About the Consultant

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Dear Science Teacher,

As you begin a new school year, one of the biggest challenges you probably will encounter is getting students to read their textbooks. Informational text can overwhelm students, leaving them less likely to read and more likely to become apathetic about learning. I believe that this Science Notebook will help students use their textbooks more effectively as they learn about science.

Note-Taking and Student Success

There is considerable research evidence that addresses how students understand difficult concepts and content in school. Glencoe/McGraw-Hill has developed the Science Notebook for science students based upon that research. Evidence indicates that students need to know how to take notes, use graphic organizers, learn vocabulary, and develop their thinking skills by writing in order to achieve academic success.

The ability to take and organize notes predicts how well students will do in school. Peverly, Brobst, Graham, and Shaw (2003) showed that when students use background knowledge and take notes, they are likely to perform well on tests. Pauk (1974) observed that note-taking is a critical skill for college success. Notes serve as an external storage function (meaning on the paper) that builds comprehension and content understanding (Ganske, 1981). This Science Notebook is a tool that students can use to achieve this goal. I would like to share some of the features of this Science Notebook with you before you begin teaching.

The Cornell Note-Taking System

First, you will notice that the pages in the Science Notebook are arranged in two columns, which will help students organize their thinking. This two-column design is based on the Cornell Note-Taking System, developed at Cornell University. Faber, Morris, and Lieberman (2000) found that the Cornell Note-Taking System improves comprehension and increases test scores.

The column on the left side of the page highlights the main ideas and vocabulary of the lesson. This column will help students find information and locate the references in their textbooks quickly. Students also can use this column to sketch drawings that help them visually remember the lesson’s information. In the column on the right side of the page, students will write detailed notes about the main ideas and vocabulary. The notes they take in this column will help them focus on the important information in the lesson. As students become more comfortable using the Cornell Note-Taking System, they will see that it is an important tool that helps them organize information.

The Importance of Graphic Organizers

Second, there are many graphic organizers in this Science Notebook. Graphic organizers allow students to see the lesson’s important information in a visual format. In addition, graphic organizers help students summarize information and remember the content. I hope that you will encourage students to use the graphic organizers because they will help them understand what they are reading.
Research-Based Vocabulary Development

Third, you will notice that vocabulary is introduced and practiced throughout the Science Notebook. When students know the meaning of the words used to discuss information, they are able to understand that information better. Also, students are more likely to be successful in school when they have vocabulary knowledge. When researchers study successful students, they find that as students acquire vocabulary knowledge, their ability to learn improves (Martino and Hoffman, 2002). The Science Notebook focuses on learning words that are very specific to understanding the content of the textbook. The Science Notebook also highlights general academic words that students need to know so that they can understand any textbook. These vocabulary words are based on the Academic Word List (AWL) developed by Averil Coxhead. The AWL includes the most common 570 words found in academic texts, excluding the 2,000 general English words such as the, in, and that. Research indicates that students who master the words on Coxhead’s list score significantly higher on standardized tests.

Writing Prompts and Note-Taking

Finally, there are a number of writing exercises included in this Science Notebook. Writing is a useful tool that helps students understand the information that is being presented. Writing helps them assess what they have learned. You will see that many of the writing exercises require students to practice the skills of good readers. Good readers make connections between their lives and the text and predict what will happen next in the reading. They question the information and the author of the text, clarify information and ideas, and visualize what is described in the text. Good readers also summarize the information that is presented and make inferences or draw conclusions about the facts and ideas.

I wish you well as you begin another school year. This Science Notebook is designed to help students understand the information in your science class. The guide will be a valuable tool that also will provide students with skills that they can use throughout their lives.

I hope you have a successful school year.

Sincerely,
Douglas Fisher

References


Note-Taking Tips

Your notes are a reminder of what you learned in class. Taking good notes can help you succeed in science. These tips will help you take better notes.

• Be an active listener. Listen for important concepts. Pay attention to words, examples, and/or diagrams your teacher emphasizes.

• Write your notes as clearly and concisely as possible. The following symbols and abbreviations may be helpful in your note-taking.

<table>
<thead>
<tr>
<th>Word or Phrase</th>
<th>Symbol or Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>for example</td>
<td>e.g.</td>
</tr>
<tr>
<td>such as</td>
<td>i.e.</td>
</tr>
<tr>
<td>with</td>
<td>w/</td>
</tr>
<tr>
<td>without</td>
<td>w/o</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Word or Phrase</th>
<th>Symbol or Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>and</td>
<td>+</td>
</tr>
<tr>
<td>approximately</td>
<td>≈</td>
</tr>
<tr>
<td>therefore</td>
<td>.:.</td>
</tr>
<tr>
<td>versus</td>
<td>vs</td>
</tr>
</tbody>
</table>

• Use a symbol such as a star (★) or an asterisk (*) to emphasize important concepts. Place a question mark (?) next to anything that you do not understand.

• Ask questions and participate in class discussion.

• Draw and label pictures or diagrams to help clarify a concept.

Note-Taking Don’ts

• Don’t write every word. Concentrate on the main ideas and concepts.

• Don’t use someone else’s notes—they may not make sense.

• Don’t doodle. It distracts you from listening actively.

• Don’t lose focus or you will become lost in your note-taking.
This note-taking guide is designed to help your students succeed in learning science content. Each chapter includes:

**Language-Based Activities**
Activities cover the content in your science book through vocabulary development, process writing, note-taking tools, analytical application, and real-world problem solving.

**Anticipation Guide/KWL Charts**
Activate students’ prior knowledge before beginning a lesson, engage them in active thinking during reading, and diagnose misconceptions.

**Science Journal**
Students assess what they know through written response.

**Writing Activities**
These activities help students process information and make connections between concepts and the real world.

**Academic Vocabulary**

- **Vocabulary Development**
This incorporates the three types of vocabulary words students need to learn to better understand content. The Academic Glossary helps students to score higher on standardized tests.
Note-Taking Based on the Cornell Two-Column Format
Students practice effective note-taking through the use of graphic organizers, outlines, SQ3R, and written summaries.

Chapter Wrap-Up
This brings the information together. Revisiting the Anticipation Guide/KWL Chart allows another opportunity for teachers to discuss misconceptions. You and your students can assess what they have learned.

Review Checklist
This list helps students assess what they have learned and prepare to study for chapter tests.

Graphic Organizers
These organizers offer a variety of visual organizers that will help students organize, analyze, and summarize information and remember content.
Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Exploring and Classifying Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• All science takes place in laboratories.</td>
</tr>
<tr>
<td></td>
<td>• All of the changes that take place during an organism’s life are called responses.</td>
</tr>
<tr>
<td></td>
<td>• Spontaneous generation is the idea that living things come from nonliving things.</td>
</tr>
<tr>
<td></td>
<td>• Organisms are classified into groups based on their similarities.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List three characteristics that you would use to classify underwater life.

Students’ responses will vary. Characteristics might include method of movement, shape of body, and what they eat.
Exploring and Classifying Life
Section 1 What is science?

Scan the list below to preview Section 1 of your book.
- Read all section headings.
- Read all bold words.
- Read all charts and graphs.
- Think about what you already know about how to solve problems.

Write three facts you discovered about scientific methods as you scanned the section. Accept all reasonable responses.
1. Scientists develop hypotheses.
2. Only one variable in an experiment should be changed.
3. Opinions, scientific theories, and scientific laws are different.

Write a paragraph describing scientific methods. Use all of the vocabulary words in your description. Underline each vocabulary word. Accept all reasonable responses.

Scientific methods are procedures that scientists use to solve problems. There are many scientific methods, but they often follow these steps. A scientist proposes a hypothesis, which is a prediction that can be tested. The scientist tests the prediction using an experiment. He or she decides which variable to change. The scientist compares changes in the variable to a control, or standard. If the data support the hypothesis, the hypothesis is accepted. If the data do not support it, it is rejected. If the hypothesis is tested many times and is always accepted, it may become a scientific theory. Theories are more likely to change than scientific laws, but less likely to change than hypotheses.
Section 1  What is science? (continued)

Main Idea

The Work of Science

I found this information on page ____________.  
SE, p. 6  
RE, p. 1

Solving Problems

I found this information on page ____________.  
SE, pp. 7–10  
RE, p. 2

Details

Define science using information from this section.

Science is an organized way of studying things and finding
answers to questions.

Sequence the steps scientists use to solve problems. Study the
figure in your book, then close your book and try to fill in the figure.
Check your work by looking back at your book.

State the problem

Gather information

Form a hypothesis

Perform an experiment

Analyze data

Draw conclusions

Hypothesis not supported

Hypothesis supported

revise hypothesis

repeat many times

Analyze the role of controls and variables in an experiment. Fill
in the missing words.

A control is the _______ to which the _______ of a test is _______. A variable is _______ in an experiment that can be _______. The number of variables that should be changed during an experiment is _______.

Exploring and Classifying Life  3
Section 1 What is science? (continued)

Main Idea

Developing Theories

Contrast an opinion, a scientific theory, and a scientific law.

Complete the table. Accept all reasonable responses.

<table>
<thead>
<tr>
<th></th>
<th>Opinion</th>
<th>Scientific Theory</th>
<th>Scientific Law</th>
</tr>
</thead>
<tbody>
<tr>
<td>What it is</td>
<td>what a person believes</td>
<td>an explanation that is the result of many observations and experiments</td>
<td>a statement about how things work in nature that seems to be true all the time</td>
</tr>
<tr>
<td>What it is based on</td>
<td>personal beliefs</td>
<td>scientific knowledge, observations, and experiments</td>
<td>scientific knowledge and observations</td>
</tr>
</tbody>
</table>

Measuring with Scientific Units

Summarize the metric units for each quantity below by listing them.

Length: millimeter, centimeter, meter, kilometer

Volume: milliliter, liter

Mass: gram, kilogram, tonne

Safety First

Identify two important safety practices to follow in a laboratory.

1. Wear eye protection.
2. Wash your hands after handling materials.

SYNTHESIZE IT

A scientist collects data about ducks’ migration patterns every year between November and April. After five years, she draws conclusions and publishes a scientific paper. Describe the scientific methods she might have used. State why it was important to wait five years before publishing her results.

Students should indicate that the scientist stated a problem, collected data, and drew conclusions. By waiting five years, she was able to collect more data for making conclusions.
Predict what you will learn in Section 2. Read the title and main headings. List three topics that you predict will be discussed in the section. Accept all reasonable responses.

1. what living things are
2. how living things grow and develop
3. what living things need

Review Vocabulary

Use raw materials in a sentence to show its scientific meaning.

Sample sentence: The raw materials for the new car included aluminum, steel, plastic, and rubber.

New Vocabulary

Find a sentence in Section 2 that uses each vocabulary term. Possible responses shown.

organisms
Any living thing is an organism.

cells
A cell is the smallest unit of an organism that carries on the functions of life.

dictionary
Homeostasis is an organism’s ability to keep proper conditions inside no matter what is going on outside the organism.

Academic Vocabulary

Use a dictionary to define chemical.

chemical
made by chemistry
Main Idea

What are living things like?

I found this information on page __________.
SE, pp. 14–17
RE, p. 8

Organize the characteristics that define living things. Complete the graphic organizer. Accept all reasonable responses.

Living Things

Respond to internal and external stimuli

Living Things

Use energy

Stimulus

A thing that causes a change in an organism

Stimulus

Using a can opener

Response

The reaction to a stimulus

Response

A cat coming running

Describe the relationship between a stimulus and a response. Complete the table. Then complete the flowchart to describe homeostasis.

<table>
<thead>
<tr>
<th>What It Is</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus</td>
<td>anything that causes a change in an organism</td>
</tr>
<tr>
<td></td>
<td>using a can opener</td>
</tr>
<tr>
<td>Response</td>
<td>the reaction to a stimulus</td>
</tr>
<tr>
<td></td>
<td>cat comes running</td>
</tr>
</tbody>
</table>

Homeostasis

Stimulus

The conditions in an organism’s cells change.

Response

The organism makes internal changes to maintain the proper conditions inside the cells.
Main Idea

Contrast the ways organisms obtain energy in the table.

<table>
<thead>
<tr>
<th>Organism</th>
<th>How It Obtains Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>from the Sun’s energy</td>
</tr>
<tr>
<td>Animals</td>
<td>by taking in food, either plants or other organisms that eat plants</td>
</tr>
<tr>
<td>Bacteria in places sunlight cannot reach</td>
<td>chemical compounds</td>
</tr>
</tbody>
</table>

What do living things need?

Classify the needs of all living things. Complete the concept map.

- right environment
- living space
- water
- food

Needs of Living Things

- a place to live
- raw materials

Summarize It

Choose one living thing and one nonliving thing with which you are familiar. Use the five characteristics of living things to explain how you know that each is living or nonliving. Complete the chart to organize your information.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept all reasonable responses. Students should identify that the living thing has all five characteristics, but the nonliving thing lacks one or more of the characteristics.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exploring and Classifying Life
Section 3 Where does life come from?

**Skim** Section 3, and write three questions that you have. Accept all reasonable responses.

1. What is biogenesis?
2. How did life start on Earth?
3. Who was Oparin and what was his hypothesis?

**Define** contaminate and use it in an original sentence.

to make dirty or pollute

Sample sentence: The trash contaminated the river.

**Write the vocabulary term that matches each definition.**

spontaneous generation

the idea that living things come from nonliving things

biogenesis

the idea that living things come only from other living things

**Use a dictionary to define estimate as both a noun and a verb.**

noun: an opinion of the value, quality, size, or cost of something

verb: to form an opinion by reasoning
Main Idea

Life Comes from Life

Contrast the theories of spontaneous generation and biogenesis. Complete the table.

<table>
<thead>
<tr>
<th>Source of life</th>
<th>Spontaneous Generation</th>
<th>Biogenesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>nonliving things,</td>
<td></td>
<td>only from</td>
</tr>
<tr>
<td>such as mud, rain,</td>
<td></td>
<td>other</td>
</tr>
<tr>
<td>and grain</td>
<td></td>
<td>living things</td>
</tr>
</tbody>
</table>

Sequence experiments that were conducted about the theory of spontaneous generation. Complete the time line.

Who: Louis Pasteur
What: Experiments disproved the theory of spontaneous generation.

Who: John Needham and Lazaro Spallanzani
What: Experiments did not show spontaneous generation but also did not entirely disprove it.

Who: Francesco Redi
What: Experiments showed that maggots hatched from fly eggs.

Life’s Origins

Complete key events in the evolution of life on Earth. Identify the event that scientists hypothesize occurred at each time.

about 5 billion years ago: The solar system was a whirling mass of gas and dust.

about 4.6 billion years ago: Earth formed.

more than 3.5 billion years ago: The first living organisms evolved.
Organize information about Oparin’s hypothesis. Complete the outline.

I. Oparin’s hypothesis of Earth’s early atmosphere composition
   A. ammonia
   B. hydrogen
   C. methane
   D. water vapor

II. What happened in the atmosphere
   A. Gases combined.
   B. Complex compounds found in living things formed.

Complete the graphic organizer summarizing Stanley Miller and Harold Urey’s experiment.

CONNECT IT
Scientists’ theories of the origin of life have changed over time. How do these changes show the use of scientific methods?

Accept all reasonable responses. Scientists developed hypotheses about the origins of life. They tested these hypotheses and rejected those that did not match the results, such as spontaneous generation. They developed and tested new hypotheses that led to the theory of biogenesis.
Exploring and Classifying Life
Section 4 How are living things classified?

