

7-6 Photosynthesis: The Prime Energy Capturing Reaction for all Life on Earth

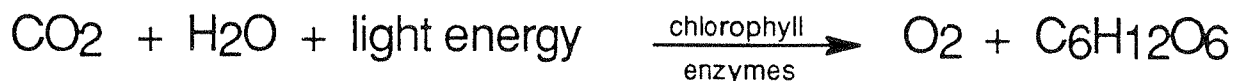
1. Briefly describe what happens in plant photosynthesis.

Objective

You will be required to write a balanced equation for plant photosynthesis and explain where the required energy comes from. You will also be required to draw a diagram of the carbon cycle and explain the interdependence between animals and plants.

In the unit, *Plant Processes*, you will learn details about photosynthesis that go beyond that covered in this chapter. In this chapter it will be satisfactory to have a general understanding of the equation for plant photosynthesis.

All green plants carry out photosynthesis. In the process, the green **chlorophyll** in leaves traps the sun's light energy. This energy is then made available to rearrange carbon dioxide and water molecules to form glucose and oxygen molecules. The general equation is written as follows:



The balanced equation is as follows:



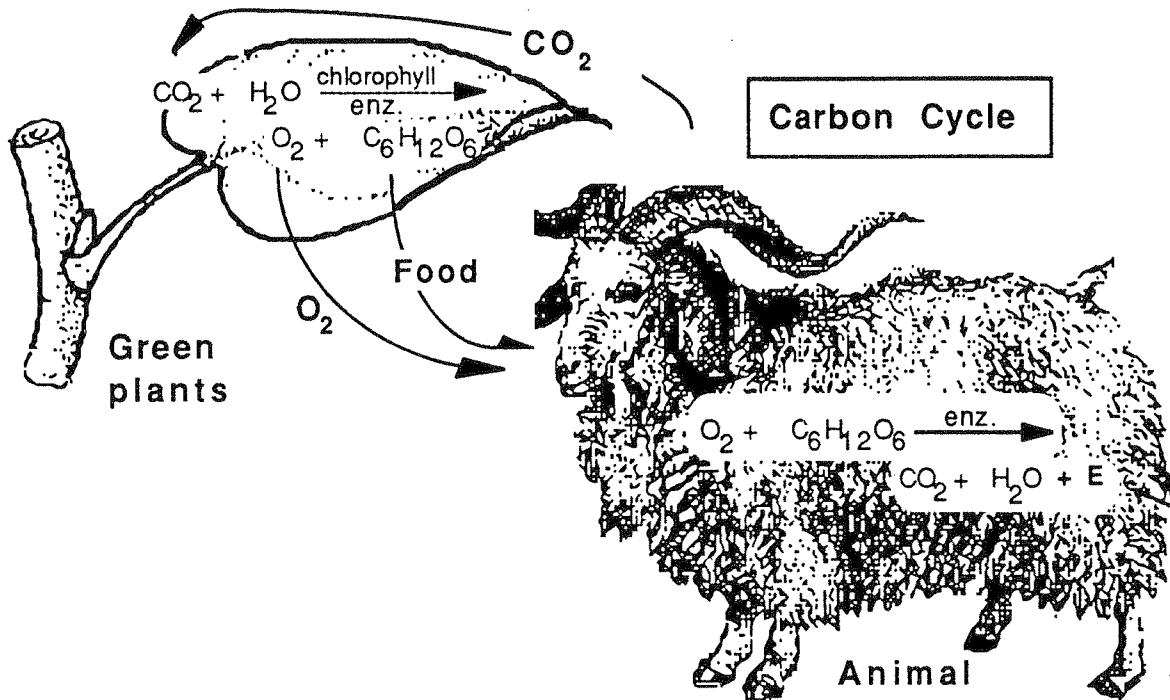
2. How many molecules of water would be required to produce 3 molecules of glucose?

Photosynthesis takes place within the **chloroplasts** of plant cells found in the leaves of green plants. The chloroplasts contain the green pigment **chlorophyll**, which is able to absorb and trap certain colors of light energy. The trapped **light energy** is used to break apart the 6 CO₂ and 6 H₂O molecules and rearrange them into one C₆H₁₂O₆ and six O₂ molecules. This is precisely what the equation shows.

3. Based upon the equation, do the H atoms in glucose come from the water or carbon dioxide molecules? Explain your choice.
4. How is the equation for animal respiration different from the equation for plant photosynthesis? In your opinion, what is the reason for this difference?

The Carbon Cycle on Planet Earth

You have no doubt noticed that the equation for animal respiration is the opposite of plant photosynthesis. That is, the products of respiration are the same as the requirements (reactants) for photosynthesis. Study the diagram below :

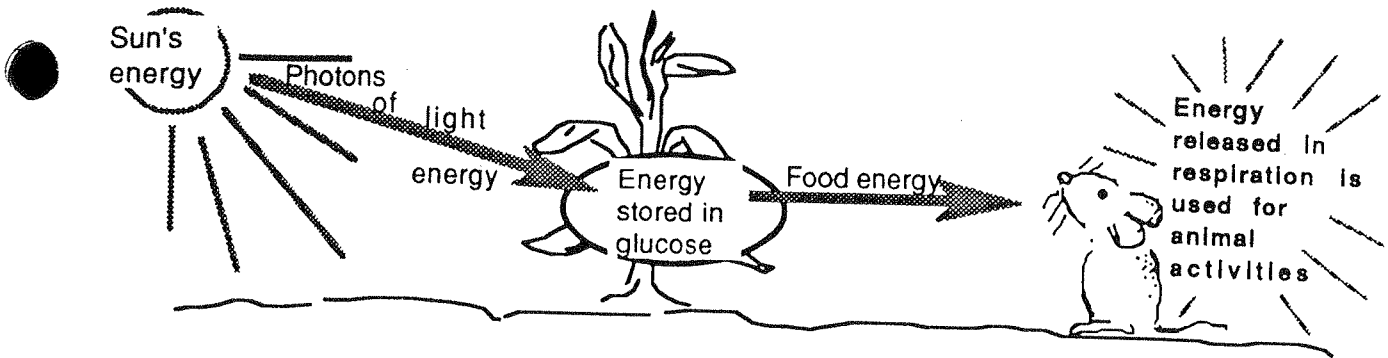


5. What substances produced by green plants are required by animals?
6. What substances are required by plants that are produced by animals?
7. What changes would occur on the planet if all of the green plants were to die tomorrow?

In the **Carbon Cycle**, the same atoms might be used over and over again. The products of plant **photosynthesis**, the oxygen and glucose, are taken in by animals. All the oxygen present in our atmosphere comes from photosynthesis. The oxygen and glucose are used in **respiration**. The products of animal respiration, carbon dioxide and water are required by the plant for photosynthesis. And the cycle goes on. Without it, life on earth would cease to exist.

Energy Flow

The energy from the sun is effectively transferred to plant glucose during photosynthesis. The energy stored in glucose is released when animals use it in respiration. The energy released in respiration becomes available for animal and human activity.



8. What is the original source of energy that ultimately is needed or used to enable you to walk?

Since the equation for photosynthesis is the reverse of respiration, you might suspect that the details for photosynthesis are the reverse of respiration. In general, this is true. The details of the photosynthetic process are complex. A greatly simplified optional version of the details of photosynthesis follow: