




8.3 The Process of Photosynthesis

Lesson Objectives

-  Describe what happens during the light-dependent reactions.
-  Describe what happens during the light-independent reactions.
-  Identify factors that affect the rate at which photosynthesis occurs.

Lesson Summary

The Light-Dependent Reactions: Generating ATP and NADPH

Photosynthesis begins with these reactions, which occur in thylakoid membranes.

- ▶ **Photosystems** are clusters of proteins and chlorophyll in thylakoid membranes.
- ▶ High-energy electrons form when pigments in photosystem II absorb light. The electrons pass through **electron transport chains**, a series of electron carrier proteins.
 - The movement of electrons through an electron transport chain causes a thylakoid to fill up with hydrogen ions and generates ATP and NADPH.
 - **ATP synthase** is a membrane protein through which excess hydrogen ions escape a thylakoid in a process that makes ATP.

The Light-Independent Reactions: Producing Sugars They occur in the stroma of thylakoids and are commonly called the **Calvin cycle**.

- ▶ Six carbon dioxide molecules from the atmosphere enter the Calvin cycle and combine with 5-carbon compounds already present. They produce twelve 3-carbon molecules.
- ▶ Two 3-carbon molecules are removed from the cycle. They are used by the plant to build sugars, lipids, amino acids, and other compounds.
- ▶ The remaining ten 3-carbon molecules are converted back to 5-carbon molecules and begin a new cycle.

Factors Affecting Photosynthesis Many factors influence the rate of photosynthesis.

- ▶ Temperature, light intensity, and availability of water affect photosynthesis.
- ▶ C4 and CAM plants have a modified type of photosynthesis that enables the plants to conserve water in dry climates.

The Light-Dependent Reactions: Generating ATP and NADPH

For Questions 1–5, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

- _____ 1. Photosystems are clusters of chlorophyll and proteins.
- _____ 2. The light-dependent reactions begin when photosystem I absorbs light.
- _____ 3. Electrons from water molecules replace the ones lost by photosystem II.
- _____ 4. ATP is the product of photosystem I.
- _____ 5. ATP and NADPH are two types of protein carriers.

Name _____ Class _____ Date _____

6. How does ATP synthase produce ATP? _____

7. When sunlight excites electrons in chlorophyll, how do the electrons change?

8. Where do the light-dependent reactions take place? _____

9. Complete the table by summarizing what happens in each phase of the light-dependent reactions of photosynthesis.

Light-Dependent Reactions	Summary
Photosystem II	
Electron Transport Chain	
Photosystem I	
Hydrogen Ion Movement and ATP Formation	

