

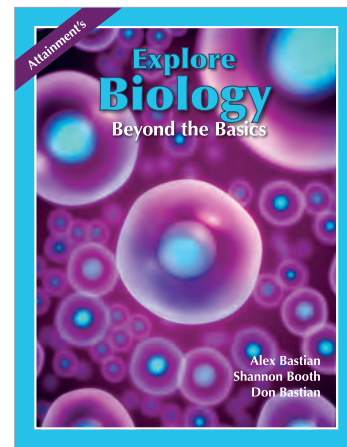
CHAPTER

6

Photosynthesis

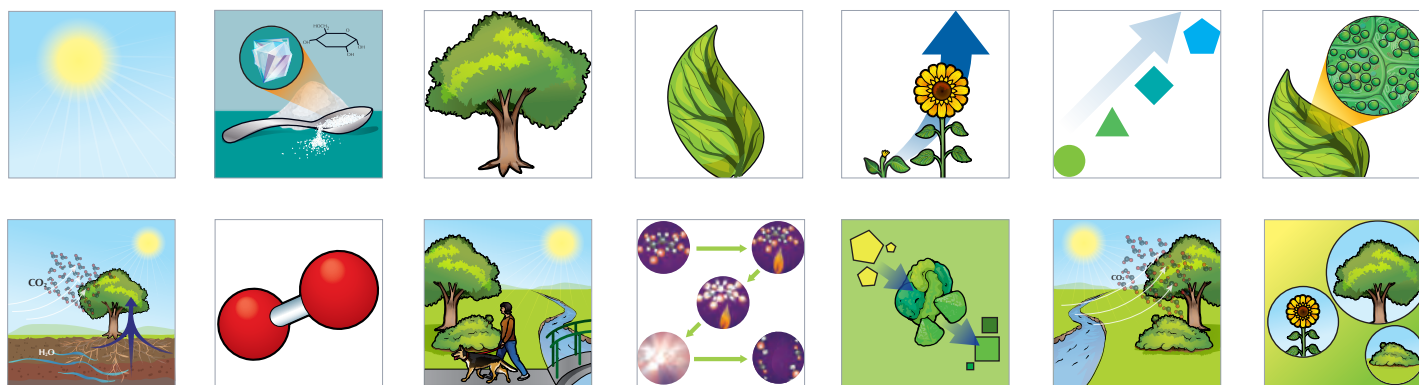


Photosynthesis



Plants obtain their food in a different way than animals. They use a process called photosynthesis to create sugars that can be used for energy. Photosynthesis occurs in special organelles called chloroplasts. There is a pigment known as chlorophyll inside the chloroplasts. This pigment takes energy from sunlight, and several chemical reactions occur turn combine molecules of carbon dioxide and water into sugar and oxygen. This sugar is used to make energy through cellular respiration, and excess oxygen is given off in the atmosphere. A lot of plant competition revolves around obtaining sunlight because it is such an important resource for plants.

Lesson	Type	Objective	Student Book Page	Content
6.39	Getting Started	Identify two facts about the major illustration	101–103	Chapter title page, Big Ideas, Major Illustration
6.40	Vocabulary and Overview	★ Identify that plants do photosynthesis	104–107	Vocabulary, Chapter 6 Overview
6.41	Topic Sequence A	★ Identify that plants make food out of sunlight, CO ₂ , and water ★ Identify that plants need sunlight to grow	108–110	Plants, Sunlight
6.42	Topic Sequence B and Animation	Identify that plants have chloroplasts that perform photosynthesis ★ Identify that photosynthesis is done with chemical reactions	111–113	Chloroplasts, Chemical Reactions
6.43	In Focus and Animation	Identify how plants compete like animals	114–115	Plant Competition
6.44	Lab	Grow plants in the sun and in the dark	116	Lab
6.45	Quiz/Review		117–118	Quiz



Chapter 6 SAMPLE IMAGES included in the Image Library

Photosynthesis

Lesson Type

Getting Started

Objective

- ▶ The student identifies two facts about the Major Illustration.

Chapter Title Page, p. 101

- ▶ Ask the students, “What do you think the chapter will be about?”
- ▶ The three images are a leaf, a sun, and a chloroplast. Ask the students, “Which two images are in plants?”
- ▶ Read the text on the page, then discuss the following points:
 - Plants are green.
 - Plants don’t move around like animals.
 - Sunlight is necessary for plants to grow.