Read the What You’ll Learn statements for Section 4. Rewrite each statement as a question. As you read, look for the responses to your questions. Accept all reasonable responses.

1. How did early scientists classify living things?
2. How are similarities used to classify organisms?
3. What is the system of binomial nomenclature?
4. How can I use a dichotomous key?

Describe how an organism’s common name is different from its scientific name.

Sample response: A common name is the name used in a particular place and language. A scientific name is the name used by all scientists.

Read the definitions below. Write the vocabulary term that matches each definition.

- **kingdom**: first and largest category used to classify organisms
- **phylogeny**: evolutionary history of an organism
- **genus**: group of similar species
- **binomial nomenclature**: two-word scientific naming system

Define similar using a dictionary.

**similar**: having many but not all qualities in common
Main Idea

Classification

I found this information on page _________.
SE, pp. 22–23
RE, p. 15

Details

Contrast historic classification systems. Identify the categories or criteria used in each system.

<table>
<thead>
<tr>
<th>Categories or criteria</th>
<th>Early classification</th>
<th>Aristotle</th>
<th>Linnaeus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>plants used in medicines; human traits</td>
<td>plant or animal; groups broken into smaller groups according to traits</td>
<td>organisms with similar structures</td>
</tr>
</tbody>
</table>

Summarize the 6 types of information that modern scientists use to determine an organism’s phylogeny.

1. similarities in structure
2. similarities in external and internal features
3. cellular characteristics, such as chromosomes
4. fossils
5. hereditary information
6. early stages of development

Label the groups used to classify organisms from least specific to most specific. Use the word bank to complete the diagram.

class  genus  order  species
family  kingdom  phylum

kingdom

phylum

class

order

family

genus

species
Main Idea

Scientific Names

I found this information on page _______.
SE, p. 24
RE, pp. 16–17

Details

Summarize binomial nomenclature. Complete the sentences.
The first word of an organism’s scientific name is its _______.
The second word might _______.

Identify four reasons the system of binomial nomenclature is useful.
1. It helps avoid mistakes caused by confusing two organisms.
2. Animals with similar evolutionary histories are classified _______.
3. Scientific names give descriptive information about the _______.
4. Scientific names allow information about organisms to be _______.

Distinguish between a field guide and a dichotomous key.

Complete the Venn diagram.

Field Guide

Dichotomous Key

Both

includes descriptions, illustrations, and information about organisms from around the world
allows you to identify organisms
contains a detailed list of identifying characteristics arranged in steps with two descriptive statements

Tools for Identifying Organisms

I found this information on page _______.
SE, pp. 25–26
RE, p. 17

SYNTHESIZE IT

Choose five similar plants or animals. Use what you know about their structures and features to develop your own dichotomous key to classify your choices. Use a dictionary to find the scientific name of each plant or animal to include in your key. Accept all reasonable responses.
Exploring and Classifying Life

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Exploring and Classifying Life</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All science takes place in laboratories.</td>
<td>D SE, p. 8 RE, p. 1</td>
</tr>
<tr>
<td>• All of the changes that take place during an organism’s life are called responses.</td>
<td>D SE, p. 16 RE, p. 8</td>
</tr>
<tr>
<td>• Spontaneous generation is the idea that living things come from nonliving things.</td>
<td>A SE, p. 20 RE, p. 12</td>
</tr>
<tr>
<td>• Organisms are classified into groups based on their similarities.</td>
<td>A SE, p. 23 RE, p. 16</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

Summarize It

List three important ideas you learned in Chapter 1.

Accept all reasonable responses. 1. Scientists use skills to solve problems and answer questions. 2. Living things are organized, respond to stimuli, use energy, grow and develop, and reproduce. 3. Research into the origins of life is still being conducted.
Cells

Before You Read

Preview the chapter title, the section titles, and the section headings. List at least one idea for each section in each column.

<table>
<thead>
<tr>
<th>K What I know</th>
<th>W What I want to find out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept all reasonable responses.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Write three questions that you would ask a scientist researching cancer cells.

Accept all reasonable responses, such as: How did you become a scientist?

How can cancer be treated? When will there be a cure for cancer?
Cells
Section 1 Cell Structure

Skim Section 1. Write two questions that come to mind. Accept all reasonable responses.
1. Why are plant cells different from animal cells?
2. What makes a cell the shape that it is?

Review Vocabulary
Write sentences using the Review Vocabulary and New Vocabulary words. Use two or more of the vocabulary words in each sentence.

photosynthesis
Accept all reasonable responses. The cell wall of a plant cell is outside the cell membrane.

New Vocabulary
Organelles, such as the cell’s nucleus, are structures within the cytoplasm.

cell membrane
Chlorophyll in chloroplasts captures light energy needed for the process of photosynthesis.

cytoplasm
A mitochondrion is an organelle in which food is broken down and energy is released.

cell wall
Some ribosomes float freely in the cytoplasm, and others are attached to the endoplasmic reticulum.

organelle
The Golgi body packages materials and moves them out through the cell membrane.

nucleus
An organ is a structure made up of two or more different types of tissues that work together.

chloroplast

mitochondrion

ribosome

endoplasmic reticulum

Golgi body

Academic Vocabulary
Write sentences using function as a noun and as a verb.

function
Noun: Each cell in the body has a specific function.

Verb: Chlorophyll functions to capture light energy.
Define cell by completing the following statement.

A cell is the smallest unit that is capable of performing life functions.

Model a prokaryotic cell and a eukaryotic cell. Show the difference between the two types.

<table>
<thead>
<tr>
<th>Prokaryotic Cell</th>
<th>Eukaryotic Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prokaryotic cells have no membrane-bound structures inside the cell. Eukaryotic cells contain membrane-bound structures.</td>
<td></td>
</tr>
</tbody>
</table>

Organize information about eukaryotic cell parts in the table.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell wall</td>
<td>found in plants, algae, fungi, and most bacteria; protects the cell; gives cell shape</td>
</tr>
<tr>
<td>Nucleus</td>
<td>usually largest organelle; directs all cell activities; contains DNA</td>
</tr>
<tr>
<td>Chloroplast</td>
<td>green organelle in plant cells; contains chlorophyll which captures light energy</td>
</tr>
<tr>
<td>Mitochondria</td>
<td>organelles that release energy from food</td>
</tr>
<tr>
<td>Ribosomes</td>
<td>small structures that make proteins</td>
</tr>
<tr>
<td>Endoplasmic reticulum</td>
<td>series of folded membranes; processes and moves materials</td>
</tr>
<tr>
<td>Golgi bodies</td>
<td>stacked, flattened membranes; package proteins in vesicles and move them out of cell</td>
</tr>
<tr>
<td>Lysosomes</td>
<td>contain digestive chemicals; break down food, wastes, worn-out cell parts</td>
</tr>
</tbody>
</table>
Section 1 Cell Structure (continued)

**Main Idea**

From Cell to Organism

I found this information on page _________.

SE, p. 45
RE, p. 23

**Details**

Sequence the following terms from simplest (at the top) to most complex in the chart below. Define each term and provide an example. Accept all reasonable examples.

<table>
<thead>
<tr>
<th>Term</th>
<th>Example</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>tissue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>organism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cell</td>
<td>muscle cell</td>
<td>the smallest unit that can perform life functions</td>
</tr>
<tr>
<td>tissue</td>
<td>muscle tissue</td>
<td>similar cells grouped together to do one job</td>
</tr>
<tr>
<td>organ</td>
<td>heart</td>
<td>two or more types of tissue that work together</td>
</tr>
<tr>
<td>organ system</td>
<td>circulatory system</td>
<td>group of organs that perform a function</td>
</tr>
<tr>
<td>organism</td>
<td>human being</td>
<td>a living thing</td>
</tr>
</tbody>
</table>

**SYNTHESIZE IT**

Compare and contrast animal and plant cells.

Both plant and animal cells carry out the functions of life for the organism. They have many of the same organelles. Plant cells have cell walls and chloroplasts, which animal cells do not.
Predict **three things that might be discussed in this section after reading its headings.** Accept all reasonable responses.

1. what early microscopes were like
2. what magnification is
3. what the cell theory is

**Review Vocabulary**

**Vocabulary**

*Use magnify in a sentence.*

**magnify**

Accept all reasonable responses. Van Leeuwenhoek’s microscope could magnify up to 270 times.

**New Vocabulary**

*Find a sentence in Section 2 in which cell theory is used and write it here.** Accept all reasonable responses.*

**cell theory**

Virchow’s observations and conclusions and those of others are summarized in the cell theory.

**Academic Vocabulary**

*Define compound as an adjective. Use a dictionary if you need to.*

**compound**

made of two or more separate parts or elements

Locate and write a sentence in Section 2 in which the word **compound is used as an adjective.**

Accept all reasonable responses. The compound light microscope has two sets of lenses—eyepiece lenses and objective lenses.
Summarize information in your book to describe van Leeuwenhoek’s microscope.

It was a simple microscope with a tiny glass bead for a lens. It could magnify about 270X.

Evaluate the total magnification of a microscope with a 10X eyepiece lens and a 43X objective lens. Write the equation for finding total magnification. Then use it to show your calculation.

\[
\text{total magnification} = \text{eyepiece lens magnification} \times \text{objective lens magnification}
\]

\[
\text{total magnification} = 10X \times 43X = 430X
\]

Compare compound microscopes with electron microscopes by completing the Venn diagram with at least seven facts.

Have students work in pairs to complete the Venn diagram.
**Main Idea**

**Cell Theory**

*Summarize discoveries made by scientists that led to the cell theory. Accept all reasonable responses.*

**Details**

- **Robert Hooke**  
  A sample of cork he looked at under his microscope seemed to be made up of empty little boxes.  
  He named them cells.

- **Matthias Schleiden**  
  Concluded that all plants are made of cells.

- **Theodor Schwann**  
  Concluded that all animals are made of cells.

- **Rudolf Virchow**  
  Hypothesized that cells divide to form new cells, and that every existing cell came from another cell.

**List the 3 main principles of the cell theory.**

1. Organisms are made up of one or more cells.
2. The cell is the basic unit of organization in organisms.
3. All cells come from cells.

**CONNECT IT**

Describe how the development of the cell theory shows that scientific beliefs can change over time. Use specific examples.

Accept all reasonable responses. The development of the microscope allowed observations of cells, which led to the beginnings of the cell theory. The original observations of Robert Hooke were added to by other scientists over many years. Each observation and new hypothesis brought new information, which led to changes in the cell theory.
Cells
Section 3 Viruses

Scan Section 3 of this chapter. Write three questions based on headings in the section. Answer the questions as you read.

1. What are viruses?
2. How do viruses multiply?
3. How do viruses affect organisms?

Define disease using your book or a dictionary.

disease
condition that results from the disruption in function of one or more of an organism’s normal processes

New Vocabulary

virus
strand of hereditary material surrounded by a protein coating

host cell
living cell in which a virus can actively multiply or in which a virus can hide until activated by environmental stimuli

Academic Vocabulary

apparent
readily seen, visible, readily understood or perceived; evident; obvious

Explain what the following sentence means. Accept all reasonable explanations.

The virus is still in your body’s cells, but it is hiding and doing no apparent harm.

The virus is still in the cells, but not doing any harm that you can see or sense.
Main Idea

What are viruses?
I found this information on page ____________.
SE, p. 52
RE, p. 28

How do viruses multiply?
I found this information on page ____________.
SE, p. 53
RE, pp. 28–29

Organize information about viruses by completing the outline.

Viruses
I. Definition: a strand of hereditary material with a protein coating; lacks nucleus, organelles, or cell membrane

II. Description:
A. Size: too small to be seen with a light microscope
B. Shapes: varied

III. Diseases caused by viruses
A. ____________ measles
B. ____________ chicken pox
C. ____________ flu
D. ____________ AIDS

Summarize what a virus needs to reproduce.
To reproduce, a virus must enter a host cell.

Distinguish between an active virus and a latent virus.
A(n) ____________ active virus enters a host cell, immediately causes the cell to make new viruses, and destroys the cell.
A(n) ____________ latent virus enters a host cell, but does not immediately make new viruses or destroy the cell.

Sequence the events when an active virus enters a host cell.

- Virus attaches to a specific host cell.
- Virus’s hereditary material enters cell.
- Cell makes viral hereditary material and proteins.
- New viruses form inside the cell.
- Viruses are released as cell bursts open.
Main Idea

How do viruses affect organisms?
I found this information on page ________.
SE, p. 54
RE, p. 30

Details

Define bacteriophage and explain what it does to a bacterium.
A bacteriophage is a virus that attaches to a bacterial cell,
injects its hereditary material into the cell, and produces new
viruses. The process takes about 20 minutes. Each infected
cell produces about 100 new viruses.

Fighting Viruses
I found this information on page ________.
SE, pp. 54–55
RE, pp. 30–31

Sequence the steps by which interferons work.

<table>
<thead>
<tr>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interferons are produced rapidly by virus-infected cells.</td>
</tr>
<tr>
<td>Interferons move to noninfected cells.</td>
</tr>
<tr>
<td>Interferons cause noninfected cells to produce protective substances.</td>
</tr>
</tbody>
</table>

Research with Viruses
I found this information on page ________.
SE, pp. 54–55
RE, p. 31

Summarize how scientists use viruses in gene therapy.
Scientists place normal hereditary material into viruses. The altered viruses infect cells that have flawed hereditary material. The normal hereditary material enters the cells and replaces the flawed material.

Connect It

Describe why it is not a good idea to take antibiotics for a cold.
Accept all reasonable responses. It is not a good idea because antibiotics treat infections caused by bacteria, but they do not affect viruses. Colds are caused by viruses, so the antibiotics will not affect them.
Tie It Together

A scientist is researching an unknown disease. After examining the disease-causing agent with a compound microscope and testing it in various ways, she has decided that the disease should be treated with an antibiotic drug to disrupt its membrane and prevent it from reproducing. Describe what is causing the disease and how you know.

Accept all reasonable responses. Students should conclude that the agent is a __________ bacterium and not a virus, because the agent is visible under a compound microscope.

If it were a virus, it would be visible only with the help of an electron microscope. In addition, cells have membranes but viruses do not. Antibiotics are not given to treat __________ viral diseases.
Cells Chapter Wrap-Up

Review the ideas you listed at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
<th>L</th>
<th>What I learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accept all reasonable responses.</td>
</tr>
</tbody>
</table>

Review

*Use this checklist to help you study.*

- Review the information you included in your Foldable.
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**SUMMARIZE IT**

What are the three most important ideas in the chapter?

Accept all reasonable responses. 1. Each cell in a many-celled organism carries on its own life functions while depending in some way on other cells in the organism. 2. The cell theory took hundreds of years to develop and was the result of the work of many people. 3. There are helpful uses for viruses.
Cell Processes

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Cell Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Matter is made up of atoms.</td>
</tr>
<tr>
<td></td>
<td>• All substances chemically combine when they are mixed together.</td>
</tr>
<tr>
<td></td>
<td>• Energy is always needed to move material across a cell membrane.</td>
</tr>
<tr>
<td></td>
<td>• Plants can convert light energy into chemical energy.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe two ways in which you think plants get food and energy.

Student responses may include from the Sun, from the air, and from the ground.
Cell Processes
Section 1 Chemistry of Life

**Predict** what you will learn in Section 1 after reading the headings and looking at the diagrams. Accept all reasonable responses.

