

**Section  
6-3**

**Glycolysis and Respiration**

(pages 123-129)

**SECTION REVIEW**

Remember that the energy captured by photosynthesis is generally stored in the chemical bonds of the sugar glucose. This energy is released when the chemical bonds of glucose are broken. In this section you learned about two processes that release energy from glucose: glycolysis and respiration.

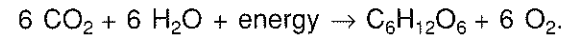
Glycolysis, which takes place in the cytoplasm of a cell, is the first stage in the breakdown of glucose. Glycolysis is a series of enzyme-mediated chemical reactions that change glucose one step at a time into different molecules. Ultimately, glycolysis transforms 1 molecule of 6-carbon glucose into 2 molecules of 3-carbon pyruvic acid. It also produces a small amount of energy in the form of ATP and NADH.

Respiration continues the breakdown of glucose by breaking down pyruvic acid to pro-

duce 34 molecules of ATP. In eukaryotes, respiration takes place in the mitochondria of a cell. The process of respiration can be divided into two parts: the Krebs cycle and the electron-transport chain.

Respiration can be defined as an oxygen-requiring process in which food molecules are broken down to release energy. Remember that the oxygen needed for respiration is taken in by breathing. And the food molecules used in respiration are not limited to glucose.

When a glucose molecule is totally broken down in the presence of oxygen, the energy produced is equivalent to 36 molecules of ATP. Following is the equation for this reaction:  $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O + \text{energy}$ . Note that this is the reverse of the equation for photosynthesis:



**Relating Terms: Building Vocabulary Skills**

In your own words, explain how the paired terms are related to each other.

1. Krebs cycle, electron-transport chain \_\_\_\_\_

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2. PGAL, pyruvic acid \_\_\_\_\_

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3. Glycolysis, respiration \_\_\_\_\_  
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**Examining Glycolysis and Respiration: Finding the Main Ideas**

1. Define the term *calorie*. \_\_\_\_\_  
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How many calories are released when 1 gram of glucose is completely broken down in the presence of oxygen? \_\_\_\_\_

How does this amount of energy compare to that released by glycolysis and respiration?

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2. What is the net energy gain in glycolysis? Explain. \_\_\_\_\_  
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3. What happens to the NADH produced in glycolysis? \_\_\_\_\_

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What happens to the pyruvic acid produced in glycolysis? \_\_\_\_\_

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4. What happens to pyruvic acid before it enters the Krebs cycle? \_\_\_\_\_

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5. What compounds are produced by the Krebs cycle for each molecule of acetic acid that enters the cycle? \_\_\_\_\_

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What happens to the carbon dioxide produced in your body during respiration?

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What happens to the NADH and FADH<sub>2</sub> molecules produced by the Krebs cycle?

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6. What happens to the high-energy electrons after they are passed to the electron-transport chain? \_\_\_\_\_

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As the high-energy electrons move through the electron-transport chain, some of their energy is released. How is this energy used? \_\_\_\_\_

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7. Why is the difference in charge across the inner mitochondrial membrane important?

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8. What happens to the high-energy electrons after they are passed to the electron-transport chain? \_\_\_\_\_

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Write a balanced equation for this reaction. \_\_\_\_\_

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Explain why respiration requires oxygen. \_\_\_\_\_

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How does your body obtain the oxygen needed for respiration? \_\_\_\_\_

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### ■ Concept Mapping

The construction of and theory behind concept mapping are discussed on pages vii–ix in the front of this Study Guide. Read those pages carefully. Then consider the concepts presented in Section 6–3 and how you would organize them into a concept map. Now look at the concept map for Chapter 6 on page 66. Notice that the concept map has been started for you. Add the key facts and concepts you feel are important for Section 6–3. When you have finished the chapter, you will have a completed concept map.