

Lesson Overview

9.1 Cellular Respiration:
An Overview

Lesson Overview Cellular Respiration: An Overview

THINK ABOUT IT

You feel weak when you are hungry because food serves as a source of energy. How does the food you eat get converted into a usable form of energy for your cells?

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Chemical Energy and Food

Where do organisms get energy?

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Chemical Energy and Food

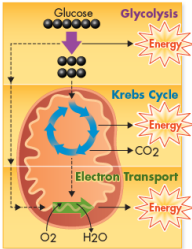
Where do organisms get energy?

Organisms get the energy they need from food.

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Stages of Cellular Respiration

The three main stages of cellular respiration are glycolysis, the Krebs cycle, and the electron transport chain.



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Chemical Energy and Food

Food provides living things with the chemical building blocks they need to grow and reproduce.

Food molecules contain chemical energy that is released when its chemical bonds are broken.

Chemical Energy and Food

Energy stored in food is expressed in units of calories. A **Calorie** is the amount of energy needed to raise the temperature of 1 gram of water by 1 degree Celsius. 1000 calories = 1 kilocalorie, or Calorie.

Chemical Energy and Food

Cells use all sorts of molecules for food, including **fats, proteins, and carbohydrates**. The energy stored in each of these molecules varies because their chemical structures, and therefore their energy-storing bonds, differ.

Chemical Energy and Food

Cells break down food molecules **gradually** and use the energy stored in the chemical bonds to produce compounds such as **ATP** that power the activities of the cell.

Overview of Cellular Respiration

➡ What is cellular respiration?

Overview of Cellular Respiration

Cellular respiration is the process that releases energy from food in the presence of oxygen.

Overview of Cellular Respiration

If oxygen is available, organisms can obtain energy from food by a process called **cellular respiration**. The summary of cellular respiration is presented below.

In symbols:



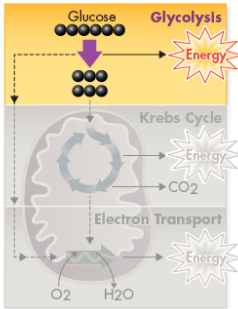
In words:

Oxygen + Glucose → Carbon dioxide + Water + Energy

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Stages of Cellular Respiration

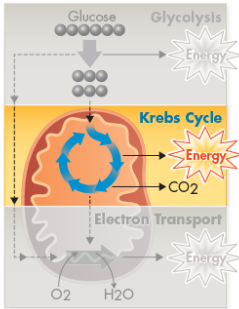
Glycolysis produces only a small amount of energy. Most of glucose's energy (90%) remains locked in the chemical bonds of pyruvic acid at the end of glycolysis.



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Stages of Cellular Respiration

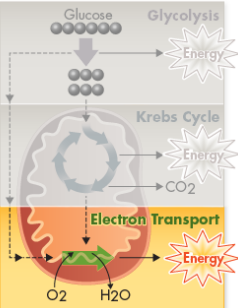
During the **Krebs cycle**, a little more energy is generated from pyruvic acid.



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Stages of Cellular Respiration

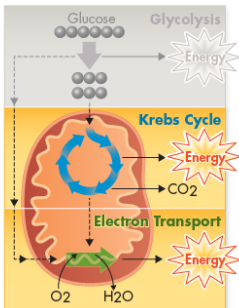
The **electron transport chain** produces the bulk of the energy in cellular respiration by using oxygen, a powerful electron acceptor.



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Oxygen and Energy

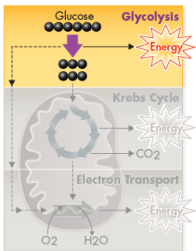
Pathways of cellular respiration that require oxygen are called **aerobic**. The Krebs cycle and electron transport chain are both aerobic processes. Both processes take place inside the mitochondria.



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Oxygen and Energy

Glycolysis is an **anaerobic** process. It does not directly require oxygen, nor does it rely on an oxygen-requiring process to run. However, it is still considered part of cellular respiration. Glycolysis takes place in the cytoplasm of a cell.



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Comparing Photosynthesis and Cellular Respiration

What is the relationship between photosynthesis and cellular respiration?

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Comparing Photosynthesis and Cellular Respiration

What is the relationship between photosynthesis and cellular respiration?

Photosynthesis removes carbon dioxide from the atmosphere, and cellular respiration puts it back. Photosynthesis releases oxygen into the atmosphere, and cellular respiration uses that oxygen to release energy from food.

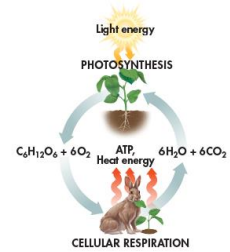
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Comparing Photosynthesis and Cellular Respiration

Photosynthesis and cellular respiration are opposite processes.

The energy flows in opposite directions. Photosynthesis "deposits" energy, and cellular respiration "withdraws" energy.

The reactants of cellular respiration are the products of photosynthesis and vice versa.



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Comparing Photosynthesis and Cellular Respiration

The release of energy by cellular respiration takes place in plants, animals, fungi, protists, and most bacteria.

Energy capture by photosynthesis occurs only in plants, algae, and some bacteria.