Big Ideas, p. 102

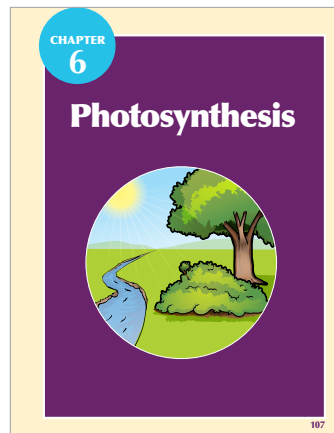
- ▶ Read the text for each Big Idea, and discuss the following points:
 - Photosynthesis is how plants get food.
 - Plants are green because of the need to do photosynthesis.
 - CO₂ is the same gas that humans breathe out.
 - Photosynthesis is used to get energy to the cells of plants.

Major Illustration, p. 103

- ▶ Read the text on the page, then discuss the following points:
 - There are a lot of different kinds of plants.
 - Most plants are green.
 - Sunlight comes from the sun.
 - Ask the students to point to the things in the picture that do photosynthesis.

Word Study

This everyday word is highlighted in the sample pages on the right: **CO₂**. Say the word aloud and ask the students to repeat it. Read the sentence in which it appears, and discuss its definition.

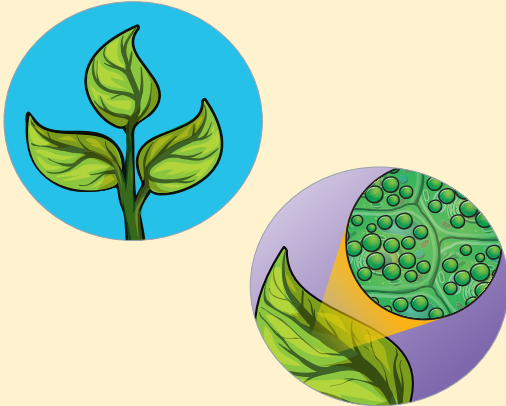


Introductory Script

“Today we are starting a new chapter called Photosynthesis. Photosynthesis is a very important process that plants do to get food and energy. Let’s start on page 101.”

chapter
6

Photosynthesis



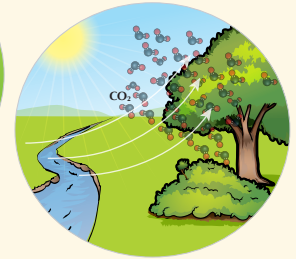
101



big ideas



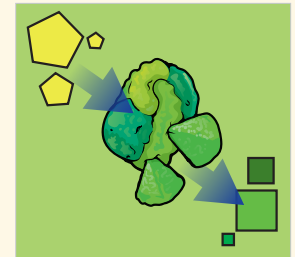
Plants do photosynthesis.



Plants make food out of sunlight, CO₂, and water.



Plants need sunlight to grow.



Photosynthesis is a chemical reaction.

102 Photosynthesis ... Chapter 6

Explore Biology

Photosynthesis



Photosynthesis

Lesson Type

Vocabulary and Overview

Objective

- ★ The student identifies that plants do photosynthesis.

Vocabulary, pp. 104–105

- ▶ Read each vocabulary word and its definition.
- ▶ Write the two “Find the words” on a whiteboard, and read them aloud.
- ▶ Ask the students to either (1) copy them in their **Student Book**, on the whiteboard, or on a separate piece of paper; or (2) point to the word you’ve written when it’s spoken.
- ▶ Use the corresponding **Study Cards** when presenting the vocabulary words.
- ▶ Tell the students that “each word will be reviewed again after it’s read in a lesson.”
- ▶ The quiz vocabulary words are **chloroplast**, **leaf**, and **sunlight**.
- ▶ Review the previous vocabulary words that are essential to this chapter: **energy**, **ATP**, and **chemical reaction**.

