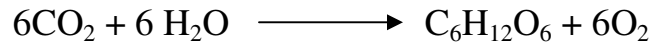


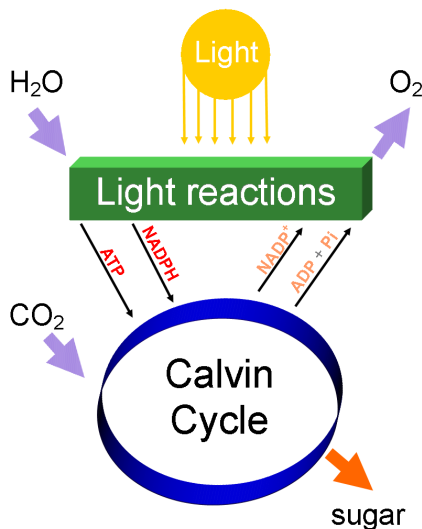
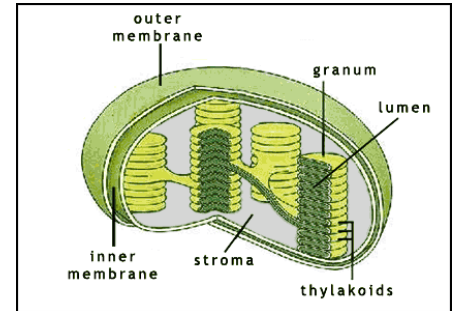
CELLULAR ENERGY

All organisms need energy, but only some living things can directly use the energy of sunlight. **Autotrophs** (producers) make their own food by obtaining energy from sunlight (or inorganic compounds). **Heterotrophs** (consumers) cannot make their own food, and must get their energy from food sources.

Photosynthesis- carried out in the chloroplasts of plants; uses carbon dioxide to store energy in the form of glucose (organic molecules); produces oxygen



Chloroplasts- found in the cells of green plants- convert light energy into chemical energy, stores energy in food molecules. Chloroplasts contain the pigment chlorophyll, which absorbs mostly blue and red light, and reflects green and yellow (giving plants their green appearance).



Photosynthesis occurs in two stages:

- Light-dependent stage- occurs in the thylakoid membrane, the energy of sunlight is converted into energy carrier molecules (ATP and NADPH) used in the second stage
- Calvin cycle (light-independent stage)- occurs in the stroma, uses the energy from the first stage and CO_2 to form glucose.

The rate of photosynthesis can be affected by:

- The amount of water available
- The amount of sunlight available
- Temperature (must be within an optimal range since the reactions of photosynthesis depend on enzymes)

The plant uses the energy stored in the sugar molecule to carry out life processes. The sugar molecule is also used to build more complex carbohydrates, which can be used in growth and development.

PRACTICE

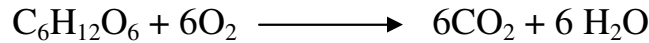
Why are pigments important to the process of photosynthesis?

How is the Calvin cycle dependent on the first stage of photosynthesis?

Why is photosynthesis important?

The glucose made in photosynthesis is the starting point for **cellular respiration**. Cellular respiration should not be confused with the process of breathing. Breathing simply involves taking in oxygen and eliminating carbon dioxide, but cellular respiration is a series of chemical reactions that change glucose into a usable form of chemical energy (ATP).

Cellular (aerobic) respiration- occurs in mitochondria; uses oxygen to release energy (ATP) from food molecules; produces carbon dioxide

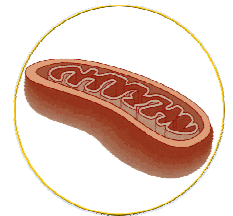


ATP is energy that drives chemical reactions in cells.

Cellular respiration begins with a series of steps called **glycolysis**, which converts glucose into pyruvate. If oxygen is present, pyruvate enters *aerobic respiration*, and a great deal of ATP is produced.

