



Modeling Cellular Respiration

Activity

Both animals and plants carry out cellular respiration. Cells in both animals and plants contain organelles called mitochondria where cellular respiration happens. Mitochondria are sometimes called the powerhouse of the cell because this is where food, water, and oxygen convert into energy for life.

Cellular respiration uses glucose and oxygen to produce energy in the form of ATP molecules, along with water and carbon dioxide. ATP, or Adenosine Triphosphate ($C_{10}H_{16}N_5O_{13}P_3$), powers the organism's life activities, such as movement, excretion, and circulation. ATP molecules capture the energy released when chemical bonds break.

You may remember that photosynthesis uses water and carbon dioxide in the presence of chlorophyll and sunlight to produce glucose and oxygen in plants. Plants and animals then use the glucose as food. Combined with oxygen, glucose makes energy in the process of cellular respiration. In fact, the two chemical reactions are the reverse of each other. You will use snap cubes to model what happens in the mitochondria during cellular respiration in this activity.

Procedure

1. Your teacher will give each group a large picture of a mitochondrion.
2. Obtain three different colors of snap cubes. You will need the following:
 - 12 of one color, which will be the element hydrogen;
 - 6 of another color, which will be the element carbon; and
 - 18 of another color, which will be the element oxygen.
3. As a group, make a molecule glucose out of the snap cubes. The formula for glucose is:
$$C_6H_{12}O_6$$
4. As a group, make six molecules of oxygen. The formula for oxygen is O_2 .
5. Place the molecule of glucose and the models of oxygen on the picture of the mitochondrion in the labeled area.
6. Move all of the molecules into the mitochondrion and break all the bonds apart. The breaking of the bonds creates energy that is captured by ATP molecules and used by the cell for cellular activity.
7. Using the snap cubes in the mitochondrion, make six water molecules and six carbon dioxide molecules.
8. The formula for water is H_2O and the formula for carbon dioxide is CO_2 .



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Activity, continued

Procedure

9. Take them out of the mitochondrion and place them in the labeled area.
10. Answer the following questions in your lab journal.
 1. How many carbon atoms did you start with?
 2. How many carbon atoms were left in the mitochondrion?
 3. How many hydrogen atoms did you start with?
 4. How many hydrogen atoms were left in the mitochondrion?
 5. How many oxygen atoms did you start with?
 6. How many oxygen atoms were left in the mitochondrion?
 7. Where does the energy that ATP molecules capture come from?