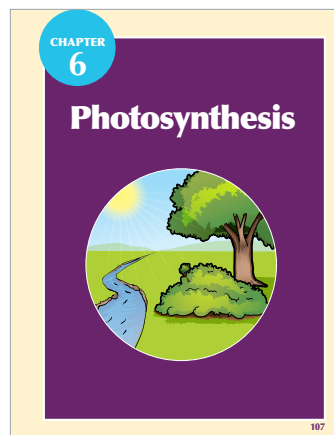
Chapter 6 Overview, pp. 106–107

Note: You can read and discuss the two passages together or separately.

- ▶ Read the title “Chapter 6 Overview” and look at the images and corresponding captions. Then discuss the following points:
 - Plants need sunlight to grow.
 - Trees in a forest are tall so they can get sunlight.
 - Some sunlight gets through the trees to help the smaller plants grow as well.
 - Many people have gardens with colorful flowers.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, review the definitions of the new vocabulary words in the passage: **plants**, **photosynthesis**, and **sunlight**.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, discuss three ideas in the two passages, for example:
 - Plants do photosynthesis.
 - Sunlight is needed for photosynthesis.
 - Humans take in oxygen through the respiratory system.
- ▶ Review all three of the vocabulary words in the Chapter Overview and their definitions.

Word Study

These everyday words are highlighted in the sample pages on the right: **release**, **survival**, **slightly**. Say the words aloud and ask the students to repeat them. Read the sentences in which they appear, and discuss their definitions.



Introductory Script

“The chapter we’re studying is called *Photosynthesis*. Today we’ll review important vocabulary words like **leaf** and **sugar**. Then we’ll read the Chapter Overview. Let’s begin on page 104.”



vocabulary



plants

Mostly green organisms that make their own food.



photosynthesis

The process that *plants* use to make their own food.



sunlight

Energy that comes from the sun as light.



chloroplast

The organelle that performs *photosynthesis*.



They make their own food and are mostly green organisms.



vocabulary



leaf

A flat, usually green, part of a *plant*.



growth

Increase in size.



convert

To make something change.



sugar

A sweet substance made of carbohydrates that gives organisms energy.



To make something change.



chapter 6 overview



Forests are ecosystems with many trees.

Plants use a special process called **photosynthesis** to make their own food. This way, they don't have to search for food. A few other organisms also use photosynthesis, including bacteria called cyanobacteria. However, they use it in a **slightly** different way. Both can make their own food using only air, water, and **sunlight**.



Not all parts of a plant are green. Flowers can be many colors.



chapter 6 overview



Humans need plants to survive.

Humans and other organisms need plants because they **release** oxygen during photosynthesis. Oxygen is needed for **survival**. Because of plants, there is always enough oxygen in the air to live. Plants also need oxygen to survive. The relationship between plants and humans is very important. Without plants, many organisms could not exist.

Photosynthesis

Lesson Type

Topic Sequence A

Objectives

- ★ The student identifies that plants need sunlight to grow.
- ★ The student identifies that plants make food out of sunlight, CO₂, and water.

Plants, pp. 108–109

Note: You can read and discuss the two passages together or separately.

- ▶ Read the title “Plants” and look at the images and corresponding captions. Then discuss the following points:
 - Flowers can be many different colors.
 - Flowers and all other plants have leaves.
 - Leaves turn different colors in the fall.
 - The roots make a tree sturdy and get nutrients for the tree.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, review the definitions of the new vocabulary words in the passage: **chloroplast**, **leaf**, and **growth**.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, discuss four ideas in the two passages, for example:
 - Plants need sunlight to grow.
 - Plants make food out of sunlight, CO₂, and water.
 - Plants need to be watered. This often comes from the rain.
 - Humans have all the characteristics to be alive as well.
- ▶ Review all three of the vocabulary words in the Chapter Overview and their definitions.

Sunlight, p. 110

- ▶ Read the title “Sunlight” and look at the images and corresponding captions. Then discuss the following points:
 - The sun gives energy to Earth.
 - The sun is needed for there to be life on Earth.
 - The other planets do not have life on them.
- ▶ Read the passage and ask students to “follow along in your book as I read the text to you.” When finished, discuss two ideas in the passage, for example:
 - The sun is very hot. It has a lot of energy that it gives to Earth.
 - The energy from the sun is used to make food for cells.
- ▶ Review the three vocabulary words in the lesson and their definitions.

