the warmth and energy from the sun's rays.

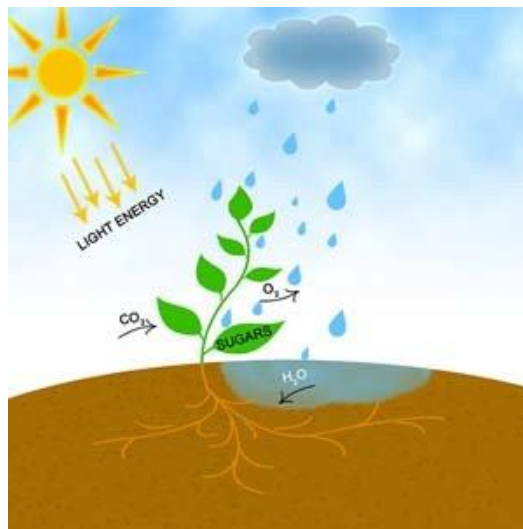
Sun-energy isn't all a plant needs to make its food, though. They also need water and air.

Drink up!

While the leaves are collecting energy from the sun, they are also pulling water up from the plant's roots. Water in the soil travels through the roots, up the stem and into the leaves - kind of like moving through a big straw. But that's not all. Water enters the roots via a plant cell called **xylem**.

Most land plants have to make sure they don't dry out. But plants are very clever and have a specialized structure called **stomata** which will not allow carbon dioxide pass through its protective waxy layer covering the leaf. That waxy layer is called the **cuticle**.





Take a deep breath

Plants have to breathe just like people do. The difference between plants and people, though, is what we need to breathe.

Take a big deep breath and hold it. You are breathing in oxygen. Now let that breath out. The air you let out is carbon dioxide. Plants do the same thing, except when they take a deep breath, they breathe in carbon dioxide and when they let it out, it is oxygen. You might be thinking you've never seen a plant breathe before. That is because you haven't -- not the way that humans breathe, anyway. A plant takes in carbon dioxide without anyone even noticing.



How plants breathe

You have already learned that the sun's energy enters the leaves through the chlorophyll in those leaves. A plant's leaves also have hundreds of thousands of tiny holes in them called **stoma**. Stoma are so small you have to have a microscope to see them, but they are big enough to breathe in the carbon dioxide a plant needs to make its food.

Plants take in carbon dioxide through their leaves at the same time they are soaking up energy from the sun and taking a drink of water. When the leaves of a plant have collected enough carbon dioxide, water and sun-energy, they are ready to make food for the entire plant.

Dinner time!



When the carbon dioxide, water and energy from the sun are combined, the sun turns the water and carbon dioxide into **glucose**, also known as sugar. The plant uses the glucose as food and takes hydrogen molecules from the water to keep itself from getting dry and wilted.

Glucose gives the plant energy, and the plant uses this energy to make more leaves, flowers, fruit or vegetables, and seeds that can grow into new plants. The glucose also gives the plant the energy it needs to grow taller and fuller and make the cell walls of the plant.

We know why it is important for flowers to make new leaves, flowers, fruits, vegetables, and seeds, but why are the plants cell walls so important?

On guard!

The cell walls of a plant have two main jobs:

- ✓ Surround the actual cells of the plant
- ✓ Protect the plant

Every living thing is made up of cells, and every plant cell has a cell wall. Those cell walls are near the surface or outside of the plant -- the part we see. Because they are so close to the outside of the plant, the cell walls of a plant keep bugs, insects, and diseases from attacking a plant and help the plant stand straight and tall.

All filled up

When a plant combines water, carbon dioxide, and the sun's energy to make the glucose, there is always something left over. The leftovers are oxygen -- the very same oxygen we need to breathe.

Because the plants don't need it, they get rid of it. When a plant gets rid of the oxygen they don't need, it is called **respiration**. A plant gets rid of oxygen through its leaves, stems and flowers, fruits, or vegetables. When they do, we have the oxygen we need to breathe. Thank you, plants!

Photosynthesis facts for kids:

- ✓ Photosynthesis is the most important chemical process in the world. Without it, plants and people could not exist.
- ✓ A plant's leaves are vital for its survival.
- ✓ Most of the photosynthesis process takes place in the leaves of a plant.

ACTIVITY: Beans and photosynthesis

Materials

- Cotton balls
- 2 small jars or cups
- Dried beans



1. Place one cotton ball in the bottom of two small jars or cups (1 cotton ball in each).
2. Place 2 dried beans on each cotton ball and moisten with water.
3. Cover the beans in both containers with another wet cotton ball.
4. Place one container in a sunny location such as a window sill.
5. Place the other container in a dark location (closet or cabinet).
6. Check them each day to see which one grows best.

How did photosynthesis work in this activity?

Describe and explain the differences you see between the growth habits of the beans. Why did these differences occur?

A bean grown in sunlight looks much different than one grown in darkness. Sunlight helps the seedling grow taller, straighter and stronger. The seedling grown in sunlight should also be a healthy, bright shade of green, thanks to the powers of photosynthesis!

ADDITIONAL RESOURCES

Books available from the Washoe County Library System:

[*Edible Sunlight*](#) by Tara Haelle

[*Leaves*](#) by Melanie Waldron

[*Living Sunlight : How Plants Bring the Earth to Life*](#) by Molly Bang and Penny Chisholm

[*The Magic School Bus Gets Planted : A Book About Photosynthesis*](#) by Joanna Cole, Lenore Notkin and Bob Ostrom, contributors

[*The Secret Lives of Plants!*](#) by Janet Slingerland and Oksana Kemarskaya

[*Why Do Elephants Need The Sun?*](#) by Robert E. Wells

Videos:

Smithsonian Science Education Center, "Good Thinking! — Photosynthesis: Blinded by the Light"

<https://youtu.be/PL9CRhRsy5A>

TED-Ed, "The simple story of photosynthesis and food - Amanda Ooten" <https://youtu.be/eo5XndJaz-Y>

Websites:



British Broadcasting Corporation (BBC), Gardening Guides, Did you know? Photosynthesis

http://www.bbc.co.uk/gardening/gardening_with_children/didyouknow_photosynthesis.shtml

DK findout!, How Plants Make Food

<https://www.dkfindout.com/us/animals-and-nature/plants/how-plants-make-food/>

Scholastic, Plants: 11 StudyJams! Interactive Science Activities

<https://www.scholastic.com/teachers/activities/teaching-content/plants-11-studyjams-interactive-science-activities/>

