How Do Green Cells Make Food? U-3 L-2

Exploring Science

Algae At Work Have you had a milkshake at a fast-food restaurant? It might surprise you to know that it was thickened with a substance that comes from red algae. In fact, a quick search online for "foods with algae" will reveal that many foods contain some algae.

Algae of various types are harvested from the sea, dried, and eaten every day by millions of people, especially in Japan.

Algae are plant-like organisms that grow in ponds, lakes, streams, and the ocean. They can grow very quickly, and are very important producers on our planet. In other words, algae start many of the Earth's food chains. In the wild, they are eaten by many organisms, from microscopic protists to quite large animals.

Producers Fight Global Warming. In this lesson, you will learn details about how plant-like protists (like algae) and actual plants (like trees) make food. A key point is that they *take in* carbon dioxide. So algae and plants help to lower the amount of carbon dioxide in our atmosphere!

Obviously, to fight global warming we must protect our oceans and waterways so that algae will grow well. And we must protect the land so that plants, especially trees, grow and reproduce.

➢ Since algae behave much like plants, in which specific aquatic habitat do you think more algae will be found?

A. near the bottom Explain.
B. near the surface Explain.

The algae that make kelp forests provide food (and shelter) for many marine organisms - all the while removing carbon dioxide from the ocean! This allows more carbon dioxide to leave the atmosphere and enter the ocean.

Tropical rainforests are the most biodiverse land ecosystems. They remove enormous amounts of carbon dioxide from the atmosphere.

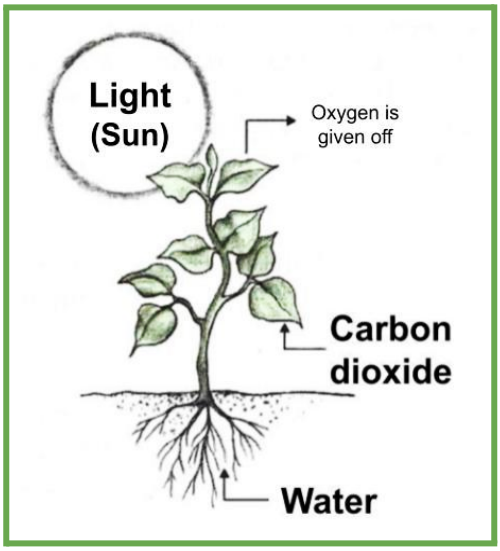
How Green Cells Make Food

How do algae and plants make food? To find out, let's look inside of the cells of the most common producers - those that are green.

Unlike animal cells, green cells contain large numbers of small, oval structures called **chloroplasts** (KLOWR-uh-plasts). These hold **chlorophyll** (KLOWR-uh-fil), the special green compound that cells need in order to make food.

A green cell with chlorophyll uses three "ingredients" to produce food - carbon dioxide (from the air or the water), water, and light.

Chlorophyll traps light (such as sunlight). It uses light's energy to change carbon dioxide and water into food. The light energy is changed into energy that is stored in a simple sugar. (Often, plants later change some of this sugar into starch).



Green plants need three things to make food: carbon dioxide, water and light.

[**Stomates** are microscopic openings on the underside of most leaves. They allow oxygen, carbon dioxide, and water vapor to move into and out of leaves. Stomates can easily be viewed with a compound microscope.]

➢ An Adult Demonstration

How can the green in a leaf be found?

You will need:

An adult to help you; a pair of googles; a spinach leaf; a saucepan; an electric hot plate; water; two test tubes; two corks for the test tubes; a test-tube rack; a well ventilated area; alcohol

1. This lab **must** be done with an adult.

2. Tear a spinach leaf into small bits.

3. Put on your goggles. Boil the bits in a pan of water for a few minutes. Turn off the heat source; now work far from heat for the rest of this lab.

4. Place some boiled leaf bits into the empty test tube.

5. Fill this tube one-fourth full of alcohol.

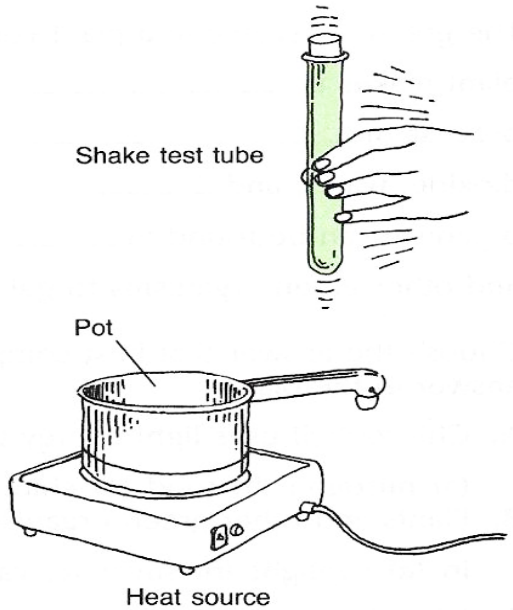
6. Cork the tube and shake it every so often.

7. Allow the tube to cool for several minutes.

8. Pour the liquid into an empty test tube. Cork both tubes. Observe the liquid.

9. Observe the remains of the leaf bits.

10. Record your observations.



Questions

1. At the beginning, and then at the end, what color was the liquid ?_____/_____

2. At the beginning, and then at the end, what color were the leaf bits?_____/_____

3. What do you think caused the color changes?_____

Changing carbon dioxide and water into sugar in the presence of sunlight is called **photosynthesis** (foh-tuh-SIN-thih-sus). *Photo* means "light." In photosynthesis, the light is usually from the sun. *Synthesis* means "putting together." Carbon dioxide and water are put together using light energy - to make sugar! Oxygen is given off during the process.

Below, this process is shown as an **equation**. The top version uses words to tell the story. The version below it uses formulas. See if you can follow both versions. The arrows in the equations mean "makes" or "gives." Notice the numbers in *front* of the formulas for some compounds. These numbers tell how many of each compound is used.

Carbon dioxide + Water + Light energy ----------with chlorophyll----------> Sugar (stored energy) + Oxygen

6 CO_2 + 6 H_20 + Light energy ----------with chlorophyll----------> $C_6H_{12}0_6$ + 6 0_2

Review U3 L2

I. In each blank, write the choice that fits best. Choose from the words below.

energy	**chlorophyll**	**carbon dioxide**	**chloroplasts**
oxygen	**sugar**	**light**	**photosynthesis**

The green substance in a plant cell is _____ . A food that a plant makes is _____. The plant makes food by the process of _____. To make food, a plant needs carbon dioxide, water, and _____. Chlorophyll in a green organism can be found in _____. Animals eat green plants and other green organisms to get _____. Photosynthesis not only makes food, it helps fight global warming by removing _____ from the atmosphere.

II. Circle the answer that best completes each sentence.

A. Chlorophyll uses light energy to change carbon dioxide and water into …

(a) nitrogen **(b)** food **(c)** chloroplasts

B. Plants and other green organisms store energy in …

(a) sunlight **(b)** sugar **(c)** carbon dioxide

III. Explain why some animals need to eat green plants.