Word Study

These everyday words are highlighted in the sample pages on the right: **wide**, **flat**, **dependent**, **support**. Say the words aloud and ask the students to repeat them. Read the sentences in which they appear, and discuss their definitions.



Introductory Script

“The chapter we’re studying is called Photosynthesis. Today we’ll read three interesting passages. They are all about how the sun helps plants grow. Let’s begin on page 108.”

Plants



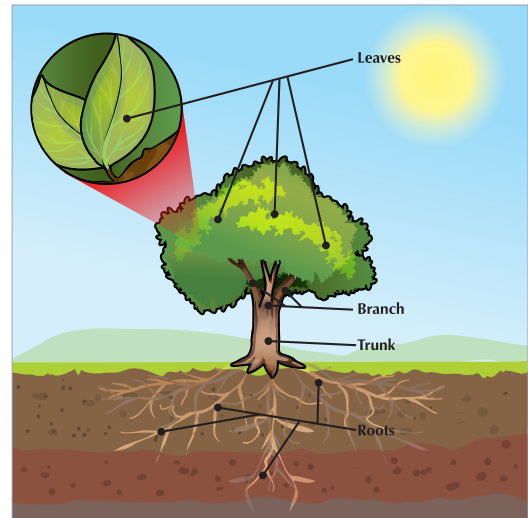
Plants can be very colorful.

Plants have very special organelles called **chloroplasts** that make photosynthesis possible. The **leaves** of plants perform most of the photosynthesis. Leaves work



The leaves of a plant perform most of the photosynthesis.

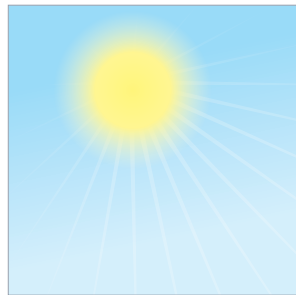
well because they are **wide** and **flat**, so there's a lot of room for light to hit. The **growth** and survival of plants are **dependent** on this process. It is performed by all plants, from giant trees to tiny blades of grass.



Each part of a plant serves a purpose.

Even though plants don't eat, they still need to drink. They use their roots to drink water from the soil, so it's important that plants get enough water. Plants also get other nutrients from the soil. Plants have all the characteristics needed to be alive. They just get food in a different way.

Sunlight



The sun gives Earth light and heat.

The sun's light reaches Earth even though it's very far away. This keeps Earth warm enough to **support** life. Sunlight has a lot of energy. The energy from sunlight is different from the type of energy found in ATP. Plants use the sun's energy to make food through photosynthesis. Some plants need more sunlight than others to grow and make food.



The sun makes life on Earth possible.

Photosynthesis

Lesson Type

Topic Sequence B and Animation



Objectives

- ★ The student identifies that plants have chloroplasts that perform photosynthesis.
- ★ The student identifies that photosynthesis is done with chemical reactions.

Chloroplasts, p. 111

- ▶ Read the title “Chloroplasts” and look at the image and corresponding caption. Then discuss the following points:
 - Chloroplasts make plants look green.
 - Cells in leaves have many chloroplasts to do photosynthesis.
 - Plant cells are squarer than animal cells.
- ▶ Read the passage and ask students to “follow along in your book as I read the text to you.” When finished, discuss three ideas in the passage, for example:
 - Plants have chloroplasts that perform photosynthesis.
 - Chloroplasts are an organelle that animals don’t have. Point out that there are no chloroplasts on the **Animal Cell Model**.
 - The endosymbiotic theory applies to chloroplasts.

Note: You can read and discuss the two passages together or separately.

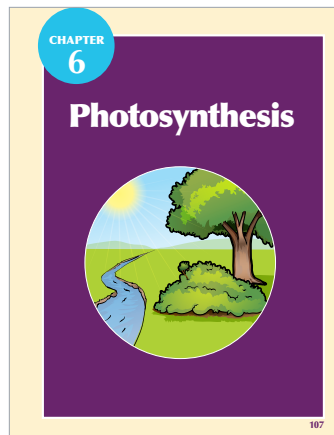
- ▶ Read the title “Chemical Reactions” and look at the images and corresponding captions. Then discuss the following points:
 - The sugar is a bigger molecule than the other three.
 - Air, soil, and sunlight are all needed for plants to grow.
 - Humans breathe in oxygen.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, review the definitions of the new vocabulary words in the passage: **convert** and **sugar**.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, discuss four ideas in the two passages, for example:
 - Plants need energy and nutrients just like animals and all cells.
 - Photosynthesis is done with chemical reactions.
 - The sugar that is made is food for the plants.
 - Cellular respiration was the focus of Chapter 5. Review what cellular respiration is.
- ▶ Review the two vocabulary words in the lesson and their definitions.