1. what matter is
2. why water is important for living things
3. how carbohydrates, fats, and proteins work in the body

**Define** cell to show its scientific meaning.

- **cell**: smallest unit of an organism that can carry on life functions

**Find each term in Section 1 and write the sentence where it is used.**

- **mixture**: A mixture is a combination of substances in which individual substances retain their own properties.

- **organic compound**: Organic compounds always contain carbon and hydrogen and usually are associated with living things.

- **enzyme**: Certain proteins called enzymes regulate nearly all chemical reactions in cells.

- **inorganic compound**: Most inorganic compounds are made from elements other than carbon and contain fewer atoms than organic compounds.

**Use a dictionary to define chemical bond.**

- **chemical bond**: the force holding atoms together in a molecule
Main Idea

The Nature of Matter

I found this information on page 67–69.
SE, pp. 68–69
RE, p. 34

I found this information on page 68–69.
SE, p. 69
RE, p. 35

Have students work in pairs to identify the important ideas in this section.

Details

Compare elements and compounds by completing the chart below.

<table>
<thead>
<tr>
<th></th>
<th>Elements</th>
<th>Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of types of atom</td>
<td>one</td>
<td>two or more</td>
</tr>
<tr>
<td>Example</td>
<td>oxygen</td>
<td>water</td>
</tr>
</tbody>
</table>

Classify each characteristic of compounds as ionic, molecular, or both.

________ ionic has positively and negatively charged ions
________ molecular share outermost electrons to bond
________ ionic salt
________ molecular sugar
________ both involved in many life processes
________ both have different properties than the elements from which they are made

Compare mixtures, solutions, and suspensions. Complete the statements below.

A mixture is a combination of substances that do not chemically combine when put together.

Both solutions and suspensions are types of mixtures in which substances are mixed evenly.

In a solution, one substance does not sink to the bottom of the container if it is left standing.

In a suspension, one substance usually will sink to the bottom if the mixture is left standing long enough.
Summarize the functions of the 4 main organic compounds.

<table>
<thead>
<tr>
<th>Organic Compounds in Living Things</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compound</strong></td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Lipids</td>
</tr>
<tr>
<td>Proteins</td>
</tr>
<tr>
<td>Nucleic acids</td>
</tr>
</tbody>
</table>

Compare and contrast characteristics of organic and inorganic compounds by completing the table below.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Organic</th>
<th>Inorganic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains carbon?</td>
<td>yes</td>
<td>sometimes</td>
</tr>
<tr>
<td>Role in living things</td>
<td>make up living things, usually come from them</td>
<td>provide elements needed by living things</td>
</tr>
</tbody>
</table>

Identify three ways that water is important to living things.

1. Living things are more than 50 percent water.

2. Seeds and spores need water to sprout.

3. Chemical reactions in living things take place in water.
Cell Processes
Section 2 Moving Cellular Materials

Skim Section 2. List three headings you would use to make an outline of this section.

1. Passive Transport
2. Active Transport
3. Endocytosis and Exocytosis

Define cytoplasm to show its scientific meaning.

Cytoplasm
gel-like mixture inside the cell that contains hereditary material
and is the location of most of the cell’s life processes

Write the vocabulary term that matches each definition.

Passive transport
movement of substances through a cell membrane without the use of energy

Equilibrium
occurs when molecules of one substance are spread evenly throughout another substance

Active transport
energy-requiring process in which transport proteins bind with particles and move them through a cell membrane

Endocytosis
process by which a cell takes in a substance by surrounding it with the cell membrane

Exocytosis
process by which vesicles release their contents outside the cell

diffusion
type of passive transport in which molecules move from where there are more of them to where there are fewer of them

Osmosis
type of passive transport that occurs when water diffuses through a cell membrane

Use a dictionary to define the term facilitate.

Facilitate
to make easy or easier
Main Idea

Create a diagram that shows how oxygen diffuses from air sacs in the lungs to red blood cells.

Details

Drawings should show the motion of oxygen from air sacs in the lung to red blood cells.

Write a short caption on how oxygen moves from the lungs to toe cells. Accept all reasonable responses.

Oxygen diffuses from the lungs to red blood cells. These red blood cells carry oxygen to cells. The oxygen then diffuses from the red blood cells to toe cells.

Complete the concept map of osmosis.

Osmosis

**is a type of**

**diffusion**

**does not require**

**energy**

involves the movement of water through the cell membrane.

occurs in both plant and animal cells.

List three facts about facilitated diffusion. Accept all reasonable responses.

1. used to move large molecules
2. involves transport molecules
3. is a type of passive transport
Main Idea

**Active Transport**

*Sequence the process of how active transport moves materials into the cell.*

1. The transport protein binds to the needed particle.
2. Energy is used to move the particle through the cell membrane.
3. The particle is released by the transport protein.

**Compare and contrast** facilitated diffusion and active transport by writing yes or no in each box of the chart.

<table>
<thead>
<tr>
<th>Uses transport proteins?</th>
<th>Facilitated Diffusion</th>
<th>Active Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Transports materials across cell membrane?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Requires energy?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Able to move materials from an area with less of the material to an area with more of the material?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

**Endocytosis and Exocytosis**

*Complete the table to identify the processes involved in moving very large particles in and out of cells.*

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocytosis</td>
<td>The cell membrane surrounds the material and pinches off to form a vesicle inside the cell.</td>
</tr>
<tr>
<td>Exocytosis</td>
<td>A vesicle inside the cell that contains material to be released joins with the cell membrane. The material is released outside the cell.</td>
</tr>
</tbody>
</table>
Scan Section 3 of your book. Write three things you think you will learn about in this section. Accept all reasonable responses.

1. How enzymes change molecules.
2. What chlorophyll is.
3. The difference between fermentation and respiration.

Define mitochondrion to show its scientific meaning.

mitochondrion

a cell organelle that breaks down lipids and carbohydrates and releases energy

Read the definitions below. Write the vocabulary term that matches the definition in the blank to the left.

Respiration

process by which producers and consumers release stored energy from food molecules

Fermentation

process by which oxygen-lacking cells and some one-celled organisms release small amounts of energy from glucose molecules and produce wastes such as alcohol, carbon dioxide, and lactic acid

Photosynthesis

process by which plants and many other producers use light energy to produce a simple sugar from carbon dioxide and water and give off oxygen

Metabolism

total of all chemical reactions in an organism

Use a dictionary to define obtain.

obtain
to get possession of, especially by some effort
Section 3  Energy for Life (continued)

Main Idea

Trapping and Using Energy

Model a chemical reaction in which an enzyme changes two smaller molecules into one larger molecule.

Drawings should show two small molecules binding to the enzyme and becoming one larger molecule. The enzyme should not change.

Complete the table on the different materials and their roles in photosynthesis.

<table>
<thead>
<tr>
<th>Material</th>
<th>Role in Photosynthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>raw materials for photosynthesis</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>products of photosynthesis</td>
</tr>
<tr>
<td>Sugar</td>
<td>pigment that captures light energy in plants</td>
</tr>
</tbody>
</table>

Analyze why photosynthesis is important to animals.

Animals depend on photosynthesis for energy. Sometimes they eat organisms that carry out photosynthesis directly. Other times they feed on other consumers. However, the energy that powers these consumers was originally made by a producer.
Summarize the process of respiration. State what is broken down and what the products are.

During respiration, food molecules are broken down to release stored energy. Oxygen is used to complete this process. The waste products carbon dioxide and water are produced.

Compare fermentation with respiration.

<table>
<thead>
<tr>
<th>Comparing Fermentation and Respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
</tr>
<tr>
<td>What gets broken down?</td>
</tr>
<tr>
<td>Where does breakdown occur?</td>
</tr>
<tr>
<td>Is energy released?</td>
</tr>
<tr>
<td>What wastes are produced?</td>
</tr>
</tbody>
</table>

Describe the relationship between plants and animals. Use the listed terms in your description.

carbon dioxide consumer energy oxygen photosynthesis producer respiration

Accept all reasonable responses. Students should clearly describe producers as organisms that make food that is then broken down by themselves and by consumers.
Suppose that you are small enough to be able to move around within the cytoplasm of a cell. Write a story about what it might be like to move through the cell membrane, including the method the cell would use to let you in. Explain why this is the best method.

Accept all reasonable responses. Well, I’m a pretty big molecule, but I like to think I fit nicely inside a cell. Getting inside the cell, though, is always quite a process! In fact, just yesterday I crossed the cell membrane. I was outside the cell when the cell membrane started to surround me. Eventually, I was completely surrounded. The part of the membrane that surrounded me then pinched off. I was inside a vesicle inside the cytoplasm of the cell. This process is called endocytosis. I can’t imagine myself crossing the membrane any other way. Some smaller molecules can cross the membrane through transport proteins. I am too big to fit through a transport protein. Even smaller molecules can actually diffuse across the cell membrane. Since I cannot even fit through a transport protein, diffusion directly through the membrane is definitely not the right choice for me!
Cell Processes  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Cell Processes</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Matter is made up of atoms.</td>
<td>A SE, p. 66</td>
</tr>
<tr>
<td></td>
<td>RE, p. 33</td>
</tr>
<tr>
<td>• All substances chemically combine when they are mixed together.</td>
<td>D SE, p. 69</td>
</tr>
<tr>
<td></td>
<td>RE, p. 36</td>
</tr>
<tr>
<td>• Energy is always needed to move material across a cell membrane.</td>
<td>D SE, p. 74</td>
</tr>
<tr>
<td></td>
<td>RE, p. 40</td>
</tr>
<tr>
<td>• Plants can convert light energy into chemical energy.</td>
<td>A SE, p. 82</td>
</tr>
<tr>
<td></td>
<td>RE, p. 46</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

Summarize It

List three important ideas in the chapter.

Accept all reasonable responses. 1. Both active and passive transport are used to move things in and out of cells in living things. 2. As consumers, humans depend on plants for both food and oxygen. 3. Respiration takes place in all cells and is the process of breaking down stored food for its energy.
Before You Read

*Before you read the chapter, respond to these statements.*

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Cell Reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• One-celled organisms reproduce through cell division.</td>
<td></td>
</tr>
<tr>
<td>• Every living organism has a life cycle.</td>
<td></td>
</tr>
<tr>
<td>• All organisms reproduce sexually.</td>
<td></td>
</tr>
<tr>
<td>• Most of the cells formed in your body do not contain genetic material.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

*Write three things that you know about how and why cells reproduce.*

Student responses will vary, but may include that cells split into two and that they reproduce so that an organism can grow.
**Cell Reproduction**

**Section 1 Cell Division and Mitosis**

**Skim** Section 1 of your book. Read the headings, illustrations, and captions. Write three questions that come to mind as you skim the section. Accept all reasonable responses.

1. Why do cells divide?
2. What is mitosis?
3. What is asexual reproduction?

**Review Vocabulary**

**Define** nucleus to show its scientific meaning.

- **nucleus**: organelle that controls all the activities of a cell and contains hereditary material made of proteins and DNA

**New Vocabulary**

Locate sentences in your book that use each of the following terms. Write each sentence here, and give the page on which you found it.

- **mitosis**: Mitosis is the process in which the nucleus divides to form two identical nuclei. SE, p. 98; RE, p. 52
- **chromosome**: A chromosome is a structure in the nucleus that contains hereditary material. SE, p. 98; RE, p. 53
- **asexual reproduction**: In asexual reproduction, a new organism (sometimes more than one) is produced from one organism. SE, p. 101; RE, p. 56

**Academic Vocabulary**

Use a dictionary to write a scientific definition of the term *cycle*. Then find a sentence in this section that defines the cell cycle, and write it here.

- **cycle**: a complete set of events or phenomena recurring in the same sequence; The cell cycle is a series of events that takes place from one cell division to the next.
Main Idea

Why is cell division important?

1. growth
2. replacement
3. reproduction

The Cell Cycle

Interphase is the longest part of the cell cycle. During interphase, cells grow and develop. During interphase, cells that are still dividing copy their DNA and prepare for cell division. Cells no longer dividing are always in interphase.

Mitosis

Sequence the steps of mitosis, and write a short description of what takes place in each phase.

1. Interphase—Cell prepares for mitosis; chromosomes duplicate.
2. Prophase—Chromatid pairs are visible; spindle is beginning to form.
3. Metaphase—Chromatid pairs line up at the center of the cell.
4. Anaphase—Chromatids separate and start moving to opposite ends of the cell.
5. Telophase—Spindle fibers start to disappear and the chromosomes start to uncoil.
6. Division of the cytoplasm—Two new cells are formed.
Section 1 Cell Division and Mitosis

Main Idea

Compare mitosis in animals and plants. State if each feature exists in plant cells, animal cells, or both.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Cell Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrioles</td>
<td>animal</td>
</tr>
<tr>
<td>Spindle fibers</td>
<td>both</td>
</tr>
<tr>
<td>Cell plate</td>
<td>plant</td>
</tr>
<tr>
<td>Cell wall</td>
<td>plant</td>
</tr>
</tbody>
</table>

Organize important concepts about mitosis.

1. Mitosis is the division of a ___________ cell nucleus.
2. Mitosis produces two new nuclei that are identical both to each other and to ___________ the original nucleus.
3. A nucleus with 46 chromosomes that undergoes mitosis will produce ___________ nuclei, each with ___________ chromosomes.

Identify the 3 forms of asexual reproduction described below.

_______ fission the method by which bacteria reproduce
_______ budding new organism growing from body of the parent
_______ regeneration to regrow body parts that are lost or damaged

Asexual Reproduction

I found this information on page ___________.

SE, pp. 101–102
RE, p. 56

CONNECT IT

A strawberry farmer wants to increase her crop without spending large amounts of money for new seeds. How can she take advantage of asexual reproduction to increase her crop? Accept all reasonable responses.

Strawberry plants can reproduce asexually. They grow horizontal stems called runners, which can produce new plants. The farmer could take advantage of these runners. She could let them grow and produce new plants.
Skim the headings and illustrations in Section 2. Write three things you think you will learn about in this section.

1. Accept all reasonable responses.
2. ________________________________
3. ________________________________

Define organism to show its scientific meaning.

organism
any living thing; uses energy, is made of cells, reproduces, responds, grows, and develops

Read the definitions below. Write the correct vocabulary term on the blank to the left.

fertilization
in sexual reproduction, the joining of a sperm and egg

zygote
new diploid cell formed when a sperm fertilizes an egg; will divide by mitosis and develop into a new organism

egg
sex cell formed in the female reproductive organs

diploid
cell whose similar chromosomes occur in pairs

meiosis
reproductive process that produces haploid cells

sperm
haploid sex cell formed in the male reproductive organs

haploid
cells that have only half of each pair of chromosomes

sexual reproduction
type of reproduction in which two sex cells join to form a zygote

Use a dictionary to define process.

process
series of steps performed in doing something
Compare characteristics of human diploid and haploid cells in the table below. Give examples of each type of cell.

<table>
<thead>
<tr>
<th>Types of Human Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploid</td>
</tr>
<tr>
<td>Number of chromosomes</td>
</tr>
<tr>
<td>Process that produces them</td>
</tr>
<tr>
<td>Examples</td>
</tr>
</tbody>
</table>

Model the 4 stages of meiosis I in the spaces below. Use the figure in your book to help you.

