

**Chapter 8**

# Photosynthesis

## Section 8-1 Energy and Life (pages 201-203)

*This section explains where plants get the energy they need to produce food. It also describes the role of the chemical compound ATP in cellular activities.*

### Autotrophs and Heterotrophs (page 201)

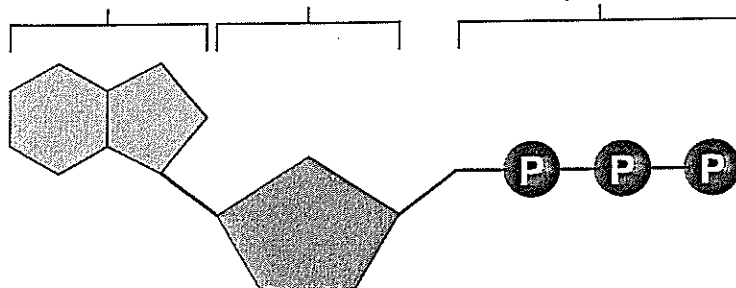
- Where does the energy of food originally come from? \_\_\_\_\_
- Complete the table of types of organisms.

**TYPES OF ORGANISMS**

Type	Description	Examples
	Organisms that make their own food	
	Organisms that obtain energy from the food they eat	

### Chemical Energy and ATP (pages 202-203)

- What is one of the principal chemical compounds that living things use to store energy? \_\_\_\_\_
- How is ATP different from ADP? \_\_\_\_\_
- Label each part of the ATP molecule illustrated below.



- When a cell has energy available, how can it store small amounts of that energy? \_\_\_\_\_
- When is the energy stored in ATP released? \_\_\_\_\_

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8. For what purpose do the characteristics of ATP make it exceptionally useful to all types of cells? \_\_\_\_\_  
\_\_\_\_\_
9. What are two ways in which cells use the energy provided by ATP?  
a. \_\_\_\_\_  
b. \_\_\_\_\_

### ATP and Glucose (page 203)

10. Why is it efficient for cells to keep only a small supply of ATP on hand?  
\_\_\_\_\_  
\_\_\_\_\_
11. Circle the letter of where cells get the energy to regenerate ATP.  
a. ADP    b. phosphates    c. carbohydrates    d. organelles

## Section 8-2 Photosynthesis: An Overview (pages 204-207)

*This section describes what important experiments revealed about how plants grow. It also introduces the overall equation for photosynthesis and explains the roles light and chlorophyll have in the process.*

### Introduction (page 204)

1. What occurs in the process of photosynthesis? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Investigating Photosynthesis (pages 204-206)

2. What did Jan van Helmont conclude from his experiment? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Circle the letter of the substance produced by the mint plant in Joseph Priestley's experiment.  
a. carbon dioxide    b. water    c. air    d. oxygen
4. What did Jan Ingenhousz show? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### The Photosynthesis Equation (page 206)

5. Write the overall equation for photosynthesis using words.  
\_\_\_\_\_
6. Write the overall equation for photosynthesis using chemical formulas. \_\_\_\_\_

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## Chapter 8, Photosynthesis (continued)

7. Photosynthesis uses the energy of sunlight to convert water and carbon dioxide into oxygen and high-energy \_\_\_\_\_.

### Light and Pigments (page 207)

8. What does photosynthesis require in addition to water and carbon dioxide? \_\_\_\_\_
9. Plants gather the sun's energy with light-absorbing molecules called \_\_\_\_\_.
10. What is the principal pigment of plants? \_\_\_\_\_
11. Circle the letter of the regions of the visible spectrum in which chlorophyll absorbs light very well.
- a. blue region
  - b. green region
  - c. red region
  - d. yellow region

### Reading Skill Practice

By looking at illustrations in textbooks, you can help yourself remember better what you have read. Look carefully at Figure 8-4 on page 206. What important ideas does this illustration communicate? Do your work on a separate sheet of paper.