Animation

- ▶ There is an animation about photosynthesis to show with this lesson.
 - The animation shows the process of photosynthesis as it occurs inside the chloroplasts.

Word Study

These everyday words are highlighted in the sample pages on the right: **pigment**, **captures**, **store**. Say the words aloud and ask the students to repeat them. Read the sentences in which they appear, and discuss their definitions.



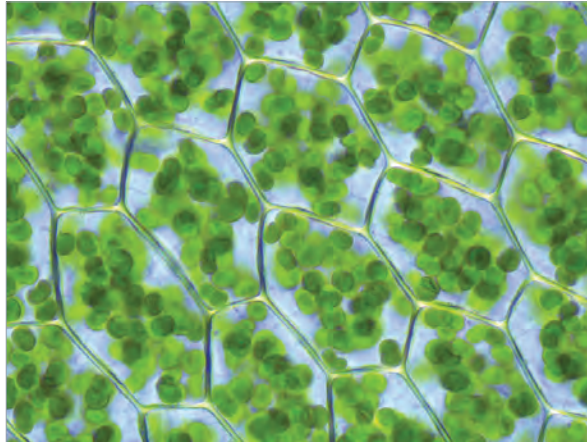
Introductory Script

“The chapter we’re studying is called Photosynthesis. Today we’ll read three interesting passages. They are about the organelles that do photosynthesis and the chemical reactions that happen there. Let’s begin on page 111.”

Reference Guide

Animations
Photosynthesis

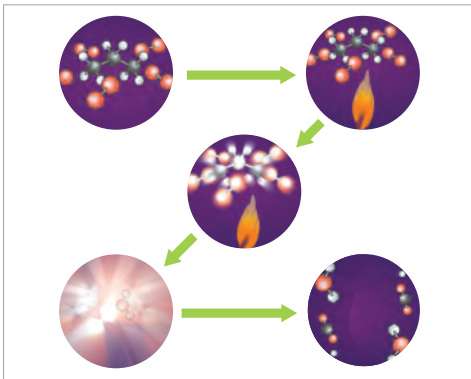
Chloroplasts



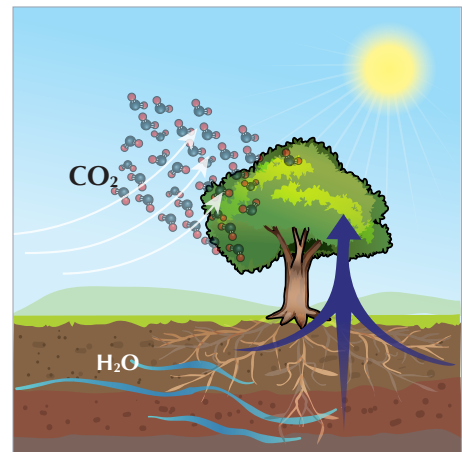
There are many chloroplasts in a cell.

Chloroplasts are the organelles in plant cells that perform photosynthesis. They have two membranes, much like mitochondria. One plant cell can contain up to 100 chloroplasts. Human and other animal cells don't have any. These organelles contain chlorophyll, which captures sunlight. Chlorophyll is a pigment that gives plants their green color.

Chemical Reactions

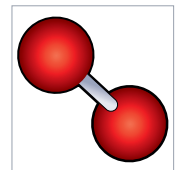


Photosynthesis is a series of chemical reactions that happens in all plants. Plants take carbon dioxide (CO₂) and water (H₂O) and **convert** them into oxygen (O₂) and **sugar**. They do this by using the sun's energy. Plants turn the energy from sunlight into energy as ATP. This process also turns water into oxygen. Then that energy from ATP is used to convert carbon dioxide into sugar.



Plants use the resources around them to get what they need.

