

# Cellular Respiration

## Reflect

We all need energy to survive. We use energy for daily activities, such as riding a bike home from school, studying, playing a game of catch with friends, and more. The energy that allows us to do these activities comes from the foods we eat. The most efficient way for our cells to collect this energy is through a process known as cellular respiration.



All life depends on plants.

## What Is Cellular Respiration?

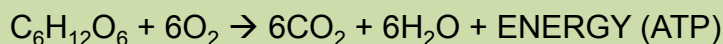
Cellular respiration is the set of chemical reactions that take place in the cells of organisms to convert energy from nutrients that we eat into energy bonds. Waste is a byproduct of this process and is released after each reaction.

Like the tearing down of building blocks, cellular respiration breaks down large molecules into smaller ones, a process known as a catabolic reaction. When the bonds are broken down, energy is released in the form of adenosine triphosphate (ATP).

Unlike chemical reactions such as photosynthesis, cellular respiration is an exothermic reaction. An exothermic reaction releases heat through chemical processes and molecule transformations.



To summarize, cellular respiration is a chemical process in which the bonds of food molecules, such as glucose ( $C_6H_{12}O_6$ ) and oxygen ( $O_2$ ) molecules, are broken down and new compounds, such as water ( $H_2O$ ) and carbon dioxide ( $CO_2$ ), are formed that can transport energy to muscles.



**adenosine triphosphate:**  
a nucleotide that contains a high amount of energy

**catabolic reaction:**  
reactions that break molecules into smaller ones

**exothermic:**  
a reaction that releases heat

# Cellular Respiration

## Reflect

### Why is Cellular Respiration Important?

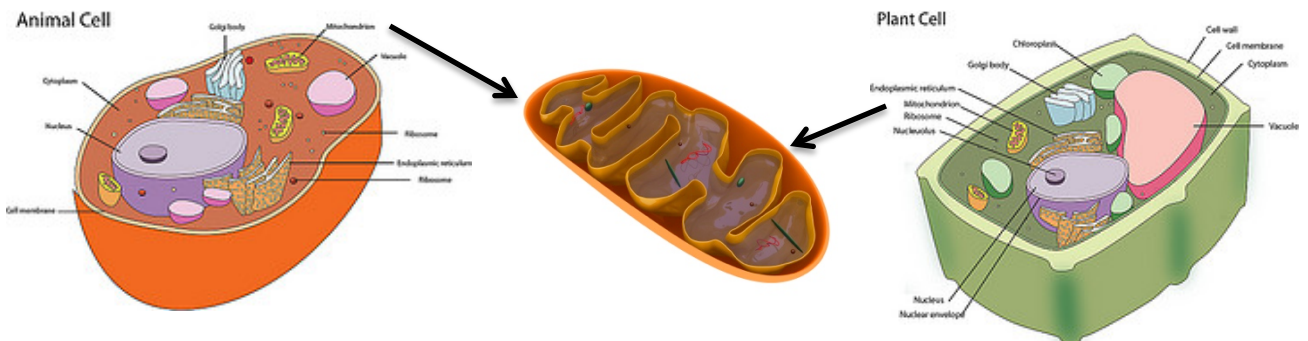
The process of cellular respiration is of the utmost importance to all life on Earth. This process is how organisms break down the food they eat into molecules that give them energy to perform daily functions.

Without the oxygen that cellular respiration brings into the cells, organisms would not be able to run any of the processes they need to survive. These processes include digestion, maintaining pH levels, filtering waste from the kidneys, pumping blood and nutrients through the body, and many others.

Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

### Who Can Respire?

All living things respire! Within the eukaryotic cell, respiration takes place within the mitochondria. Prokaryotes respire in their cytoplasm because they lack mitochondria and other membrane-bound organelles.



Plants and animals both have mitochondria and therefore both respire.

# Cellular Respiration

## Try Now

### What Do You Know?

Fill in the empty spaces with one of the terms below. Words may be used more than once or not at all.

Word Bank					
Cellular Respiration	ATP	Oxygen	$6H_2O$	$C_6H_{12}O_6$	Sun
$6CO_2$		Chlorophyll		$6O_2$	

+  →  +  +

Process of:

### Match each term with one definition.

mitochondria	a reaction that releases heat
exothermic	energy molecule
respiration	organelles where respiration occurs in eukaryotic cells
ATP	the process of breaking down large molecules into smaller ones

### Which of the organisms below require cellular respiration to survive?



Bacteria

Birds



Plants



Humans



Fish

# Cellular Respiration

## Connecting With Your Child

Respiration is the process of breaking larger molecules into smaller ones. For example, glucose and oxygen are broken down to make water and carbon dioxide and to release energy. There are many experiments and activities that you can do at home to show your child cellular respiration at work. To help your child learn more about cellular respiration, try the following experiments together.



### Experiment 1

#### Question of Inquiry:

*Can we see the carbon dioxide ( $\text{CO}_2$ ) produced by a plant from cellular respiration?*

#### Materials

- A light source (a window or outdoor area will work)
- One house plant
- Plastic wrap

#### Instructions:

1. Cover one or two of the house plant leaves loosely with the plastic wrap.
2. After a few hours, check the plastic wrap for condensation. The carbon dioxide released will appear as bubbles within the plastic wrap.

### Experiment 2

#### Question of Inquiry:

*What effects will we see when we combine yeast, sugar, and water?*

#### Materials

- One plastic Ziploc bag
- One small bag of active yeast (found in the baking section of a grocery store)
- Granulated sugar
- Small cup of warm water

#### Instructions:

1. Combine all ingredients into the Ziploc bag and seal it.
2. Within minutes, a reaction will occur and the bag will begin to inflate from the release of carbon dioxide from the yeast.

## Connecting With Your Child

Tip: Too much pressure in the bag will cause it to pop. Release pressure by opening the bag every once in awhile.

Here are some questions to discuss with child:

- What happened to the plastic wrap over the covered house plant leaves?
- What happened to the air pressure in the Ziploc bag?
- Do you think you would get similar results if a different house plant was used? What if the house plant was outside instead of inside?
- How would changing the amount of yeast affect the respiration rate in the Ziploc bag?