

CDL DAY 5

Cellular Respiration and Photosynthesis

Name _____

Class period _____

An essential characteristic of life is the ability to obtain and use energy for growth and maintenance. Living things would not be able to obtain energy if it weren't for photosynthesis. Photosynthesis is a chemical process that makes food (a sugar called glucose). It takes place in organelles called chloroplasts found in plant and some algae cells. Photosynthetic organisms convert carbon dioxide (CO_2) and water (H_2O) into glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and oxygen (O_2).

This reaction only occurs with the help of ultraviolet light energy from the sun. The oxygen produced is released into the atmosphere and then inhaled by animals. Oxygen was not available in our atmosphere until organisms capable of photosynthesis evolved. The glucose produced is a carbohydrate used as the plant's food source. Because plants (and some bacteria and algae) can make their own food, we call them autotrophs ("auto-" means self). The glucose produced by photosynthesis is a very important sugar that can be broken down to create an ATP molecule, which is the most important energy source for all cells. Breaking down glucose to make ATP is called cellular respiration. Both plants and animals carry out cellular respiration, but because animals cannot make their own glucose, they must eat plants to obtain this sugar. An organism that must eat others to get glucose and other nutrients is called a heterotroph ("hetero-" means different). Cellular respiration combines glucose and oxygen to produce ATP. In the process, carbon dioxide and water are produced. Carbon dioxide is then exhaled from the lungs, and available for photosynthetic organisms to use. This process takes place in organelles called mitochondria found in all eukaryotic cells. The ATP is then used to help the cell carry out metabolic processes that keep the cell and organism alive.

Cellular respiration is the reverse process of photosynthesis. If you study the equations listed above, you will notice that the products of photosynthesis are the reactants (the starting material) of cellular respiration. It is impossible to have cellular respiration without photosynthesis, which is why plants are so important in the flow of energy through an ecosystem. Without plants, animal life would not be possible.

Review Questions:

1. What are the two products of photosynthesis and what are they used for?
2. What is the relationship between photosynthesis and cellular respiration?
3. What is the difference between autotrophs and heterotrophs?
4. Why can't heterotrophs make ATP (energy) without eating plants?
5. Explain how cellular respiration is the opposite of photosynthesis.
6. When was oxygen available in our atmosphere?
7. What is the name of the sugar produced during photosynthesis?