<table>
<thead>
<tr>
<th>Meiosis I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prophase I</td>
</tr>
<tr>
<td>pairs of duplicated chromosomes together</td>
</tr>
<tr>
<td>nuclear membrane disappearing</td>
</tr>
<tr>
<td>spindle is forming</td>
</tr>
<tr>
<td>Metaphase I</td>
</tr>
<tr>
<td>pairs of duplicated chromosomes lined up in center of cell</td>
</tr>
<tr>
<td>centromeres attached to single spindle fibers</td>
</tr>
<tr>
<td>Anaphase I</td>
</tr>
<tr>
<td>duplicated chromosomes moving to opposite ends of the cell</td>
</tr>
<tr>
<td>Telophase I</td>
</tr>
<tr>
<td>cell cytoplasm beginning to divide</td>
</tr>
<tr>
<td>one duplicated chromosome from each pair in each half</td>
</tr>
</tbody>
</table>

Diagrams should resemble those in the book. Accept reasonable variations.

Ask students to discuss the differences and similarities between mitosis and the first division in meiosis.
Section 2  Sexual Reproduction and Meiosis (continued)

Main Idea

Model what takes place inside a cell nucleus during meiosis II by drawing the 4 phases in the spaces below.

<table>
<thead>
<tr>
<th>Meiosis II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prophase II</td>
</tr>
<tr>
<td>pairs of duplicated chromosomes</td>
</tr>
<tr>
<td>spindle is forming</td>
</tr>
<tr>
<td>Metaphase II</td>
</tr>
<tr>
<td>duplicated chromosomes moving to the center of the cell</td>
</tr>
<tr>
<td>two spindle fibers attaching to each centromere</td>
</tr>
<tr>
<td>Anaphase II</td>
</tr>
<tr>
<td>The chromatids are separating and moving to opposite ends of the cell.</td>
</tr>
<tr>
<td>Telophase II</td>
</tr>
<tr>
<td>spindle fibers disappearing</td>
</tr>
<tr>
<td>nuclear membranes forming around the chromosomes at each end of the cell</td>
</tr>
</tbody>
</table>

Diagram should resemble those in the book. Accept reasonable variations.

Summarize differences between meiosis I and meiosis II by writing a number, yes, or no in each box of the chart.

<table>
<thead>
<tr>
<th></th>
<th>Meiosis I</th>
<th>Meiosis II</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many cells result?</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Is a haploid cell formed?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Do chromatids separate?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

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Fruit flies have eight chromosomes in their body cells. Mice have 40. How many chromosomes are there in each sex cell of these organisms?

fruit flies—4; mice—20
Cell Reproduction
Section 3 DNA

Scan the list below to preview Section 3.

- Read all section titles.
- Read all bold words.
- Look at all illustrations and their labels.
- Think about what you already know about DNA.

Define heredity to show its scientific meaning.

heredity
the passing of traits from parents to offspring

Write the correct vocabulary term next to each definition.

DNA
deoxyribonucleic acid; a cell’s heredity material; made up of two strands, each consisting of a sugar-phosphate backbone and nitrogen bases: adenine, thymine, guanine, and cytosine

gene
section of DNA that contains instructions for making specific proteins

RNA
ribonucleic acid; type of nucleic acid that contains the sugar ribose, phosphates, and bases adenine, guanine, cytosine, and uracil

mutation
any permanent change in a gene or chromosome of a cell; may be beneficial, harmful, or have little effect on an organism

The word code can be used as a noun or as a verb. Write a definition for its use as a noun and as a verb.

Noun: set of signals representing letters or numerals, used to send messages

Verb: to put in the form or symbols of a code
Main Idea

What is DNA?
I found this information on page ___________.
SE, p. 111
RE, p. 63

I found this information on page ___________.
SE, p. 111
RE, p. 62

Details

Identify the 4 nitrogen bases found in DNA.
1. ___________ adenine
2. ___________ guanine
3. ___________ cytosine
4. ___________ thymine

Model a section of a DNA molecule, showing its twisted-ladder structure. Label the nitrogen bases, sugar, and phosphates. Make sure the nitrogen bases in your drawing are correctly paired.

Summarize how DNA copies itself.
The DNA unwinds and separates. Then, new bases pair with the two separated strands. Two identical DNA molecules are produced.

Complete the following paragraph on the relationship of proteins and genes.
Proteins are made up of long chains of ___________ amino acids.
Genes determine the ___________ order of ___________ amino acids in a protein. Changing the ___________ order of the amino acids makes a ___________ protein.
A man has a discolored area on the back of his hand. The doctor has assured him it is a harmless body cell mutation. Explain why the mutation probably will not appear in his children.

This is a body cell mutation. If the mutation had appeared in an egg or sperm, a child that developed from the sex cell might show the mutation.
Tie It Together

Draw an animal cell with six chromosomes.
Follow the chromosomes as they go through the steps of meiosis.
Show the chromosomes duplicating and separating, and describe the final end products.
Name each step in the process.
Show one way that a mutation might occur during the process.

Drawings should show all the phases of meiosis I and II.
Centrioles and spindle fibers should be visible.
At the end there should be four haploid cells.
The normal cells should have three chromosomes each; the mutated cells may have more or fewer.
Cell Reproduction  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Cell Reproduction</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• One-celled organisms reproduce through cell division.</td>
<td>A SE, p. 96</td>
</tr>
<tr>
<td></td>
<td>RE, p. 51</td>
</tr>
<tr>
<td>• Every living organism has a life cycle.</td>
<td>A SE, p. 96</td>
</tr>
<tr>
<td></td>
<td>RE, p. 51</td>
</tr>
<tr>
<td>• All organisms reproduce sexually.</td>
<td>D SE, p. 101</td>
</tr>
<tr>
<td></td>
<td>RE, p. 56</td>
</tr>
<tr>
<td>• Most of the cells formed in your body do not contain genetic material.</td>
<td>D SE, p. 100</td>
</tr>
<tr>
<td></td>
<td>RE, p. 55</td>
</tr>
</tbody>
</table>

Review
Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT
List three important ideas from this chapter.

Accept all reasonable responses. 1. Mitosis produces two cells with the same number of chromosomes as the original cell. 2. Meiosis produces sex cells with half the number of chromosomes as the original cell. 3. DNA is the molecule that carries the code for making proteins.
Heredity

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Heredity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Offspring of an organism always have the same traits as the parents.</td>
<td></td>
</tr>
<tr>
<td>• There may be more than two forms of a gene.</td>
<td></td>
</tr>
<tr>
<td>• Some traits are determined by more than one gene.</td>
<td></td>
</tr>
<tr>
<td>• Traits from one type of organism can be introduced into another type of organism.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of the chapter.

Write three traits that you have and how you would determine how those traits were passed to you.

Student responses will vary, but traits may include eye color, hair color, or shape of face. Students may respond that they can determine how traits were passed on to them by looking at their family history of those traits.
Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings of this section. Accept all reasonable responses.
1. How do people inherit traits?
2. Who was Mendel, and what did he study?

Define meiosis.

meiosis
reproductive process that produces four haploid sex cells from one diploid cell

Write a paragraph describing heredity. Use the five vocabulary terms from the left in your paragraph.

heredity
Heredity is the passing of traits to offspring. The study of how

genetics
traits are passed is called genetics. In genetics, scientists study

allele
alleles, which are the forms of a trait that a gene may have. The

dominant
forms of a trait can be dominant or recessive. Dominant forms

recessive
cover over, or dominate, recessive forms.

Write a paragraph describing genotype. Use the five vocabulary terms from the left in your paragraph.

Punnett square
If an organism has two of the same allele for a gene, it is

genotype
homozygous. If it has different alleles, it is heterozygous.

phenotype
An organism's alleles determine its genotype, or genetic

homozygous
makeup. The genotype determines the phenotype, or outward

heterozygous
appearance. Scientists use a Punnett square to identify possible

pairs of alleles that can come from two parents.

Use a dictionary to define physical.

physical
having to do with the body
Summarize what alleles are and how they are inherited.

The different forms of a trait that a gene can have are called alleles. An organism usually has two alleles for each trait, one from each parent.

Identify three things Mendel did that made his work more useful than previous studies of heredity.

1. He was the first to trace one trait through many generations.

2. He was the first to record how traits pass from one generation to another.

3. He was the first to use the mathematics of probability to explain heredity.

Analyze one trait that Mendel studied.

- Identify the dominant and recessive forms of the trait.
- Predict how an organism would look if it had two dominant alleles, two recessive alleles, or one of each allele.

Students may use any trait from their books.

<table>
<thead>
<tr>
<th>Trait</th>
<th>shape of seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant form</td>
<td>round</td>
</tr>
<tr>
<td>Recessive form</td>
<td>wrinkled</td>
</tr>
<tr>
<td>Two dominant alleles</td>
<td>round</td>
</tr>
<tr>
<td>Two recessive alleles</td>
<td>wrinkled</td>
</tr>
<tr>
<td>One of each allele</td>
<td>round</td>
</tr>
</tbody>
</table>
Complete the Punnett square for black and blond fur in a dog.

<table>
<thead>
<tr>
<th></th>
<th>Black dog</th>
<th>Blond dog</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>b</td>
</tr>
<tr>
<td>b</td>
<td>Bb</td>
<td>bb</td>
</tr>
<tr>
<td>b</td>
<td>Bb</td>
<td>bb</td>
</tr>
</tbody>
</table>

Analyze the Punnett square to complete the sentences.

The black dog carries heterozygous black-fur traits. The blond dog carries homozygous blond-fur traits. The chance that the offspring will have black fur is 50 percent, or one in two.

Summarize Mendel’s 3 principles of heredity.

1. Traits are controlled by alleles on chromosomes.
2. An allele’s effect is dominant or recessive.
3. When a pair of chromosomes separates during meiosis, the different alleles for a trait move into separate sex cells.

CONNECT IT

A pea plant is heterozygous for purple flowers (Rr). A gardener crosses it with another pea plant with the same genotype. The recessive gene for this trait causes white flowers. Predict the possible genotypes and phenotypes for the offspring. Predict the percentage for each genotype and phenotype.

Possible genotypes: RR, Rr, and rr; Possible phenotypes: purple flowers, white flowers;

25% will be RR, 50% Rr, and 25% rr; 75% will have purple flowers and 25% will have white flowers.
Heredity

Section 2 Genetics Since Mendel

Scan the headings and illustrations in Section 2. Write two facts you learned about genetics as you scanned the section.

1. Accept all reasonable responses.
2. ____________________________

Review Vocabulary

Define gene to show its scientific meaning.

gene
section of DNA on a chromosome that contains instructions for making specific proteins

New Vocabulary

Define each vocabulary term.

incomplete dominance
production of a phenotype that is intermediate between the phenotypes of two homozygous parents

polygenic inheritance
occurs when a group of gene pairs acts together to produce a trait

sex-linked gene
allele inherited on a sex chromosome

Academic Vocabulary

Use a dictionary to define intermediate. Then rewrite the sentence below, using your definition.

When the allele for white four-o’clock flowers and the allele for red four-o’clock flowers combined, the result was an intermediate phenotype—pink flowers.

intermediate
in the middle or being between; Sample sentence: When the allele for white four-o’clock flowers and the allele for red four-o’clock flowers combined, the result was a phenotype in the middle—pink flowers.
**Main Idea**

**Incomplete Dominance**

I found this information on page __________.

SE, pp. 134–135

RE, pp. 73–74

**Details**

**Draw** a Punnett square for red and white four-o’clock flowers showing the possible offspring. Use \( R \) for the allele for red flowers and \( R' \) for the allele for white flowers. In each section of the square, write the genotype and phenotype of the offspring.

<table>
<thead>
<tr>
<th>Red four-o’clock</th>
<th>White four-o’clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R )</td>
<td>( R' )</td>
</tr>
<tr>
<td>( R )</td>
<td>( R' ); pink</td>
</tr>
<tr>
<td>( R' )</td>
<td>( R' ); pink</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Summarize** incomplete dominance.

Neither allele is dominant in incomplete dominance. The offspring have a phenotype intermediate to that of the parents.

**Analyze** how a gene with multiple alleles can produce more than three phenotypes. Use blood types as an example.

A gene with more than two alleles can produce more than three possible combinations. In blood types, there are three alleles: A, B, and O. O is recessive to the other two. There are six possible genotypes: AA, AB, AO, BB, BO, and OO. These produce four phenotypes: A, B, AB, and O.

**Polygenic Inheritance**

I found this information on page __________.

SE, p. 136

RE, p. 74

**Identify** how internal environment can affect the expression of a trait. Complete the flow chart.

- **Gene for bright plumage is present.**
  - **Male bird**
    - Chemicals **do** activate gene.
    - **Gene** is expressed.
  - **Female bird**
    - Chemicals **do not** activate gene.
    - **Gene** is not expressed.
Main Idea

Human Genes and Mutations

I found this information on page ________.
SE, p. 137
RE, pp. 74–75

Analyze how chromosome disorders occur.

A chromosome disorder occurs as a result of a mistake in the process of meiosis. It causes an organism to have more or fewer chromosomes than normal.

Model how two heterozygous parents who do not have a recessive disorder can have a child with the disorder. Use C for a dominant allele and c for a recessive allele.

Mother’s genotype: Cc
Father’s genotype: Cc
Child’s genotype: cc

Sex-Linked Disorders

I found this information on page ________.
SE, p. 139
RE, p. 75

Complete the statements about sex-linked traits.

Sex-linked disorders usually result from recessive alleles on the X chromosome. A man will have the disorder when his only X chromosome has the recessive allele. A woman will have the disorder when both her X chromosomes have the recessive allele.

Pedigrees Trace Traits

I found this information on page ________.
SE, pp. 139–140
RE, p. 75

Summarize why pedigrees are useful to geneticists.

Pedigrees allow a geneticist to trace a trait over several generations. Geneticists use them to predict the probability that a baby will have a certain trait and to breed animals.

Choose a trait described in Section 2, such as color-blindness, calico patterns in cats, or cystic fibrosis. Choose genotypes for two parents. Draw a pedigree starting with these parents. Continue your pedigree for two generations. Use Punnett squares to help you predict possible offspring.

Check pedigrees to make sure that the patterns of inheritance are shown correctly.
Preview the section title and headings. Write three questions that you would ask a modern geneticist after your preview. Accept all reasonable responses.

1. What is recombinant DNA?
2. How is gene therapy used?
3. What are the uses and risks of genetically engineered plants?

Review Vocabulary

Use DNA in an original sentence to show its scientific meaning.

Accept all reasonable responses. All chromosomes are made of DNA.

New Vocabulary

Define genetic engineering.

using biological and chemical methods to change the arrangement of DNA that makes up a gene

Academic Vocabulary

Use a dictionary to define insert as a verb. Then find a sentence in Section 3 that uses the term or a form of the term.

to put or fit (something) into something else; Sample sentence:

Recombinant DNA is made by inserting a useful section of DNA from one organism into a bacterium.
Distinguish three uses for genetic engineering.

1. to produce large amounts of medicines
2. to change how cells perform their normal functions
3. to improve crop production and quality

Organize information about recombinant DNA. Complete the graphic organizer.

Recombinant DNA

Produced by: inserting a section of DNA from one organism into a bacterium

Used for: producing large amounts of insulin, growth hormones, and chemicals used to treat cancer

Summarize how gene therapy may be used in the future.

Accept all reasonable responses. Gene therapy may be used to replace defective alleles in human cells with normal alleles. This may be used to treat cystic fibrosis and some types of cancer.
Main Idea

Genetic Engineering

Create a flow chart about gene therapy. Show how the gene gets into the body and what happens when it reaches the cells.

Flow charts should show how a normal allele is inserted into a virus. The virus then delivers the normal allele when it infects its target cell. The normal allele replaces the defective one.

