

CHAPTER

1

Cellular Respiration

Learning Objectives

- Define cellular respiration.
- Summarize the significance of ATP.



Why do you need food?

The main reason you need to eat is to get energy. Food is your body's only supply of energy. However, this energy must be converted from the apple (or any other food you eat) into an energy source that your body can use. The process of getting energy from your food is called cellular respiration.

What is Cellular Respiration?

How does the food you eat provide energy? When you need a quick boost of energy, you might reach for an apple or a candy bar. But cells do not "eat" apples or candy bars; these foods need to be broken down so that cells can use them. Through the process of **cellular respiration**, the energy in food is changed into energy that can be used by the body's cells. Initially, the sugars in the food you eat are digested into the simple sugar **glucose**, a **monosaccharide**. Recall that glucose is the sugar produced by the plant during photosynthesis. The glucose, or the **polysaccharide** made from many glucose molecules, such as **starch**, is then passed to the organism that eats the plant. This organism could be you, or it could be the organism that you eat. Either way, it is the glucose molecules that holds the energy.

ATP

Specifically, during cellular respiration, the energy stored in glucose is transferred to ATP (**Figure 1.1**). **ATP**, or adenosine triphosphate, is chemical energy the cell can use. It is the molecule that provides energy for your cells to perform work, such as moving your muscles as you walk down the street. But cellular respiration is slightly

more complicated than just converting the energy from glucose into ATP. Cellular respiration can be described as the reverse or opposite of photosynthesis. During cellular respiration, glucose, in the presence of oxygen, is converted into carbon dioxide and water. Recall that carbon dioxide and water are the starting products of photosynthesis. What are the products of photosynthesis?

The process can be summarized as: glucose + oxygen \rightarrow carbon dioxide + water. During this process, the energy stored in glucose is transferred to ATP.

Energy is stored in the bonds between the phosphate groups (PO_4^-) of the ATP molecule. When ATP is broken down into ADP (adenosine diphosphate) and inorganic phosphate, energy is released. When ADP and inorganic phosphate are joined to form ATP, energy is stored. During cellular respiration, about 36 to 38 ATP molecules are produced for every glucose molecule.

Adenosine Triphosphate (ATP) structural formula

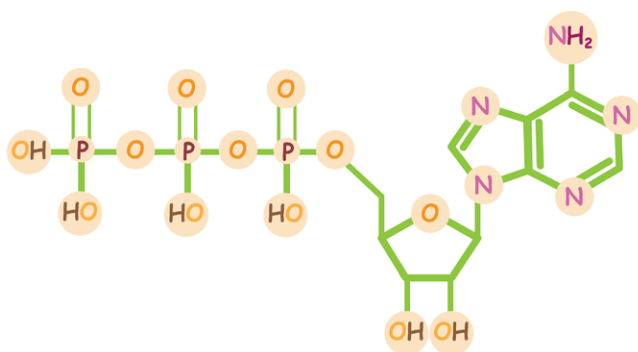
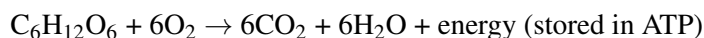


FIGURE 1.1

The structural formula for adenosine triphosphate (ATP). During cellular respiration, energy from the chemical bonds of the food you eat must be transferred to ATP.

What Happens During Cellular Respiration?

Cellular respiration involves many biochemical reactions. However, the overall process can be summed up in a single chemical equation:



Summary

- Through the process of cellular respiration, the energy in food is converted into energy that can be used by the body's cells.
- During cellular respiration, glucose and oxygen are converted into carbon dioxide and water, and the energy is transferred to ATP.

Explore More

Use the resource below to answer the questions that follow.

- **Define Cellular Respiration** at <http://www.youtube.com/watch?v=Sr9rYgYS1Fc> (1:02)