




## 9.1 Cellular Respiration: An Overview

### Lesson Objectives

-  Explain where organisms get the energy they need for life processes.
-  Define cellular respiration.
-  Compare photosynthesis and cellular respiration.

### Lesson Summary

**Chemical Energy and Food** Chemical energy is stored in food molecules.

- ▶ Energy is released when chemical bonds in food molecules are broken.
- ▶ Energy is measured in a unit called a **calorie**, the amount of energy needed to raise the temperature of 1 gram of water 1 degree Celsius.
- ▶ Fats store more energy per gram than do carbohydrates and proteins.

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

- ▶ Cellular respiration captures the energy from food in three main stages:
  - glycolysis
  - the Krebs cycle
  - the electron transport chain
- ▶ Glycolysis does not require oxygen. The Krebs cycle and electron transport chain both require oxygen.
  - **Aerobic** pathways are processes that require oxygen.
  - **Anaerobic** pathways are processes that occur without oxygen.

**Comparing Photosynthesis and Cellular Respiration** The energy in photosynthesis and cellular respiration flows in opposite directions. Their equations are the reverse of each other.

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

## Chemical Energy and Food

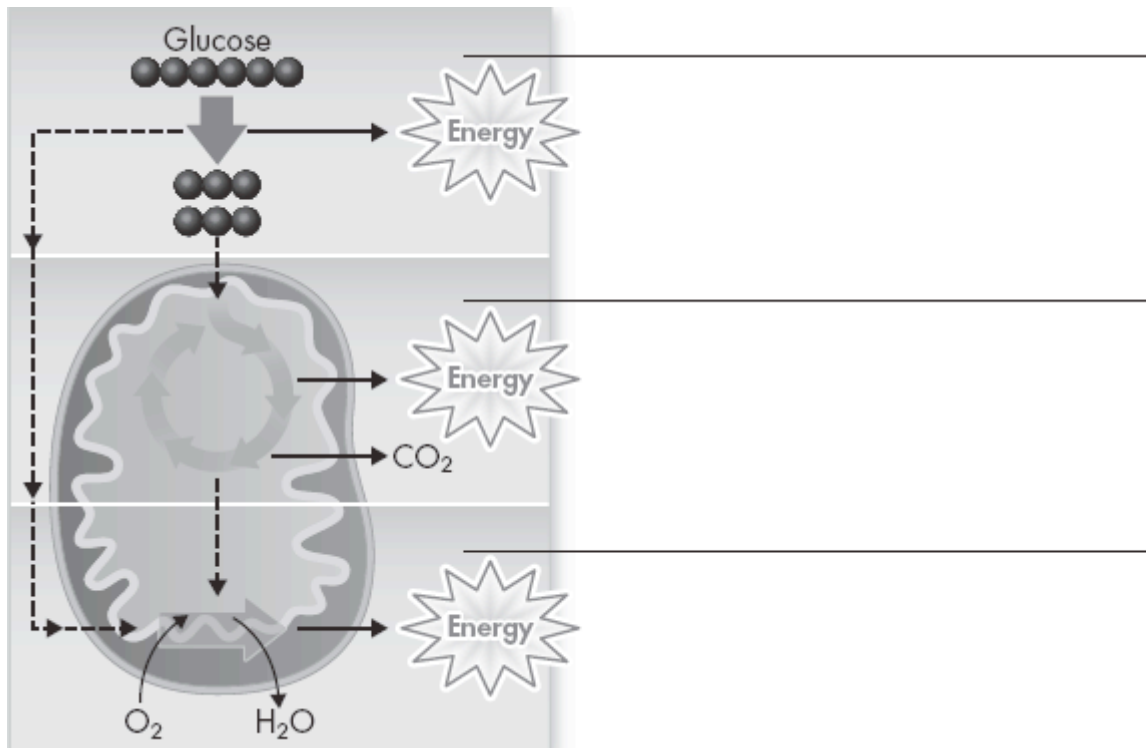
*For Questions 1–4, complete each statement by writing the correct word or words.*

1. A calorie is a unit of \_\_\_\_\_.
2. The Calorie used on food labels is equal to \_\_\_\_\_ calories.
3. A Calorie is also referred to as a \_\_\_\_\_.
4. Cells use the energy stored in chemical bonds of foods to produce compounds that directly power the cell's activities, such as \_\_\_\_\_.

## Overview of Cellular Respiration

For Questions 5–10, complete each statement by writing the correct word or words.

5. The equation that summarizes cellular respiration, using chemical formulas, is \_\_\_\_\_.
6. If cellular respiration took place in just one step, most of the \_\_\_\_\_ would be lost in the form of light and \_\_\_\_\_.
7. Cellular respiration begins with a pathway called \_\_\_\_\_, which takes place in the \_\_\_\_\_ of the cell.
8. At the end of glycolysis, about \_\_\_\_\_ percent of the chemical energy is locked in the bonds of the \_\_\_\_\_ molecule.
9. Cellular respiration continues in the \_\_\_\_\_ of the cell with the \_\_\_\_\_ and electron transport chain.
10. The pathways of cellular respiration that require oxygen are said to be \_\_\_\_\_. Pathways that do not require oxygen are said to be \_\_\_\_\_.
11. **THINK VISUALLY** Complete the illustration by adding labels for the three main stages of cellular respiration.



## Comparing Photosynthesis and Cellular Respiration

For Questions 12–15, write *True* if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

- \_\_\_\_\_ 12. The energy flow in photosynthesis and cellular respiration occurs in the same direction.
- \_\_\_\_\_ 13. Photosynthesis deposits energy in Earth’s “savings account” for living organisms.
- \_\_\_\_\_ 14. Cellular respiration removes carbon dioxide from the air.
- \_\_\_\_\_ 15. Photosynthesis takes place in nearly all life.
16. Complete the table comparing photosynthesis and cellular respiration.

A Comparison of Photosynthesis and Cellular Respiration		
Aspect	Photosynthesis	Cellular Respiration
Function	energy capture	
Location of reactions	chloroplasts	
Reactants		
Products		

### Apply the Big idea

17. How does an understanding of the process of cellular respiration support the theory that the cell is the basic functional unit of life?

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