Plants use carbon dioxide from the air, water from the soil, and energy from the sun to make food in the form of sugar. Plants **store** these sugars. At night, when there is no sunlight, plants get all their energy from these sugars. They do this by performing cellular respiration. Plants don't use all the oxygen they make from photosynthesis, so they put some of it back in the air for humans and other organisms to breathe.



Plants release oxygen that humans need to breathe.

Photosynthesis

Lesson Type

In Focus and Animation

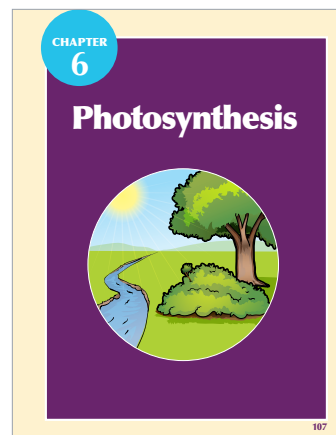
Objective

- ▶ The student identifies that plants compete like animals.

In Focus: Plant Competition, pp. 114–115

Note: You can read and discuss the two passages together or separately.

- ▶ Read the title “Plant Competition” and look at the images and corresponding captions. Then discuss the following points:
 - Plants that don’t get enough sunlight will die.
 - Some plants come back quickly after a fire.
 - Fire helps many ecosystems stay healthy.
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.”
- ▶ Read the passage and ask the students to “follow along in your book as I read the text to you.” When finished, discuss six ideas in the two passages, for example:
 - Tall trees often block sunlight from smaller plants.
 - Plants can’t do photosynthesis without sunlight.
 - Fire can burn an ecosystem.
 - Fire can be started by lightening.
 - A worse competitor will eventually die.
 - The best competing plant will eventually dominate the ecosystem.



Introductory Script

“The chapter we’re studying is called Photosynthesis. Today we’ll read the In Focus passages about plant competition. Plants compete with other plants to survive. Let’s begin on page 114.”

Animation

- ▶ There is an animation about plant competition.
 - The animation shows how plants in an area compete for resources.

Word Study

These everyday words are highlighted in the sample pages on the right: **surrounding**, **odd**, **dominate**. Say the words aloud and ask the students to repeat them. Read the sentences in which they appear, and discuss their definitions.

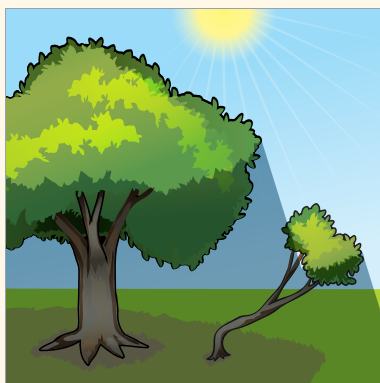
Reference Guide

Animations
Plant Competition



in focus

Plant Competition

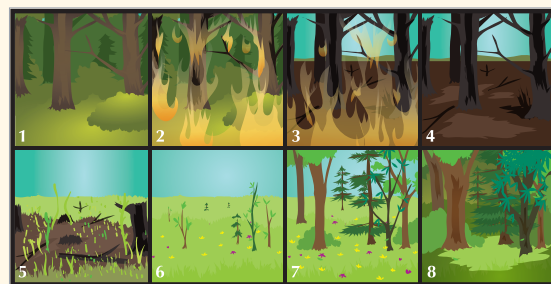


Some plants change the direction they grow so they can get enough sunlight.

Plants compete with each other for survival, just like all other organisms. They compete with **surrounding** plants for sunlight by growing larger leaves and taller stems. Plants can grow in very **odd** ways when other plants are blocking them from sunlight. Plants compete because they will die if they don't get enough sunlight.



in focus



Plant competition is most evident after an ecosystem is destroyed.

Plants compete a lot after part of an ecosystem is destroyed. Competition often happens after a fire burns everything. Certain plants grow back quickly after a fire. Other plants take a while to grow but are better at competing for sunlight and other resources. Eventually, the best competitors will **dominate** the ecosystem until it's destroyed again.

Photosynthesis

Lesson Type

Lab

Objective

- ▶ The students grow plants in the sun and in the dark.

Lab Overview

Brassica Rapa, or fast plants, are a common plant grown in biology classes. For this lab, a plant's need for sunlight is highlighted. Planted seeds are placed in the sun and in the dark, showing the impact sun and photosynthesis have on a plant.

