Lesson Outline for Teaching

Lesson 4: Cells and Energy

A. Cellular Respiration

1. All living things need energy to survive.
2. Cellular respiration is a series of chemical reactions that convert the energy in food molecules into a usable form of energy called ATP.
3. The first step of cellular respiration, called glycolysis, occurs in the cytoplasm of all cells.
4. During glycolysis glucose, a sugar, is broken into smaller molecules.
5. The second step of cellular respiration occurs in the mitochondria of eukaryotic cells. This step requires oxygen.
6. During the second step of cellular respiration, the smaller molecules made during glycolysis are broken down. Large amounts of usable energy, called ATP, are produced.
7. Water and carbon dioxide (CO_2) are two waste products that are given off during the second step of cellular respiration.

B. Fermentation

1. Eukaryotic and prokaryotic cells use fermentation to obtain energy from food when oxygen levels are low.
2. Fermentation occurs in a cell's cytoplasm.
3. Lactic-acid fermentation converts glucose into ATP and a waste product called lactic acid.
4. Some types of bacteria and yeasts make ATP during alcohol fermentation. This process produces ethanol and CO_2.

C. Photosynthesis

1. Plants and some unicellular organisms obtain energy from light.
2. Photosynthesis is a series of chemical reactions that convert light energy, water, and CO_2 into glucose and oxygen.
3. In plants, light energy is absorbed by pigments such as chlorophyll.
4. The chemical reactions of photosynthesis occur in chloroplasts, the organelles in plant cells that convert light energy into food.
5. Photosynthesis uses CO_2 that is released during cellular respiration to make food energy and release oxygen.
6. When an organism eats plant material, it takes in food energy. An organism's cells use oxygen released during photosynthesis.

Discussion Question

How are cellular respiration and photosynthesis related?

Photosynthesis uses light energy and CO_2 that is released during cellular respiration to make food energy and release oxygen. When an organism eats plant material, it takes in food energy. An organism's cells use oxygen released during photosynthesis and convert the food energy into usable energy through cellular respiration.