Summarize each step of gene therapy in your model above.

1. A normal allele is placed into a virus.
2. The virus infects a target cell and delivers the normal allele.
3. The normal allele replaces the abnormal allele in the target cell.

Evaluate the benefits and potential risks of genetic engineering of crop plants. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants have desirable characteristics, such as arriving at stores ripe and firm.</td>
<td>The long-term effects of eating genetically engineered plants are not known.</td>
</tr>
</tbody>
</table>

Connect It

Describe how viruses are useful tools in genetic engineering.

Accept all reasonable responses. Viruses inject the DNA they carry into other cells, so scientists can use them to carry desirable DNA into other organisms.
Tie It Together

Suppose that Gregor Mendel came to visit a modern genetics laboratory and you were asked to give him a tour. Write a report describing what you would show him and how you would explain modern genetics. Remember that he does not know the words gene or allele, although he described “factors” that controlled traits.

Accept all reasonable responses. Students should include descriptions of aspects of modern genetics, including the existence of genes and allele pairs, the process of meiosis, the existence of incomplete dominance and polygenic traits, and modern techniques such as recombinant DNA.
Heredity  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Heredity</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Offspring of an organism always have the same traits as the parents.</td>
<td>D SE, p. 128 RE, p. 69</td>
</tr>
<tr>
<td>• There may be more than two forms of a gene.</td>
<td>A SE, p. 135 RE, pp. 73–74</td>
</tr>
<tr>
<td>• Some traits are determined by more than one gene.</td>
<td>A SE, p. 136 RE, p. 74</td>
</tr>
<tr>
<td>• Traits from one type of organism can be introduced into another type of organism.</td>
<td>A SE, p. 141 RE, p. 78</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

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☐ Look over the Chapter Review at the end of the chapter.

Summarize It

Identify the three most important ideas in this chapter.

Accept all reasonable responses. 1. Most cells in the body have two alleles for every trait. 2. Punnett squares can be used to predict the genotypes and phenotypes of offspring. 3. Recombinant DNA and gene therapy may lead to cures for many diseases and disorders.
Adaptations over Time

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Adaptations over Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Traits acquired by an organism during its life can be passed on to its offspring.</td>
</tr>
<tr>
<td></td>
<td>• Most evidence of evolution comes from fossils.</td>
</tr>
<tr>
<td></td>
<td>• Organisms with traits best suited to their environment are more likely to survive and reproduce.</td>
</tr>
<tr>
<td></td>
<td>• Humans share a common ancestor with other primates.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Pick a favorite plant or animal and list all the ways it is well-suited to its environment.

Answers will vary. Check that students understand that an adaptation is anything that helps an organism survive and reproduce in its environment. Also note that especially because of humans, many organisms are not well-adapted to their current habitats.
Adaptations over Time
Section 1 Ideas About Evolution

Predict three things that will be discussed in Section 1 as you scan the headings and illustrations. Accept all reasonable responses.

1. different theories about how organisms change over time
2. principles of natural selection
3. how fast evolution occurs

Define gene using your book.

gene

a section of DNA that contains instructions for making specific proteins

Write the correct term next to its definition.

species

group of organisms that share similar characteristics and can reproduce among themselves, producing fertile offspring

evolution

change in inherited characteristics over time

natural selection

process by which organisms with traits best suited to their environment are more likely to survive and reproduce

variation

inherited trait that makes an individual different from other members of its species

adaptation

any variation that makes an organism better suited to its environment

Use your book or a dictionary to define hypothesis.

hypothesis

something that is suggested as being true for the purposes of argument or of further investigation
Section 1 Ideas About Evolution (continued)

Main Idea

Early Models of Evolution

I found this information on page ___________.
SE, pp. 154–155
RE, p. 81

Darwin’s Model of Evolution

I found this information on page ___________.
SE, pp. 155–156
RE, p. 82

Natural Selection

I found this information on page ___________.
SE, pp. 156–157
RE, p. 83

Variation and Adaptation

I found this information on page ___________.
SE, pp. 158–159
RE, pp. 83–84

Details

Identify why Lamarck’s theory of evolution was not accepted.

Scientists’ data showed that acquired traits were not passed to offspring.

Analyze Darwin’s explanation of the origins of the 13 species of Galápagos finches. Fill in the missing words.

The Galápagos finches ____________ for food. Those that had ____________ beak shapes, ____________ eating habits that allowed them to get food were able to ____________ longer and ____________ more.

Over time, groups of finches became separate ____________.

State 5 main principles of natural selection.

1. Organisms produce more offspring than can survive.

2. Variations occur among individuals.

3. Some variations are passed to offspring.

4. Individuals with helpful variations survive and reproduce better than those without.

5. Over time, offspring of these individuals may become a new species.

Compare and contrast variations and adaptations. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Variation</th>
<th>Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>an inherited trait that makes an individual different from other species members</td>
<td>any variation that makes an organism better suited to its environment</td>
<td></td>
</tr>
<tr>
<td>shape of human hairline, fruit without seeds</td>
<td>color, shape, behavior, camouflage</td>
<td></td>
</tr>
</tbody>
</table>
Complete the table explaining factors that can lead to changes in a population. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>What Happens</th>
<th>How It Leads to Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in Gene Sources</td>
<td>Individuals of a species move into or out of an area.</td>
</tr>
<tr>
<td>Geographic Isolation</td>
<td>Geologic features isolate a small number of individuals from a population.</td>
</tr>
</tbody>
</table>

Compare and contrast gradualism and punctuated equilibrium. Select ideas from your reading to fill in the Venn diagram.

Gradualism: gradual change; slow, ongoing process; fossil evidence of a series of intermediate forms

Punctuated Equilibrium: rapid; mutation of a few genes; results in the appearance of a new species over a relatively short period of time

Both: result in new species

SYNTHESIZE IT
Describe how natural selection can lead to the formation of a new species. Include factors such as migration and geographic isolation.

Responses should accurately reflect the material presented in the section.
Adaptations over Time
Section 2 Clues About Evolution

Scan Section 2 of your book. Then write two items in each of the boxes below.

<table>
<thead>
<tr>
<th>What I know about fossils</th>
<th>What I want to know about fossils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept all reasonable responses.</td>
<td></td>
</tr>
</tbody>
</table>

Define epoch using your book.
epoch
smaller division of geological time than a period; characterized by differences in life-forms that may vary regionally

Use your book to help you write the correct vocabulary term next to each definition.

sedimentary rock
a type of rock made from pieces of other rocks, minerals deposited from a solution, or plant and animal matter

radioactive element
element that gives off a steady amount of radiation as it slowly changes to a nonradioactive element

embryology
study of embryos and their development

homologous
similar in structure, origin, or function

vestigial structure
structure that does not seem to have a function and that may once have functioned in the body of an ancestor

Use a dictionary to define method.
method
way of doing something; a process
Main Idea

Clues from Fossils

Create a concept map to summarize information about the Green River formation. Include information about

- where it is
- what it was in the past
- how fossils formed, and
- what scientists learn from the fossils there.

Accept all reasonable responses.

Types of Fossils

Summarize the types of rock in which fossils are commonly found.

Most fossils are found in ___________ rock. They are most often found in ___________.

Determining a Fossil's Age

Organize information about how scientists determine the age of fossils. Complete the outline. Accept all reasonable responses.

I. Relative dating
   A. Younger rock layers are deposited on top of older rock layers.
   B. provides an estimate of a fossil’s age by comparing it to layers above and below fossil

II. Radiometric dating
   A. uses radioactive elements
   B. Scientists estimate age by comparing the amount of radioactive and nonradioactive elements in the rock.
Create a graphic organizer to identify what scientists learn from fossils.

- what the organism might have looked like
- what the organism ate
- whether the organism lived alone or in groups
- what the environment was like

Information obtained from fossils

Other clues about evolution

- embroyology
- homologous structures
- DNA
- vestigial structures

A scientist discovers a new species of mammal. How could the scientist determine its evolutionary relationships to other animals? Explain how the scientist could use each type of evidence discussed in the section.

Answers will vary, but should reflect accurate use of embryology, DNA, homologous structures, and vestigial structures, and any relevant fossil evidence.
# Adaptations over Time

## Section 3 The Evolution of Primates

<table>
<thead>
<tr>
<th>Skim</th>
<th>Section 3 of your book. Read the headings. Write three questions that come to mind. Accept all reasonable responses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>What are hominids?</td>
</tr>
<tr>
<td>2.</td>
<td>When did early humans first appear?</td>
</tr>
<tr>
<td>3.</td>
<td>How do Neanderthals and Cro-Magnon humans differ?</td>
</tr>
</tbody>
</table>

### Review Vocabulary

- **opposable**
  - can be placed against another digit of a hand or foot

### New Vocabulary

- **primates**
  - group of mammals including humans, monkeys, and apes that share characteristics such as opposable thumbs and binocular vision; Sample sentence: Chimpanzees are primates.

- **hominid**
  - humanlike primate that ate both plants and meat and walked upright on two legs; Sample sentence: Hominids predated humans.

- **Homo sapiens**
  - early humans that likely evolved from Cro-Magnons; Sample sentence: Homo sapiens are modern humans.

### Academic Vocabulary

- **similar**
  - almost, but not exactly the same

---

Use your book to define the following terms. Then use each term in a sentence. Accept all reasonable sentences.
Main Idea

Primates

Analyze adaptations that are common among primates by completing the table below. List three primate adaptations and the functions each allows.

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposable thumb</td>
<td>grasping and holding objects</td>
</tr>
<tr>
<td>Binocular vision</td>
<td>judging depth and distances</td>
</tr>
<tr>
<td>Flexible shoulders</td>
<td>moving from branch to branch</td>
</tr>
</tbody>
</table>

Distinguish three characteristics of hominids.

1. ate both plants and meat
2. walked upright
3. had a larger brain

Sequence the ancestors of early humans. Create a timeline of hominids in the boxes below. Identify and describe the hominid that lived during each time period.

**Time period:** 4–6 million years ago
**Hominid:** Australopithecus
**Characteristics:** small brain, humanlike jaw and teeth, walked upright

**Time period:** 1.5–2 million years ago
**Hominid:** Homo habilis
**Characteristics:** larger brains and more human-like features than Australopithecus

**Time period:** 1.6 million years ago
**Hominid:** Homo erectus
**Characteristics:** larger brains and more human-like features than Australopithecus
Main Idea

Organize information about the origins of modern humans. Complete the diagram.

Contrast Neanderthals and Cro-Magnon humans by completing the diagram.

Have students discuss in small groups the significance of art and burying the dead as human characteristics.

CONNECT IT
Hypothesize how scientists might determine whether Neanderthals are ancestors of modern humans.
Accept all reasonable answers. Students may suggest that scientists would compare the fossils of Neanderthals with the body structures of modern humans. Students aware of the news might suggest DNA testing.
Tie It Together

Make Fossils

With a partner, model a set of fossils that show how organisms can change over time. Draw or model three related organisms. One should be the original organism. The others should be descendants of the original organism. Record the adaptations shown by your fossils. What environmental changes might have led to the adaptations?

Trade fossils with another pair. Describe the fossils that you are given. What adaptations can you find?

Accept all reasonable responses. Students' fossils should show adaptations that helped their creatures better survive, and students should explain the significance of the adaptations. You may wish to establish a specific environment in which the creatures originally lived and changes that might have occurred in the environment that resulted in adaptations.
Adaptations over Time Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Adaptations over Time</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Traits acquired by an organism during its life can be passed on to its offspring.</td>
<td>D SE, p. 154 RE, p. 81</td>
</tr>
<tr>
<td>• Most evidence of evolution comes from fossils.</td>
<td>A SE, p. 167 RE, p. 88</td>
</tr>
<tr>
<td>• Organisms with traits best suited to their environment are more likely to survive and reproduce.</td>
<td>A SE, p. 157 RE, p. 83</td>
</tr>
<tr>
<td>• Humans share a common ancestor with other primates.</td>
<td>A SE, p. 170 RE, p. 92</td>
</tr>
</tbody>
</table>

Review

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Summarize It

After reading this chapter, identify three things that you have learned about adaptations of organisms over time.

Accept all reasonable responses. 1. Individuals with helpful variations are more likely to survive. 2. Geological isolation can lead to separate species. 3. Scientists can determine the age of rock by measuring the radiation it gives off.
Bacteria

Before You Read

Preview the chapter and section titles and the section headings. Complete the first two columns of the table by listing at least two ideas for each section in each column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>What I want to find out</td>
</tr>
</tbody>
</table>

**Science Journal**

List ways that bacteria can be harmful and ways that bacteria can be beneficial. Which list is longer?

Student responses will vary. Beneficial bacteria include decomposer bacteria, such as those used in bioreactor landfills, and bacteria used to make yogurt, cheese, root beer, and other foods. Harmful bacteria include those that spoil food or cause disease. The beneficial list should be longer.
Bacteria
Section 1 What are bacteria?

Scan Section 1 of the chapter.
• Read all headings and bold words.
• Look at all of the illustrations.
• Think about what you already know about bacteria.

Write three facts that you learned while scanning the section. Accept all reasonable responses.
1. Bacteria contain cytoplasm.
2. Some bacteria have tails.
3. An aerobe uses oxygen for respiration.

Define prokaryotic to show its scientific meaning.
prokaryotic
type of cell without membrane-bound organelles

Read the definitions below. Write the key term on the blank in the left column.
aerobe
organism that uses oxygen for respiration
fission
simplest form of asexual reproduction, in which two new cells are produced that have genetic material that is identical to each other and to the original cell
flagella
whiplike tails that help many bacteria move
anaerobe
organism that is adapted to live without oxygen

Use a dictionary to define the term environment.
environment
living and nonliving factors that surround an organism
Section 1 What are bacteria? (continued)

Main Idea

Characteristics of Bacteria

I found this information on page __________.
SE, p. 187
RE, p. 95

Details

Identify 3 shapes of bacterial cells.
1. coci: sphere-shaped
2. bacilli: rod-shaped
3. spirilla: spiral-shaped

Summarize how the following pairs of words relate to bacteria.

Asexual Reproduction/Sexual Reproduction: Bacteria reproduce asexually by fission. This type of reproduction results in two identical cells. Some bacteria carry out a process similar to sexual reproduction. In this process, two bacteria exchange DNA through a thin tube.

Producers/Consumers: Some bacteria are producers. They are able to make their own food. Other bacteria are consumers. They get their food from the environment.

Aerobes/Anaerobes: Some bacteria are aerobes. They use oxygen to obtain energy. Some bacteria are anaerobes. They live without oxygen.

I found this information on page __________.
SE, p. 188
RE, pp. 96–97
Main Idea

Eubacteria

I found this information on page ________.
SE, pp. 189–190
RE, pp. 97–98

**Details**

Complete the graphic organizer about the characteristics of cyanobacteria.

<table>
<thead>
<tr>
<th>Cyanobacteria</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Summarize the different types of consumer eubacteria.**

There are two categories of consumer bacteria: gram-positive and gram-negative. Gram-positive bacteria have thicker cell walls than gram-negative bacteria. Some gram-positive bacteria can be harder to treat with antibiotics than gram-negative bacteria.

One group of eubacteria does not have cell walls.

Archaebacteria

I found this information on page ________.
SE, p. 191
RE, p. 99

**Identify three types of extreme environments in which archaebacteria can survive.**

Sample response: Archaebacteria can survive in salty, acidic, and hot environments.