If there is no oxygen present, some cells can undergo anaerobic (*without oxygen*) respiration to make ATP. Some microorganisms, such as yeast, carry out alcohol fermentation, which produces ATP and alcohol. In humans, however, muscle cells carry out lactic acid fermentation. For example, if your muscles are fatigued and run out of oxygen they will produce lactic acid, which causes muscle cramps. Only a small amount of ATP is produced in *anaerobic respiration*.

Mitochondria- in **both plants and animals**, breaks down food molecules and transforms food into energy (ATP)= **the “powerhouse” of the cell**



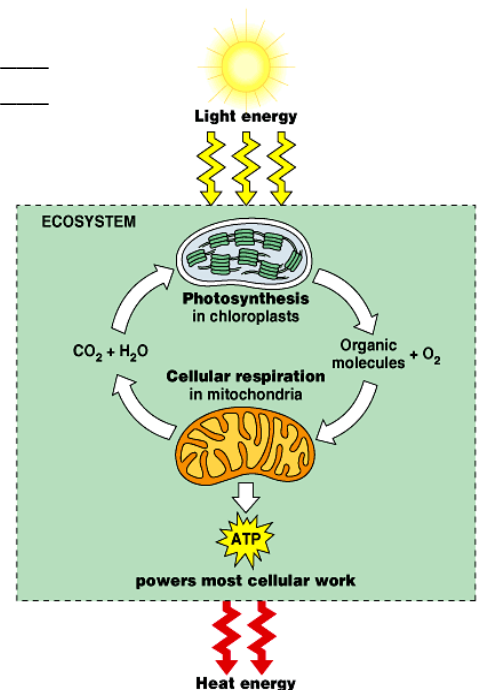
PRACTICE

Why is cellular respiration important?

What is the importance of ATP in a cell?

Comparison of Cellular Respiration and Photosynthesis

Process	Reactants	Products	Energy Change
Photosynthesis	Carbon dioxide, water	Glucose, oxygen	Light energy to chemical energy
Cellular Respiration	Glucose, oxygen	Carbon dioxide, water	Chemical energy to other chemical energy



PRACTICE

1. Energy flows through an ecosystem from—
 - a. the sun to autotrophs to heterotrophs
 - b. the sun to heterotrophs to autotrophs
 - c. autotrophs to heterotrophs and back to autotrophs
 - d. heterotrophs to autotrophs and back to heterotrophs
2. Which of the following is not an autotroph?
 - a. Blue-green bacteria
 - b. Algae
 - c. Plants
 - d. Humans
3. Which compound is a major energy carrier in the process of photosynthesis?
 - a. DNA
 - b. Water
 - c. ATP
 - d. Carbon dioxide
4. During photosynthesis, the light reactions take place in the _____, while the Calvin cycle takes place in the _____.
 - a. stroma, thylakoid
 - b. thylakoid, stroma
 - c. grana, thylakoid
 - d. stroma, grana
5. Cellular respiration involves an energy conversion. Which of the following represents the energy conversion that occurs during cellular respiration?
 - a. light energy to glucose
 - b. ATP to light energy
 - c. ATP to glucose
 - d. glucose to ATP
6. What do both glycolysis and fermentation have in common?
 - a. They require oxygen
 - b. They produce lactic acid and ethyl alcohol
 - c. They require light energy
 - d. They produce ATP
7. Glucose is the starting point for cellular respiration. Which type of biomolecule is glucose?
 - a. carbohydrate
 - b. lipid
 - c. protein
 - d. nucleic acid
8. Each chemical reaction that occurs in cellular respiration relies on an enzyme. What role does an enzyme play in cellular respiration?
 - a. an enzyme reverses a chemical reaction
 - b. an enzyme converts light energy into chemical energy
 - c. an enzyme speeds up a chemical reaction
 - d. an enzyme contains the genetic information needed for the chemical reaction to occur
9. Which of the following contains an organelle for respiration?
 - a. prokaryote
 - b. eukaryote
 - c. bacterial cell
 - d. cell without a nucleus