## Section 8-3 The Reactions of Photosynthesis (pages 208-214)

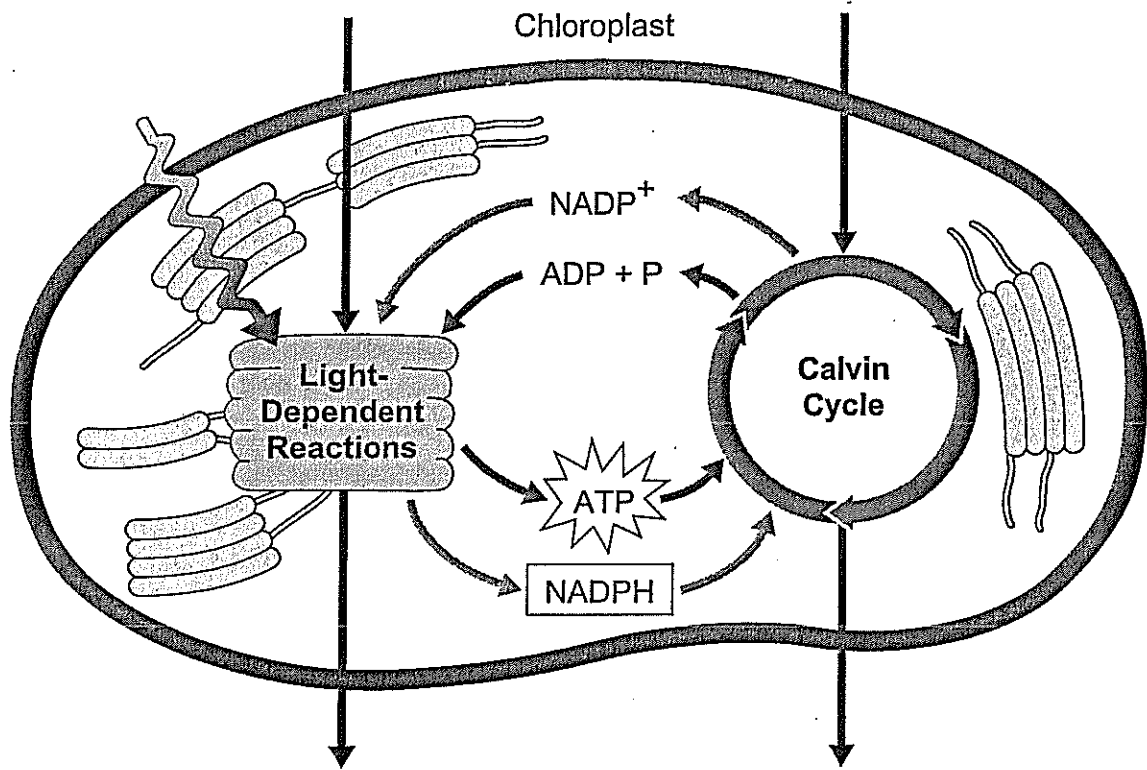
*This section explains what happens inside chloroplasts during the process of photosynthesis.*

### Inside a Chloroplast (page 208)

1. Chloroplasts contain saclike photosynthetic membranes called \_\_\_\_\_.
2. What is a granum? \_\_\_\_\_
3. The region outside the thylakoid membranes in the chloroplasts is called the \_\_\_\_\_.
4. What are the two stages of photosynthesis called?
- a. \_\_\_\_\_
  - b. \_\_\_\_\_

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

5. Complete the illustration of the overview of photosynthesis by writing the products and the reactants of the process, as well as the energy source that excites the electrons.



**NADPH** (page 209)

6. When sunlight excites electrons in chlorophyll, how do the electrons change? \_\_\_\_\_

7. What is a carrier molecule? \_\_\_\_\_

8. Circle the letter of the carrier molecule involved in photosynthesis.

a. H<sub>2</sub>O                      c. CO<sub>2</sub>

b. NADP<sup>+</sup>                    d. O<sub>2</sub>

9. How does NADP<sup>+</sup> become NADPH? \_\_\_\_\_

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## Chapter 8, Photosynthesis (continued)

### Light-Dependent Reactions (pages 210–211)

10. Circle the letter of each sentence that is true about the light-dependent reactions.

- a. They convert ADP into ATP.
- b. They produce oxygen gas.
- c. They convert oxygen into carbon dioxide.
- d. They convert  $\text{NADP}^+$  into NADPH.

11. Where do the light-dependent reactions take place? \_\_\_\_\_  
\_\_\_\_\_

12. Circle the letter of each sentence that is true about the light-dependent reactions.

- a. High-energy electrons move through the electron transport chain from photosystem II to photosystem I.
- b. Photosynthesis begins when pigments in photosystem I absorb light.
- c. The difference in charges across the thylakoid membrane provides the energy to make ATP.
- d. Pigments in photosystem I use energy from light to reenergize electrons.

13. How does ATP synthase produce ATP? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### The Calvin Cycle (pages 212–213)

14. What does the Calvin cycle use to produce high-energy sugars?  
\_\_\_\_\_  
\_\_\_\_\_

15. Why are the reactions of the Calvin cycle also called the light-independent reactions? \_\_\_\_\_

16. Circle the letter of each statement that is true about the Calvin cycle.

- a. The main products of the Calvin cycle are six carbon dioxide molecules.
- b. Carbon dioxide molecules enter the Calvin cycle from the atmosphere.
- c. Energy from ATP and high-energy electrons from NADPH are used to convert 3-carbon molecules into similar 3-carbon molecules.
- d. The Calvin cycle uses six molecules of carbon dioxide to produce a single 6-carbon sugar molecule.

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

### Factors Affecting Photosynthesis (page 214)

17. What are three factors that affect the rate at which photosynthesis occurs?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

18. Is the following sentence true or false? Increasing the intensity of light decreases the rate of photosynthesis. \_\_\_\_\_

### WordWise

*Answer the questions by writing the correct vocabulary terms from Chapter 8 in the blanks. Use the circled letter from each term to find the hidden word. Then, write a definition for the hidden word.*

1. What is the process called by which plants use the sun's energy to make high-energy sugars?

\_\_\_\_\_

2. What is the stage of photosynthesis called in which plants use the energy that ATP and NADPH contain to build high-energy sugars?

\_\_\_\_\_

3. What are the reactions of the first stage of photosynthesis called?

\_\_\_\_\_  
\_\_\_\_\_

4. What is the region called where the Calvin cycle takes place?

\_\_\_\_\_

5. What is an organism called that obtains energy from the food it consumes?

\_\_\_\_\_

6. What is one of the principle chemical compounds that living things use to store energy?

\_\_\_\_\_

\_\_\_\_\_

7. What is an organism called that makes its own food?

\_\_\_\_\_

Hidden word: \_\_\_\_\_

Definition: \_\_\_\_\_