**Summarize how methane-producing bacteria obtain energy.**

Methane-producing bacteria use carbon dioxide for energy and release methane gas as waste.
Skim the headings in Section 2. What do you think are two major ideas that will be discussed in this section? Accept all reasonable responses.

1. how bacteria can be harmful
2. how bacteria can be helpful

Define disease and use it in an original sentence.

disease
a condition with symptoms that interferes with normal body functions; Sample sentence: The disease that Tommy has affects his ability to breathe.

Match the definitions with the appropriate key terms.

- antibiotic: chemical produced by some bacteria that is used to limit the growth of other bacteria
- saprophyte: organism that uses dead organisms for food and energy
- nitrogen-fixing bacteria: bacteria that change nitrogen from the air into forms that plants and animals can use
- pathogen: organism that causes disease
- toxin: poisonous substance produced by some pathogens
- endospore: thick-walled, protective structure produced by some bacteria when conditions are unfavorable for survival
- vaccine: preparation made from killed bacteria or damaged particles from bacterial cell walls that can prevent some bacterial diseases

Use a dictionary to define the term benefit.

benefit
to help
Analyze how some bacteria help you. Complete the paragraph.

Bacteria are helpful in many ways. Without them, you would not be able to stay healthy for very long. Bacteria in the large intestine produce vitamin K which is needed for blood clotting. Some bacteria produce antibiotics. These chemicals slow or stop the growth of other bacteria.

Summarize the roles of saprophytes and nitrogen-fixing bacteria in the environment.

Role of saprophytes: Saprophytes are organisms that use dead organisms as a food source. They help keep balance in nature by breaking down dead organisms.

Nitrogen-fixing bacteria: Nitrogen-fixing bacteria change the nitrogen in the air into forms that plants can use. This helps animals and plants obtain the nitrogen they need.

Complete the table describing some of the ways people use bacteria.

<table>
<thead>
<tr>
<th>Use</th>
<th>How do the bacteria help?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioremediation</td>
<td>by breaking down wastes and pollutants into harmless compounds</td>
</tr>
<tr>
<td>Food Production</td>
<td>by making yogurt, cheeses, buttermilk, sauerkraut, pickles, and soy sauce</td>
</tr>
<tr>
<td>Industry</td>
<td>by producing certain medicines, cleansers, adhesives, and methane gas</td>
</tr>
</tbody>
</table>
Analyze how pathogens make you sick. Complete the paragraph.

Pathogens can enter your body when you _______inhale/breathe______ and through _______cuts in your skin______. Once inside the body, they can multiply, _______damage cells______, and cause _______illness and disease______.

Complete the graphic organizer about pasteurization.

<table>
<thead>
<tr>
<th>Pasteurization</th>
</tr>
</thead>
<tbody>
<tr>
<td>The taste of the food _______does not change.</td>
</tr>
<tr>
<td>Most harmful bacteria are killed because _<strong><strong><strong>temperature of the product is increased</strong></strong></strong>.</td>
</tr>
<tr>
<td>The process is used to prepare these foods: milk, orange juice, _<strong><strong><strong>apple juice, ice cream, yogurt</strong></strong></strong>.</td>
</tr>
</tbody>
</table>

Summarize information about vaccines.

Vaccines are made from dead bacterial cells or particles taken _______from bacterial cell walls. They are injected into a person. This _______process allows white blood cells to start recognizing the type of _______bacteria used to make the vaccine. If this type of bacteria enters _______the body at a later time, white blood cells attack the bacteria. _______

Have students work in pairs to research some of the common vaccines and when they are usually administered.

Summarize IT

Explain why it is important to learn about bacteria.

Bacteria can be used for useful purposes, such as cleaning the environment and making _______foods. Bacteria also can cause diseases. Understanding these bacteria can lead to better _______treatments and even cures. _______
Bacteria  Chapter Wrap-Up

Review the ideas that you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column. How do your ideas about what you know now compare with those you provided at the beginning of the chapter?

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
<th>L</th>
<th>What I learned</th>
<th>Accept all reasonable responses.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

Identify three important ideas in this chapter.

Accept all reasonable responses. 1. Bacteria live and survive in many different types of environments. 2. Bacteria can be both helpful and harmful to humans. 3. Bacteria help maintain balance in nature.
Protists and Fungi

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Protists and Fungi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some protists have roots like those of plants.</td>
<td>• Some protists have roots like those of plants.</td>
</tr>
<tr>
<td>The oxygen you breathe comes partly from green algae.</td>
<td>• The oxygen you breathe comes partly from green algae.</td>
</tr>
<tr>
<td>Protozoans are usually classified by what they eat.</td>
<td>• Protozoans are usually classified by what they eat.</td>
</tr>
<tr>
<td>Lichens can indicate the pollution level in an area.</td>
<td>• Lichens can indicate the pollution level in an area.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

In what ways might fungi benefit other organisms and the environment?

Students’ responses will vary. They may include: edible mushrooms, cheese manufacturing (bleu cheese, for example), olive oil industry, and pesticides.
Preview the What You’ll Learn statements for Section 1. Rewrite each statement as a question. Look for the answers as you read the section. Accept all reasonable responses.

1. What characteristics do all protists share?
2. How are the three groups of protists similar and different?
3. What are examples of the three groups of protists?
4. Why are protists difficult to classify?

Define asexual reproduction to show its scientific meaning.

Reproduction in which only one parent is required to produce a new, genetically identical individual.

Write the vocabulary word that matches each definition.

protist

one-celled or many-celled eukaryotic organism that lives in moist or wet surroundings.

algae

plantlike protists.

protozoan

one-celled, animal-like protist.

flagellum

long, thin, whiplike structure used for movement.

cilia

short, threadlike structures that extend from the cell membrane and help the organism move quickly.

pseudopod

temporary extension of cytoplasm that helps some protists move.

Use a dictionary to define visible.

Able to be seen.
Compare and contrast the 3 groups of protists.

<table>
<thead>
<tr>
<th></th>
<th>Plantlike</th>
<th>Animal-like</th>
<th>Funguslike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do they make their own food?</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Is there a cell wall?</td>
<td>yes</td>
<td>no</td>
<td>some have cell walls</td>
</tr>
<tr>
<td>Can they move?</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Summarize key information about plantlike protists.

**Diatoms**: live in fresh water and salt water; golden-brown pigment covers chlorophyll; form glasslike boxes

**Dinoflagellates**: move using flagella that cause organism to spin; most live in salt water and have chlorophyll

**Euglenoids**: have characteristics of both plants and animals; one-celled algae; no cell wall

**Red algae**: many-celled; have chlorophyll and red pigment; found in salt water up to 200 m deep

**Green algae**: one- or many-celled; have large amounts of chlorophyll; produce oxygen

**Brown algae**: many-celled; have chlorophyll and brown pigment; found in cool saltwater environments

Evaluate the importance of algae.

<table>
<thead>
<tr>
<th>Algae in the Environment</th>
<th>Human Uses of Algae</th>
</tr>
</thead>
<tbody>
<tr>
<td>food source; provide oxygen; can produce toxins that cause other organisms to die</td>
<td>food source; used in cosmetics and other products; used to thicken food</td>
</tr>
</tbody>
</table>
Classify protozoans. Summarize key information about each type of protozoan.

<table>
<thead>
<tr>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ciliates</td>
<td>move using cilia; usually feed on bacteria</td>
</tr>
<tr>
<td>flagellates</td>
<td>move through water with flagella; many live in freshwater; some are parasites</td>
</tr>
<tr>
<td>protozoans that use pseudopods</td>
<td>found in freshwater and saltwater environments; some are parasites</td>
</tr>
<tr>
<td>other protozoans</td>
<td>do not move on their own; all are parasites</td>
</tr>
</tbody>
</table>

Summarize the importance of protozoans to other organisms.
Accept all reasonable responses. Protozoans are a source of food for larger organisms. Some cause diseases such as malaria.

Funguslike protists and importance of funguslike protists.
Funguslike protists produce spores like fungi and must take in food from outside sources. Slime molds use pseudopods to move and live on rotting logs or dead leaves in moist, cool, shady environments. Downy molds and mildews grow as a mass of threads over an organism. Some are parasites; others feed on dead organisms. Funguslike protists in the ecosystem help breakdown dead organisms. Some are harmful to other organisms.

Why is it dangerous to drink water from unknown sources?
Accept all reasonable responses. Many protists can cause disease, and protists live in water or wet environments. Drinking water from an unknown source can bring these protists into a person’s body.
Protists and Fungi
Section 2 Fungi

Skim Section 2. Predict two topics that will be covered. Accept all reasonable responses.
1. types of fungi
2. how fungi reproduce

Review Vocabulary
photosynthesis

Define photosynthesis using your book or a dictionary.
process by which plants and many other producers use light energy to produce a simple sugar from carbon dioxide and water and give off oxygen

New Vocabulary

hyphae
mass of threadlike tubes forming the body of a fungus
saprophyte
organism that absorbs energy from dead and decaying tissues
spore
waterproof reproductive cell that can grow into a new organism
basidium
reproductive cells produced by club fungi
ascus
reproductive cells produced by sac fungi
budding
form of asexual reproduction in which a new, genetically identical organism forms on the side of its parent
sporangium
case containing reproductive cells produced by some types of fungi
lichen
organism made up of a fungus and a green alga or a cyanobacterium
mycorrhizae
network of hyphae and plant roots that helps plants absorb water and minerals from the soil

Academic Vocabulary

Use a dictionary to define decline.
decline
to weaken or lessen

Name ___________________________ Date ______________
Main Idea

What are fungi?
I found this information on page ________.
SE, pp. 222–223
RE, pp. 114–116

Have students work in pairs to complete information on the characteristics of fungi and how they reproduce.

Details

Complete the table to describe the characteristics of fungi.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Obtaining Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body usually consists of many-celled, threadlike tubes called hyphae.</td>
<td>Most fungi are saprophytes, which obtain food by absorbing the dead or decaying tissue of other organisms. Some fungi are parasites, which obtain food directly from living things.</td>
</tr>
</tbody>
</table>

Reproduction

They can be sexual or asexual. They produce spores, which are waterproof reproductive cells.

Differences from Plants

They have no specialized tissues and organs and contain no chlorophyll.

Compare club, sac, and zygote fungi.

<table>
<thead>
<tr>
<th>Examples</th>
<th>How they reproduce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Club fungi</td>
<td>mushrooms</td>
</tr>
</tbody>
</table>

Sac fungi

yeasts, molds, morels, truffles

produce spores in a saclike structure called an ascus; yeasts can also reproduce asexually by budding

Zygote fungi

mold on bread or fruit

produce spores in a round spore case called a sporangium

Summarize why some fungi are difficult to classify.
Some fungi either never reproduce sexually or have never been observed reproducing sexually.
Main Idea

**Lichens, Fungi, and Plants**

I found this information on page 226.

SE, p. 226
RE, pp. 117–118

I found this information on page 226–227.

SE, pp. 226–227
RE, p. 118

**Details**

Identify three important roles of lichens.

1. **provide food for some animals**
2. **weather rock and help the process of making soil**
3. **act as indicator organisms that monitor pollution levels**

Model the beneficial relationship between fungi and plants by completing the diagram.

Some fungi and plants form a network of **hyphae** and **roots** called **mycorrhizae**.

The fungi help the plants absorb nutrients from soil.

The plants supply **food** and **nutrients** to the fungi.

Identify the importance of fungi in each of these areas.

<table>
<thead>
<tr>
<th>Foods</th>
<th>Agriculture</th>
<th>Health and Medicine</th>
<th>Decomposers</th>
</tr>
</thead>
<tbody>
<tr>
<td>used to make cheeses</td>
<td>some cause diseases in plants and animals</td>
<td>some cause diseases</td>
<td>break down organic materials</td>
</tr>
<tr>
<td>yeasts used in baking</td>
<td>some are the source of helpful drugs</td>
<td>some are the source of helpful drugs</td>
<td>serve as nature’s recyclers</td>
</tr>
<tr>
<td>some are edible</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Importance of Fungi

I found this information on page 228–229.

SE, pp. 228–229
RE, pp. 118–119

Connect It

Describe what nature would be like without lichens, mycorrhizae, and decomposer fungi. Accept all reasonable responses.

Without lichens, rock might weather more slowly; without mycorrhizae, plants would not get the nutrients they need; without decomposer fungi, nutrients that plants and animals need would not be returned to the soil.
Protists and Fungi  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Protists and Fungi</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some protists have roots like those of plants.</td>
<td>D SE, p. 211  RE, p. 107</td>
</tr>
<tr>
<td>The oxygen you breathe comes partly from green algae.</td>
<td>A SE, p. 214  RE, p. 108</td>
</tr>
<tr>
<td>Protozoans are usually classified by what they eat.</td>
<td>D SE, p. 215  RE, p. 109</td>
</tr>
<tr>
<td>Lichens can indicate the pollution level in an area.</td>
<td>A SE, p. 226  RE, p. 117</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading the chapter, write three facts you learned that you did not know before.  Accept all reasonable responses.

1. Some protists have characteristics of both plants and animals.  2. Protists are an important food source for many animals.  3. Lichens are made up of both fungi and algae.
Plants

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>• In tropical rain forests, there are more than 260,000 known plant species and probably more to be identified.</td>
<td></td>
</tr>
<tr>
<td>• Land plants’ ancestors may have been green algae that lived in the sea.</td>
<td></td>
</tr>
<tr>
<td>• Ferns and mosses produce spores rather than seeds.</td>
<td></td>
</tr>
<tr>
<td>• Paper and clothing are made from seed plants.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write three characteristics that you think all plants have in common.

Accept all reasonable responses. Most plants have stems, leaves or leaflike structures, roots or rootlike structures, and chlorophyll, and produce their own food through photosynthesis. All plants are multicellular. All plant cells are surrounded by a cell wall.
### Plants

**Section 1: An Overview of Plants**

Skim the headings in Section 1. Then predict three facts you will learn from reading the section. Accept all reasonable responses.

1. Plant cells have many parts.
2. Plants had to adapt to survive on land.
3. Plants are classified through a specific naming system.

**Review Vocabulary**

Define the word *species*. Use your book or a dictionary for help.

- **species**: organisms that share similar characteristics and can mate with one another to produce fertile offspring

**New Vocabulary**

Use your book to define the following key terms.

- **cuticle**: a waxy protective layer secreted by cells onto the surface of the plant
- **cellulose**: a chemical compound that plants can make out of sugar
- **vascular plant**: plant with tubelike structures that carry water, nutrients, and other substances throughout the plant
- **nonvascular plant**: plant that does not have tubelike structures and uses other ways to move water and substances

**Academic Vocabulary**

Use a dictionary to define *adapt* to reflect its scientific meaning.

- **adapt**: to change to fit new conditions
**Main Idea**

**What is a plant?**

I found this information on page __________.

SE, pp. 240–241
RE, pp. 121–122

---

**Details**

Summarize how plants make food by completing the concept map below. Use these terms: photosynthesis, chlorophyll, chloroplasts.

Green plant cells

contain

chlorophyll

in

chloroplasts

that make food through the process of

photosynthesis

---

**Origin and Evolution of Plants**

I found this information on page __________.

SE, p. 241
RE, p. 122

---

Sequence the events in the table below. Write the oldest event at the bottom of the table and the youngest event at the top of the table.

