

Think about it

A chemical reaction occurs when atoms rearrange themselves and bond together to form one or more new substances. Chemical reactions are part of everyday life. Metal rusting is an example of a chemical reaction. When iron in the metal comes in contact with water and oxygen from the air, a chemical reaction takes place. A new substance called iron oxide (rust) is formed. For this chemical reaction to take place, the atoms of iron and the atoms from water and oxygen rearrange themselves and bond together in a new arrangement to form rust.

Vocabulary

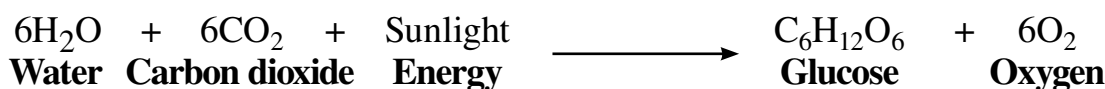
reaction
bond
photosynthesis
cell respiration
substance
exothermic

Burning wood in a fireplace is another type of chemical reaction. If enough heat is added to wood, the carbon and hydrogen atoms in the wood come apart from each other and join with oxygen from the air to produce new substances. The new substances are carbon dioxide and water. In this reaction, a lot of energy is released. Burning wood is very exothermic.

Two of the most important chemical reactions for life on Earth are *photosynthesis* and *cell respiration*.

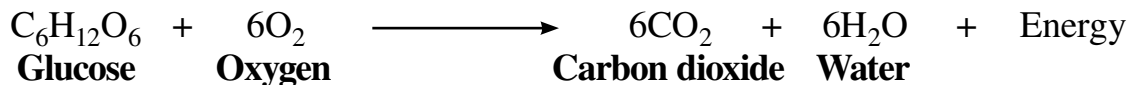
Photosynthesis

In photosynthesis, a plant uses energy from sunlight to change water (H₂O) and carbon dioxide (CO₂) into a type of sugar called *glucose* (C₆H₁₂O₆). This process also produces oxygen (O₂), which the plant releases into the air.



Cell respiration

In cell respiration, the plant or animal changes glucose (C₆H₁₂O₆) and oxygen (O₂) into carbon dioxide (CO₂) and water (H₂O). This process releases energy that the cells of the organism use to function.



If you look at the chemical equations for photosynthesis and cell respiration, you can see that they are opposites of one another. The molecules on the left side of one are on the right side of the other. Energy is also on opposite sides of the equations. What does all this mean?



Think about it *(continued)*

Well, it means that these two reactions depend on one another and that energy from the sun is the link between them. The great thing about photosynthesis is that in using the sun's energy to change water and carbon dioxide into glucose, some of the energy from sunlight is converted into or "trapped" as chemical energy in the glucose molecule. The plant, or animals that eat plants, can then break down the glucose using cell respiration to get the energy that they need to survive.

Plants and animals couldn't get the energy they need if plants didn't photosynthesize. And plants couldn't photosynthesize without the energy from the sun. So if you think about it, all living things, including you, depend on the energy from the sun to live.

Think about what you ate for lunch today. Maybe you had a turkey, lettuce, and cheese sandwich. What part of your sandwich was made possible by photosynthesis? Fifty percent? One-hundred percent? In the example of a turkey sandwich, lettuce clearly depends on photosynthesis because it is the leaf of a plant. Bread also comes from plants because it is made with flour, which comes from wheat. But what about the turkey and cheese on your sandwich? Do these depend on photosynthesis?



Turkeys cannot use sunlight to make their own food the way that plants can: They can't photosynthesize. However, turkeys do eat corn and other seeds, which are plant parts. Since plants use photosynthesis to make their own food, and turkeys eat seeds from plants, the turkey on your sandwich would not be possible without photosynthesis. Is cheese a result of photosynthesis? Cheese is made from milk, which comes from cows (or sheep or goats) that eat grasses. Since grass photosynthesizes, every part of your sandwich can be linked to photosynthesis.



So in the process of photosynthesis, plants change the sun's energy to a usable form of food. When we eat food made from plants or animals that ate plants, our bodies use the process of cell respiration to get energy that initially came from the sun!

Think about it (*continued*)

1. Photosynthesis uses energy from the _____ to make food for the plant.
 - a. earth
 - b. sun
 - c. plant's leaves
 - d. bacteria
2. What fact might the author want you to remember most?
 - a. All living things depend on chemical reactions.
 - b. Photosynthesis makes food for plants.
 - c. Burning wood is a chemical process.
 - d. Cell respiration gets energy from glucose.
3. When wood is burned, the process is exothermic. What does the word *exothermic* mean in this sentence?
 - a. Energy is absorbed.
 - b. Fire breaks down the wood into ashes.
 - c. Energy is released.
 - d. Oxygen is produced.
4. Living things are able to get energy out of glucose during cell respiration. Glucose is...
 - a. the sun's energy.
 - b. a sugar molecule.
 - c. a water molecule.
 - d. carbon dioxide.
5. During photosynthesis, energy from the sun is trapped as...
 - a. water and carbon dioxide.
 - b. chemical energy in the glucose molecule.
 - c. cell respiration.
 - d. oxygen.
6. No matter what food you eat, you can always trace the source of energy back to...
 - a. the sun and photosynthesis.
 - b. fertilizer.
 - c. the heat from the center of the earth.
 - d. oxygen and carbon dioxide.

Think about it *(continued)*

7. How are photosynthesis and cell respiration similar and different?

8. In a way, everything we eat depends on photosynthesis. Describe how a breakfast of bacon and eggs depends on photosynthesis.

9. One of the reasons plants are important to us is because they reduce the amount of carbon dioxide in the atmosphere and increase the amount of oxygen, which we need to breathe. Explain how this statement relates to the chemical equation for photosynthesis.

10. We need to eat food and breathe in oxygen in order to stay alive. We also breathe out carbon dioxide gas. Explain how these statements relate to the chemical equation for cell respiration.