Lab Setup

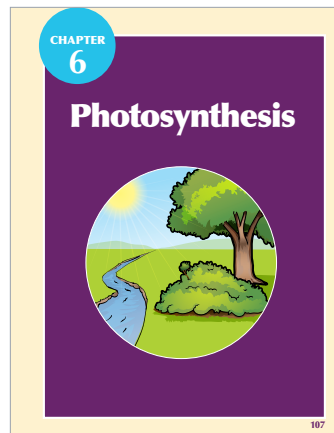
- ▶ Get the following materials ready for the lesson:
 - Brassica Rapa seeds, soil, small vessel.

Lab, p. 116

- ▶ Read the text on the page, and explain how the lab relates to the chapter.
 - Only plants do photosynthesis.
 - Plants can't grow without sunlight.
 - Sunlight is required for photosynthesis.

Procedure

- ▶ Choose the procedure that works for you:
 - Have the students do the lab independently and check the answers at the end.
 - Do the lab together as a class.
 - Do the lab in a small group of four students or less, providing individual support as needed.
- ▶ Gather all materials.
 - Plant the seeds in the soil, leaving about an inch of space between seeds.
 - Place half of the plants in the sunlight and the other half in a drawer or dark place.
 - Water the plants regularly and check their progress.
 - Ask the students which plants grew better.
 - Indicate again that plants need sunlight for photosynthesis.
- ▶ Have the students answer the three questions or go through the answers with them. Print the page from the flash drive if you don't want students writing in the book. The correct answers are circled on the copy of the student page in this book.



Introductory Script

“The chapter we’re studying is called Photosynthesis. Today’s lesson is a lab. We are going to see how plants need sunlight to grow. Let’s begin on page 116.”



lab



Student Questions:

1. Circle which is better for plants.
no sunlight **sunlight** no water
2. Circle the group of plants that grew better.
in the light in the dark neither
3. Circle the color of the plant when it grows.
blue red **green**

Photosynthesis

Lesson Type

Quiz/Review

Procedure

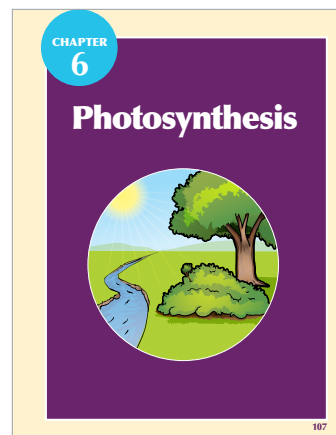
- ▶ Review the **Study Cards** for the chapter. Review all the cards first. The three vocabulary words on the quiz are **chloroplast**, **leaf**, and **sunlight**. These three cards can be further reviewed to help prepare for the quiz.

Quiz, pp. 117–118

- ▶ Choose the procedure that works for you:
 - Have the students take the quiz in the book independently.
 - Read the questions and choices to the students, and have them circle or point to their answers.
 - Use the quiz as a chapter review and not a comprehension assessment.
- ▶ The quiz is also available in two digital formats: PDF and GoWorksheet Maker.
 - Print out the quiz with symbols from the PDF for the students to write on.
 - Have the students take the quiz without symbols (PDF or GoWorksheet) after the book quiz as a review.
 - Have students only take the GoWorksheet Maker quiz.

Write About It

- ▶ Choose the method that works for you:
 - Have the students complete the Write About It exercise independently.
 - Read the writing ideas from the Write About It **Reference Guide** to the students to stimulate their writing.
 - Have the students apply sentence strips in the Write About It exercise as an alternative to writing.





quiz

Circle the correct answer.

1. ____ do photosynthesis.

Plants



Antibodies



Humans



2. Plants make ____ out of sunlight, CO₂, and water.

bacteria



food



convert



3. Plants need sunlight to ____.

grow



sugar



mitosis



4. ____ is a chemical reaction.

Chromosome



Photosynthesis



Sunlight



5. ____ are the organelles that perform photosynthesis.

Phases



Growth



Chloroplasts



6. ____ are the flat and usually green part of plants.

Water



Sugar



Leaves



7. Energy that comes from the sun as light is known as ____.

sunlight



plants



embryo



write about it