**Events**

- First cone-bearing plants
- First flowering plants
- First green algae
- First land plants

<table>
<thead>
<tr>
<th>(Youngest)</th>
<th>(Oldest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First flowering plants</td>
<td>First green algae</td>
</tr>
<tr>
<td>First cone-bearing plants</td>
<td>First land plants</td>
</tr>
<tr>
<td>First land plants</td>
<td></td>
</tr>
<tr>
<td>First green algae</td>
<td></td>
</tr>
</tbody>
</table>
Main Idea

Life on Land
I found this information on page _________.
SE, p. 242
RE, p. 122

Adaptations to Land
I found this information on page _________.
SE, pp. 242–243
RE, pp. 122–123

Classification of Plants
I found this information on page _________.
SE, p. 245
RE, p. 123

Details

Summarize how land plants made life possible for land animals.
- More and more plants grew on land.
- More oxygen was added to Earth’s atmosphere
- Land animals eventually had enough oxygen to live.

Identify the four adaptations that make it possible for plants to live on land.

<table>
<thead>
<tr>
<th>Plant Adaptations to Land</th>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>cuticle on surface of plant</td>
<td>slows water loss from leaves</td>
<td></td>
</tr>
<tr>
<td>cellulose in plant cell walls</td>
<td>helps provide support</td>
<td></td>
</tr>
<tr>
<td>tubelike structures</td>
<td>distribute water and food</td>
<td></td>
</tr>
<tr>
<td>waterproof coating on seeds and spores</td>
<td>protects seeds and spores from drying out</td>
<td></td>
</tr>
</tbody>
</table>

Complete the concept map below about plant classification.

CONNECT IT
Suppose that you are working at a greenhouse. While at work, a child asks you, “What’s a plant?” Write a short answer to this question.

Responses will vary but may include the concepts of making food, producing oxygen, and specialized reproduction.
### Plants

**Section 2 Seedless Plants**

**Skim** Section 2 of your book. Then write three questions that you have about plants. Try to answer your questions as you read.

1. How do seedless plants reproduce? **Accept all reasonable responses.**
2. What does a hornwort look like?
3. What are ferns?

**Define** spore. Use your book or a dictionary for help. Write a sentence that reflects its scientific meaning.

- **spore**
  - a waterproof reproductive cell; Sample sentence: The spore was blown by the wind and landed in an ideal spot to grow into a new moss plant.

**New Vocabulary**

Use your book to define the following key terms. Then use each word in a sentence that reflects its scientific meaning.

- **rhizoid**
  - a threadlike structure that anchors nonvascular plants where they grow; Sample sentence: Rhizoids anchor mosses to the ground.

- **pioneer species**
  - the first organisms to grow in new or disturbed areas; Sample sentence: After land is burned by forest fire, moss often grows as a pioneer species.

**Academic Vocabulary**

Use a dictionary to define soil. Write a sentence that reflects its scientific meaning.

- **soil**
  - mixture of weathered rock, organic matter, water, and air that supports the growth of plant life; Sample sentence: Pioneer species help build new soil in which other plants can grow.
Main Idea

Seedless Nonvascular Plants

Organize the characteristics of seedless nonvascular plants by completing the chart below.

<table>
<thead>
<tr>
<th>Characteristics of Seedless Nonvascular Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. grow from spores</td>
</tr>
<tr>
<td>2. do not have all of the parts of plants that grow from seeds</td>
</tr>
<tr>
<td>3. are usually only a few cells thick</td>
</tr>
<tr>
<td>4. are usually about 2–5 cm high</td>
</tr>
<tr>
<td>5. most have structures that look like leaves and stems</td>
</tr>
<tr>
<td>6. have rhizoids instead of roots</td>
</tr>
<tr>
<td>7. grow in damp places</td>
</tr>
<tr>
<td>8. absorb water through cell membranes and cell walls</td>
</tr>
</tbody>
</table>

Complete the concept map to identify examples and characteristics of seedless nonvascular plants. One example has been listed for you.

Seedless Nonvascular Plants

- central stalks
- leaflike growths around stalks
- spores in caps on stalks

Mosses
- spore structures look like horns of cattle
- less than 2.5 cm in diameter

Liverworts
- flattened, leaflike bodies
- one-cell rhizoids
- rootless plants

Hornworts
- flattened bodies
Section 2 Seedless Plants (continued)

Importance of Seedless Plants

I found this information on page ____________.
SE, pp. 250–251
RE, p. 128

Compare and contrast seedless vascular plants with seedless nonvascular plants in the Venn diagram below.

Summarize the importance of seedless plants in the table below.

<table>
<thead>
<tr>
<th>Importance of Seedless Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ancient seedless plants became coal.</td>
</tr>
<tr>
<td>2. Seedless plants in bogs become peat, a low-cost fuel.</td>
</tr>
<tr>
<td>3. Peat is used to enrich soil.</td>
</tr>
<tr>
<td>4. Ferns are used as houseplants and for landscaping.</td>
</tr>
<tr>
<td>5. Fern rhizomes and fronds can be eaten.</td>
</tr>
<tr>
<td>6. Dried stems of one kind of horsetail can be ground into flour.</td>
</tr>
<tr>
<td>7. Some seedless plants have been used as medicines.</td>
</tr>
</tbody>
</table>

CONNECT IT

Suppose you are a naturalist working in a forest area that has recently burned in a forest fire. Summarize what you would tell visitors about seedless plants and how important they are to the forest’s recovery.

Answers will vary, but should include discussion of soil building and its importance for further colonization, ability of seedless plants to survive periods of dryness or other harsh conditions, characteristics of seedless plants.
Plants
Section 3 Seed Plants

Scan Section 3 of your book. Write three questions that come to mind as you read the headings and examine the illustrations.

1. Why are there different layers in a leaf? Accept all reasonable responses.
2. What are the functions of roots?
3. Why do some plants have flowers?

Define seed. Use your book or a dictionary for help. Then use this word in a sentence that reflects its scientific meaning.

Sample sentence: The seed grew into a beautiful apple tree.

Read the definitions below. Write the correct key term on the blank in the left column. Use your book for help.

- **gymnosperm**: a vascular plant that produces seeds that are not protected by fruit
- **angiosperm**: a vascular plant that flowers and produces fruit with one or more seeds
- **monocot**: a plant with one cotyledon inside its seeds
- **dicot**: a plant with two cotyledons inside its seeds

Use a dictionary to define annual as it applies to the length of a plant’s life.

Sample sentence: The annual plant completes its life cycle in one year.
Section 3 Seed Plants (continued)

Main Idea

Characteristics of Seed Plants

I found this information on page ___________.
SE, p. 252
RE, p. 130

Have students use colored pencils for their drawings. Students should include a color key to cell structure.

Create a cross-section of a leaf in the space below. Label and describe the purpose of six important features.

Drawings should resemble the illustration in students’ books and include at least six of these features: upper epidermis, palisade layer, spongy layer, lower epidermis, phloem, xylem, vein, guard cells, stoma, or cuticle.

Organize the characteristics of seed plants by completing the chart below.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>photosynthesis</td>
</tr>
<tr>
<td>Stems</td>
<td>support branches, leaves, and reproductive structures; store food and water</td>
</tr>
<tr>
<td>Roots</td>
<td>contain vascular tissue that take in water and dissolved substances from the soil; anchor the plant; support parts of the plant that are above ground; store food and water</td>
</tr>
<tr>
<td>Vascular tissue</td>
<td>Xylem transports water and dissolved substances from roots to the rest of the plant. Phloem moves food from where it is made to other plant parts where it is used or stored. Cambium produces most new xylem and phloem cells.</td>
</tr>
</tbody>
</table>
Main Idea

**Gymnosperms**
I found this information on page __________.
SE, p. 256
RE, p. 132

**Angiosperms**
I found this information on page __________.
SE, pp. 257–259
RE, pp. 132–133

Importance of Seed Plants
I found this information on page __________.
SE, pp. 259–260
RE, p. 130

Complete the chart below about gymnosperms by writing about the characteristic listed in that cell.

<table>
<thead>
<tr>
<th>Gymnosperms</th>
<th>Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Divisions</strong></td>
<td><strong>not protected by fruit</strong></td>
</tr>
<tr>
<td>include conifers, cycads, ginkgoes, and gnetophytes</td>
<td></td>
</tr>
<tr>
<td><strong>Flowers</strong></td>
<td><strong>Leaves</strong></td>
</tr>
<tr>
<td>not produced</td>
<td>usually needlelike or scalelike</td>
</tr>
</tbody>
</table>

Complete the chart below about angiosperms by writing about the characteristic listed in that cell.

<table>
<thead>
<tr>
<th>Angiosperms</th>
<th>Seeds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Division</strong></td>
<td><strong>protected inside a fruit and have one or two cotyledons inside</strong></td>
</tr>
<tr>
<td><strong>Anthophyta</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Flowers</strong></td>
<td><strong>Fruits</strong></td>
</tr>
<tr>
<td>reproductive structures that come in different sizes, shapes, and colors; grow into fruit</td>
<td>form from flower parts; enclose one or more seeds</td>
</tr>
</tbody>
</table>

Skim your book for two uses each of gymnosperms and angiosperms.

**Gymnosperms:**
1. Most wood for building comes from conifers.
2. Resin is used to make soap, paint, and varnish.

**Angiosperms:**
1. Many foods come from seed plants.
2. Fiber for clothes; paper; or wood chairs and tables
Tie It Together

In the space below, draw a sketch of a tree. Label the tree’s roots, trunk, and leaves. Next to each label, write the important functions that each of these structures performs. Beneath your sketch, explain why trees are an important part of the environment.

Sample responses:

- Leaves: gas exchange, water evaporation, photosynthesis
- Trunk: provides support, transports water and food
- Roots: anchor tree, absorb water and nutrients from soil

Sample response: Trees make food using the process of photosynthesis. Many animals, such as squirrels and deer, eat the food that trees produce. Along with other plants and algae, trees also make the oxygen that animals need to breathe.
Plants  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Plants</th>
<th>After You Read</th>
</tr>
</thead>
</table>
| • In tropical rain forests, there are more than 260,000 known plant species and probably more to be identified. | A SE, p. 240    
| RE, p. 121                                                            |                |
| • Land plants’ ancestors may have been green algae that lived in the sea. | A SE, p. 241    
| RE, p. 122                                                            |                |
| • Ferns and mosses produce spores rather than seeds.                  | A SE, p. 248    
| RE, p. 127                                                            |                |
| • Paper and clothing are made from seed plants.                       | A SE, p. 259    
| RE, p. 130                                                            |                |

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

Summarize It

After reading this chapter, identify three things that you have learned about plants.

Accept all reasonable responses. 1. The first plants were probably green algae. 2. There are both vascular and nonvascular plants. 3. Most seed plants have leaves.
Plant Reproduction

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Plant Reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Both humans and plants need water, oxygen, energy, and food to grow.</td>
<td></td>
</tr>
<tr>
<td>• Ferns and mosses reproduce by forming spores.</td>
<td></td>
</tr>
<tr>
<td>• All seeds are produced by flowering plants.</td>
<td></td>
</tr>
<tr>
<td>• Some seeds are spread by gravity.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

List three plants that reproduce by forming seeds.

Accept all reasonable responses. All gymnosperms and angiosperms reproduce by forming seeds, with the exception of a few varieties of angiosperms—such as seedless grapes and navel oranges—that have been developed through selective breeding and asexual reproduction to suppress seed production.
Plant Reproduction
Section 1 Introduction to Plant Reproduction

Scan Section 1 of your book using the checklist below.

☐ Read all section titles.
☐ Read all bold words.
☐ Read all charts and graphs.
☐ Look at all the pictures and read their captions.
☐ Think about what you already know about plant reproduction.

Write three facts that you discovered about plant reproduction as you scanned this section. Accept all reasonable responses.
1. Plants can reproduce sexually or asexually.
2. Haploid cells produce spores.
3. Fertilization begins the sporophyte stage.

Define fertilization in a sentence that shows its scientific meaning.

fertilization

in sexual reproduction, the joining of a sperm and an egg

Use your book to define the following terms.

spore

in plants, a haploid cell that begins the gametophyte stage

gametophyte stage

plant life cycle stage that begins with haploid cells (spores) that grow to form plant structures or a new plant

sporophyte stage

plant life cycle stage that begins when fertilization occurs

Use a dictionary to define identical.

identical

same
Main Idea

Types of Reproduction

Compare and contrast two ways that plants reproduce.

Plant Reproduction

- asexual reproduction
  - forms
  - a genetically identical plant

- sexual reproduction
  - forms
  - a genetically different plant

Sequence the steps in plant fertilization. Complete the flow chart.

Female reproductive structures produce ______ eggs ______.

Male reproductive structures produce ______ sperm ______.

Are both structures found on the same plant?

- No
  - Sperm from a male plant must get to a female plant.

- Yes
  - Plant can fertilize itself.
Section 1 Introduction to Plant Reproduction (continued)

Main Idea

Plant Life Cycles

I found this information on page 274–275.

SE, pp. 274–275
RE, p. 136

Have students work in pairs to complete the life cycle diagram and the table.

Details

Model the two stages of a plant’s life cycle by labeling the diagram below with the following terms.

- gametophyte plant structures (n)
- sporophyte plant structures (2n)
- sex cells (sperm and eggs) (n)
- spores (n)

Contrast the gametophyte and sporophyte stages of plant development. Complete the table.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cell type</th>
<th>Reproductive cells formed</th>
<th>How reproductive cells form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gametophyte</td>
<td>haploid</td>
<td>cell division</td>
<td>sex cells</td>
</tr>
<tr>
<td>Sporophyte</td>
<td>diploid</td>
<td>meiosis</td>
<td>spores</td>
</tr>
</tbody>
</table>

CONNECT IT

A plant breeder wants to develop new varieties of roses that have different traits from the varieties he already has. Describe the type of reproduction the breeder is most likely to use and why.

Accept all reasonable responses. The breeder will use sexual reproduction because asexual reproduction produces plants that are genetically identical to the parent plant, but sexual reproduction produces genetically different offspring.
Plant Reproduction
Section 2 Seedless Reproduction

Skim Section 2 of your book. Read the headings and look at the illustrations. Write three questions that come to mind. Accept all reasonable responses.

1. How do nonvascular plants reproduce sexually?
2. How do male and female gametophytes differ?
3. How do ferns reproduce?

Define photosynthesis using your book or a dictionary.

food-making process by which plants and many other producers use light energy and produce glucose and oxygen from carbon dioxide and water

Use your book to define the following terms.

frond
leaf of a fern that grows from the rhizome

rhizome
underground stem

sori
fern structures in which spores are produced

prothallus
small, green, heart-shaped gametophyte plant form of a fern that can make its own food and absorb water and nutrients from the soil

Use a dictionary to define widespread.

widely scattered or prevalent
Main Idea

The Importance of Spores

I found this information on page ________.  
SE, p. 276  
RE, p. 138

Nonvascular Seedless Plants

I found this information on page ________.  
SE, p. 276  
RE, p. 138

Details

Summarize the role of spores in plant reproduction.

Spores are used by ________ all nonvascular and some ________ vascular plants ________ to reproduce. The ________ sporophyte ________ stage of the plant produces ________ haploid ________ spores in ________ spore cases ________ . These ________ break open ________ , and the spores are spread by ________ wind or water ________. The spores grow into ________ plants ________ that can produce ________ sex cells ________.

Sequence the life cycle of a moss. Complete the flow chart.

Distinguish two ways in which nonvascular plants reproduce asexually.

