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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)

1. Where does the energy of food originally come from? _____

_____

2. 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	

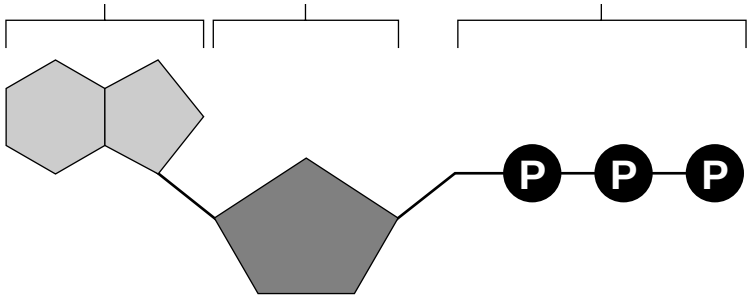
Chemical Energy and ATP (pages 202–203)

3. What is one of the principal chemical compounds that living things use to store energy? _____

4. How is ATP different from ADP? _____

_____

5. Label each part of the ATP molecule illustrated below.



6. When a cell has energy available, how can it store small amounts of that energy? _____

_____

7. 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. _____

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. _____

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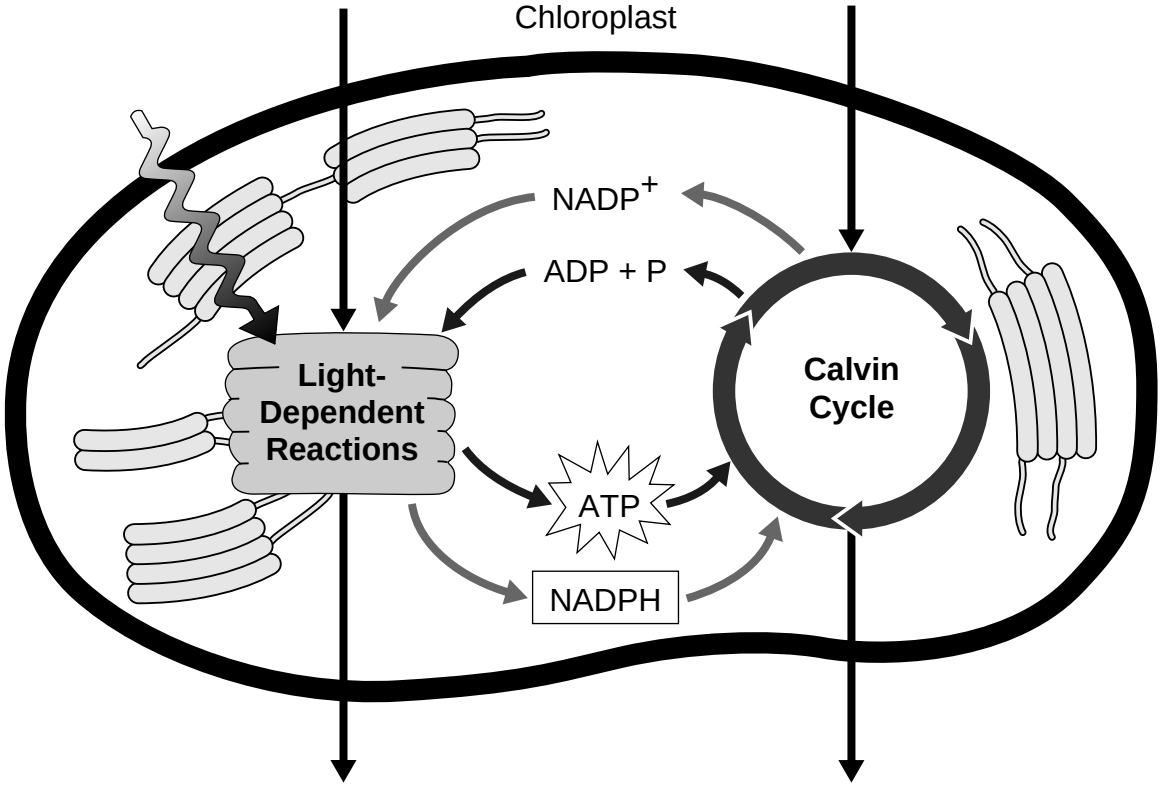
5. Complete the illustration of the overview of photosynthesis by writing the products and the reactants of the process, as well as the energy source that excites the electrons.



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_2O **c.** CO_2

b. $NADP^+$ **d.** O_2

9. How does $NADP^+$ become NADPH? _____

_____

_____

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 $NADP^+$ 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.

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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: _____

_____