Water's Part in Photosynthesis

Vocabulary	
photosynthesis	stomata
chlorophyll	guard cells
chloroplast	transpiration

Photosynthesis is the process in which plants use water, sunlight, and carbon dioxide (CO_2) to make food for themselves. Plants, algae, and certain bacteria contain a compound called **chlorophyll**—it is the pigment that gives plants their green color. This compound is located in the **chloroplast** of plant cells. Chlorophyll absorbs sunlight and uses its energy to make food carbohydrates from CO_2 and water. This food is called **glucose**. In the process of making food, plants give off or release oxygen (O_2) to the atmosphere.

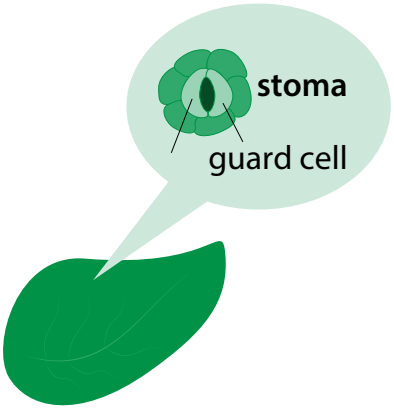
The equation for the process of photosynthesis is:

$$\text{Sunlight} + 6CO_2 + 12H_20 \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$$

Humans breathe out CO_2 during respiration, and plants use this in the process of making food for themselves. In turn, plants give off O_2 during this process, and the O_2 is breathed in by humans.

Water's Involvement

Water (H_2O) enters the plant through its roots via a special plant tissue called **xylem**. The xylem carries the water up to the leaves. The leaves have specialized structures called **stomata** that allow CO_2 to pass into the leaf. A pair of **guard cells** surrounds the stoma (the singular term for stomata). The guard cells control the opening and closing of the stoma. The stomata also allow O_2 to pass out. While these gases are moving in and out of the leaf, a great deal of water is also lost. This loss of water is called transpiration.



Transpiration is the process in which water travels from the roots of the plant, through the plant, and to the leaves. Water is lost through the stomata of the leaves. The guard cells contract and expand depending on the circumstances of the plant.

During the night, the stomata close because without the sun, there's no demand for CO_2 for photosynthesis. Transpiration rates vary depending on weather conditions. The more humid it is, the less a plant will transpire. The drier the atmosphere, the greater the transpiration rate will be. It's easier for water to evaporate into drier air than into humid air. Warmer air holds less moisture so the transpiration rate will increase in higher temperatures. When stomata are open, transpiration rates increase; when they are closed, transpiration rates decrease.

Since animals and humans obtain their food by eating plants, photosynthesis is also the source of our lives.

Questions

1. Draw a picture on the back of this paper of photosynthesis and label the parts: plant, sunlight, CO_2, O_2, transpiration, xylem, stomata, and guard cell. Use arrows to indicate whether a gas and/or water vapor is entering or leaving the plant leaf.

2. What are the ingredients used to make glucose for plants?

3. What is the name of the pigment that absorbs sunlight in plant cells?

4. What is the function of xylem?

5. What causes stomata to open?

6. What causes the rate of transpiration to increase in a plant?

7. Fill in the definitions for these vocabulary words.

Vocabulary	
photosynthesis	
chloroplast	
chlorophyll	
glucose	
xylem	
stomata	
guard cells	
transpiration	