<table>
<thead>
<tr>
<th>Type of Plant</th>
<th>Asexual Reproduction Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>moss</td>
<td>piece of plant breaks off and grows into new plant</td>
</tr>
<tr>
<td>liverwort</td>
<td>forms small balls of cells on surface of plant that can be carried away by water and grow into new plants</td>
</tr>
</tbody>
</table>
Contrast vascular and nonvascular seedless plants. Complete the Venn diagram with at least six facts. Accept all reasonable responses.

- Vascular: have tubular cells that transport water; most are ferns; gametophyte stage is small
- Nonvascular: water and materials move from cell to cell; sporophyte stage is usually small
- Both: use both sexual and asexual reproduction

Organize the life cycle of a fern into a flow chart.

1. Meiosis ______ takes place inside ______ spore cases ______.
2. Spores ______ are ejected and fall to the ground ______.
3. Spore grows into the ______ gametophyte ______ plant, called the ______ prothallus ______.
4. Fertilization ______ occurs, producing a ______ zygote ______.
5. Male and female ______ sex cells ______ form in the ______ prothallus ______.

Suppose that you are walking through a forest and you see some moss plants and ferns. Describe how you could know the stage of its life cycle each kind of plant is in.

Accept all reasonable responses. The mosses are in the gametophyte stage, and the ferns are in the sporophyte stage; I know because these stages are easily visible. I probably would not notice the opposite stage.
**Predict** three things that will be discussed in Section 3. Accept all reasonable responses.

1. How pollen and seeds combine.
2. What seeds need to grow.
3. How pollen spreads.

**Define** gymnosperms using your book or a dictionary.

vascular plants that do not flower, generally have needlelike or scalelike leaves, and produce seeds that are not protected by fruit.

**Match each vocabulary term to its definition.**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>pollen grain</td>
<td>small structure produced by the male reproductive organs of a seed plant</td>
</tr>
<tr>
<td>pollination</td>
<td>transfer of pollen grains to the female part of a seed plant</td>
</tr>
<tr>
<td>germination</td>
<td>series of events that results in the growth of a plant from a seed part of a plant that produces the egg</td>
</tr>
<tr>
<td>ovule</td>
<td>male reproductive organ in a flower</td>
</tr>
<tr>
<td>stamen</td>
<td>female reproductive organ in a flower</td>
</tr>
<tr>
<td>pistil</td>
<td>part of a flower in which ovules are found</td>
</tr>
<tr>
<td>ovary</td>
<td></td>
</tr>
</tbody>
</table>

**Use a dictionary to define structure as it is used in science.**

arrangement of parts or the way parts are arranged
Main Idea

The Importance of Pollen and Seeds

I found this information on page ____________.
SE, pp. 281–282
RE, pp. 142–143

Details

Summarize key facts about pollen and pollination. Complete the outline.

Pollen and Pollination in Seed Plants
I. Pollen grains
   A. Develop from spores
   B. Contain gametophyte parts that can produce sperm

II. Pollination
   A. Sperm are carried as part of the pollen grain.
   B. Pollen tube forms when the pollen grain reaches the female part of the plant.

Model a seed. Draw a seed and label the stored food, embryo, and seed coat. Identify the role of each part of the seed.

Drawings should resemble those on SE, p. 282 or RE, p. 143. The stored food provides energy; the embryo becomes the plant; the seed coat protects the seed.

Gymnosperm Reproduction

I found this information on page ____________.
SE, p. 282
RE, p. 143

Sequence steps of gymnosperm seed formation in the flow chart.

Male: pollen grains produced in male cones carried by wind fertilization seed develops
Female: eggs produced in ovules in female cones

I found this information on page ____________.
SE, p. 282–284
RE, p. 143

The Importance of Pollen and Seeds

I found this information on page ____________.
SE, pp. 281–282
RE, pp. 142–143

I found this information on page ____________.
SE, p. 282
RE, p. 143

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Section 3  Seed Reproduction (continued)

Main Idea

**Angiosperm Reproduction**

I found this information on page 284–288.
SE, pp. 284–288
RE, pp. 114–115

If possible, bring in sample flowers and cones so that students can observe reproductive structures.

Seed Dispersal

I found this information on page 288.
SE, p. 288
RE, p. 145

**Model** a flower by drawing and labeling its parts. Then write a brief caption to identify the male and female reproductive organs and to describe how each organ functions during fertilization.

Students’ models should include the parts of the pistil (stigma, style, ovary, and ovule); the stamen (anther and filament), and the sepal.

Captions should identify (1) the stamen as the male reproductive organ and describe how pollen grains form inside the anther by meiosis and the sperm develop in each pollen grain; (2) the pistil as the female reproductive organ and describe how pollen grains land on the stigma and move down the style to the ovary where meiosis occurs to produce gametophyte structures. Eggs are produced in the ovules.

**Sequence** the events of fertilization and germination in angiosperms.

1. Flower is __________________ pollinated.
2. Sperm fertilizes egg in the ovule __________________.
3. Zygote grows into plant embryo __________________.
4. Seed is __________________ dispersed __________________.
5. Conditions become right for ______________ germination __________________.
6. Seed tissues absorb water __________________.
7. Seed coat breaks open __________________.
8. Root grows from ______________ seed __________________.
9. Stem and leaves grow __________________.
10. Photosynthesis begins __________________.

**Connect It**

The seeds of horse chestnut trees are covered with a prickly outer layer. Propose a way that you think these seeds might be dispersed.

Accept all reasonable responses. They are dispersed by animals; the prickly outer layer adheres to animals’ fur. As they move, the animals carry the seeds with them.
Tie It Together

Describe a Plant

Suppose that you are an explorer who has discovered a new species of plant.

• Draw and describe the plant below.
• Be sure to indicate whether your plant is vascular or nonvascular.
• If it does reproduce with seeds, identify it as an angiosperm or a gymnosperm.
• Include a diagram that shows the plant’s life cycle.
• Draw a cross-section of the plant that identifies its reproductive structures.

Accept all reasonable responses.

Encourage accurate drawing rather than artistic merit.

Students’ responses should reflect understanding of the reproduction of the type of plant chosen.
Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Plant Reproduction</th>
<th>After You Read</th>
</tr>
</thead>
</table>
| Both humans and plants need water, oxygen, energy, and food to grow. | A RE, p. 272  
RE, p. 145 |
| Ferns and mosses reproduce by forming spores. | A SE, p. 276  
RE, p. 138 |
| All seeds are produced by flowering plants. | D SE, p. 281  
RE, p. 142 |
| Some seeds are spread by gravity. | A SE, p. 288  
RE, p. 145 |

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things that you have learned about plant reproduction.

Accept all reasonable responses. 1. Plants have two-stage life cycles. 2. Seedless plants include mosses and ferns. 3. Seeds can be dispersed by water, wind, animals, or gravity.
Plant Processes

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Plant Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Plants make their own food.</td>
<td></td>
</tr>
<tr>
<td>- Plants break down food to release energy.</td>
<td></td>
</tr>
<tr>
<td>- Plant stems grow away from light.</td>
<td></td>
</tr>
<tr>
<td>- Plants have hormones that control changes in their growth.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe what would happen to life on Earth if all the green plants disappeared.

Accept all reasonable responses. If students understand that virtually all oxygen in Earth’s atmosphere is produced by photosynthesis, they will answer that animal life would be impossible without green plants.
Scan the illustrations in Section 1. Write three questions that you have about plants. Try to answer your questions as you read.

2. How do plants make food?
3. What is plant respiration?

Define cellulose using your book. Then write a sentence to illustrate its scientific meaning.

**cellulose**
- chemical compound made of sugar; forms tangled fibers in plant cell walls and provides structure and support
- Sample sentence: Cellulose in plants is important to the human diet.

Use your book to define the following terms.

**stomata**
- small openings that allow raw materials such as carbon dioxide, water vapor, and waste gases to enter and exit a leaf

**chlorophyll**
- green pigment found in the chloroplasts of green leaves

**photosynthesis**
- process during which a plant’s chlorophyll traps light energy and sugars are produced

**respiration**
- series of chemical reactions that break down food molecules

Use a dictionary to define release.

**release**
- to set free; to let go
Main Idea

Taking In Raw Materials

I found this information on page 303.
SE, p. 303
RE, p. 148

The Food-Making Process

I found this information on page 305.
SE, p. 305
RE, p. 149

Details

Organize what you know about the different layers of a plant’s leaves by completing the table below.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
<td>outer layer of the leaf; allows some materials, such as carbon dioxide and water vapor, to enter or exit the leaf</td>
</tr>
<tr>
<td>Palisade layer</td>
<td>area where most of the plant’s food is made</td>
</tr>
<tr>
<td>Spongy layer</td>
<td>carbon dioxide and water vapor fill the spaces</td>
</tr>
</tbody>
</table>

Summarize why stomata are important structures in a plant leaf. Materials enter and exit the leaf through stomata. Stomata can control how much water passes out of the leaf. They close when the plant is losing too much water.

Complete the equation for photosynthesis. Identify:

- the product that is stored as a food source
- the product that is released mostly as waste
- the product made during light-dependent reactions
- the product made during light-independent reactions

$$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$$

Food source: glucose made during light-independent reactions

Waste product: oxygen made during light-dependent reactions
Define aerobic respiration.

respiration that uses oxygen to break down food chemically

Complete the equation for aerobic respiration.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$$

Compare the processes of photosynthesis and aerobic respiration by completing the table.

<table>
<thead>
<tr>
<th></th>
<th>Photosynthesis</th>
<th>Aerobic Respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>energy is stored</td>
<td>energy is released</td>
</tr>
<tr>
<td>Raw materials</td>
<td>water and carbon dioxide</td>
<td>glucose and oxygen</td>
</tr>
<tr>
<td>End products</td>
<td>glucose and oxygen</td>
<td>water and carbon dioxide</td>
</tr>
<tr>
<td>Cell structure in which process occurs</td>
<td>chloroplasts</td>
<td>mitochondria</td>
</tr>
</tbody>
</table>

Create a concept map or other diagram to summarize what you learned in this section about plant structure and function.

Encourage students to include detailed information in concise form on their diagrams, and to use sketches to help them remember concepts.
Scan Section 2. Predict three things that you will learn. Accept all reasonable responses.

1. what tropisms are
2. how ethylene affects plants
3. how darkness affects flowers

Define behavior using your book.

behavior

the way in which an organism interacts with other organisms and its environment

New Vocabulary

tropism
response of a plant to external stimuli, movement caused by change in growth

auxin
type of plant hormone that causes plant stems and leaves to exhibit positive responses to light

photoperiodism
plant’s response to the number of hours of daylight and darkness it receives

long-day plant
plant that generally requires short nights—less than 12 hours of darkness—to begin the flowering process

short-day plant
plant that generally requires long nights—12 or more hours of darkness—to begin the flowering process

day-neutral plant
plant that does not require a specific photoperiod and can begin the flowering process over a range of night lengths

Academic Vocabulary

Use a dictionary to define involve.

involve
to include; to have as part of itself
Main Idea

What are plant responses?
I found this information on page __________.
SE, p. 311
RE, p. 153

Tropisms
I found this information on page __________.
SE, p. 312
RE, pp. 153–154

Main Idea

Details

Distinguish the types of stimuli as internal or external.

1. a stimulus that comes from outside the body
2. a stimulus that comes from inside the body

Complete the table below. Identify the stimulus for each described response.

<table>
<thead>
<tr>
<th>Stimulus</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object touches plant</td>
<td>Plant stem grows faster on one side. Stem bends and twists around object.</td>
</tr>
<tr>
<td>Light hits one side of plant</td>
<td>Plant bends toward light. Leaves turn and absorb more light.</td>
</tr>
<tr>
<td>Gravity pulls on plant</td>
<td>Roots grow downward. Stems grow upward.</td>
</tr>
</tbody>
</table>

Compare the effects of different hormones that affect plants.

Plant hormones

- Ethylene helps fruit ripen; leaves fall due to extra layer of cells forming between leaf and stem.
- Auxin causes stems to grow toward light.
- Gibberellins stimulate seed germination; stem growth.
- Cytokinin stimulates plant growth by faster cell division.
- Abscisic Acid prevents seeds sprouting and buds from developing in winter, and tomatoes opening on hot days.

Encourage students to record detailed notes with reasons as well as observations.
Section 2  Plant Responses (continued)

Main Idea

**Plant Hormones**

*SE, p. 314
RE, p. 154*

Details

Create a diagram to illustrate how auxin causes a stem to grow in response to sunlight. Write a short caption to describe where auxin is concentrated in the stem.

Sample caption:

Auxin concentrates on the shaded side of the stem.

Photoperiods

*SE, pp. 316–317
RE, p. 155*

Complete the table below to show your understanding of the effects of photoperiodism on different types of plants.

<table>
<thead>
<tr>
<th>Type of Plant</th>
<th>Hours of Darkness Needed to Flower</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-day plants</td>
<td>need less than 12 hours</td>
<td>spinach, lettuce, and beets</td>
</tr>
<tr>
<td>Short-day plants</td>
<td>need 12 or more hours</td>
<td>poinsettias, strawberries, and ragweed</td>
</tr>
<tr>
<td>Day-neutral plants</td>
<td>do not need a specific amount of light</td>
<td>dandelions and roses</td>
</tr>
</tbody>
</table>

Connect It

Explain plant responses you might see in plants that are growing indoors on a windowsill.

Accept all reasonable responses. Both gravity and light affect the growth of plants indoors. Plants near a sunny window will grow toward the source of sunlight. Their stems will grow upward. Their roots will grow downward.
Plant Processes Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Plant Processes</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Plants make their own food.</td>
<td>A SE, p. 305</td>
</tr>
<tr>
<td></td>
<td>RE, p. 149</td>
</tr>
<tr>
<td>• Plants break down food to release energy.</td>
<td>A SE, p. 307</td>
</tr>
<tr>
<td></td>
<td>RE, p. 150</td>
</tr>
<tr>
<td>• Plant stems grow away from light.</td>
<td>D SE, p. 312</td>
</tr>
<tr>
<td></td>
<td>RE, p. 153</td>
</tr>
<tr>
<td>• Plants have hormones that control changes in their growth.</td>
<td>A SE, pp. 313–315</td>
</tr>
<tr>
<td></td>
<td>RE, p. 154</td>
</tr>
</tbody>
</table>

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☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT
After reading this chapter, identify three things that you have learned about plant processes.

Accept all reasonable responses. 1. Plants can take in raw materials and get rid of wastes through their leaves. 2. Some of the chemical reactions that take place during photosynthesis require light, but others do not. 3. Many plants require a specific length of darkness to begin the flowering process.
### Introduction to Animals

#### Before You Read

Before you read the chapter, think about what you know about the topic. List three things that you already know about animals in the first column. Then list three things that you would like to learn about animals in the second column.

<table>
<thead>
<tr>
<th><strong>K</strong></th>
<th><strong>W</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know</td>
<td>What I want to find out</td>
</tr>
</tbody>
</table>

#### Science Journal

List the animals you may find living around a coral reef.

Accept all reasonable responses. Lists may include various corals, fishes, and sea anemones.

<table>
<thead>
<tr>
<th>Animals you may find living around a coral reef</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Introduction to Animals
Section 1 Is it an animal?

Scan the headings in Section 1 of the chapter. Identify three topics that are discussed. Accept all reasonable responses.

1. animal characteristics
2. how animals meet their needs
3. how animals are classified

Define adaptation using your book or a dictionary. any variation that makes an organism better suited to its environment

Read the definitions below. Write the correct vocabulary term on the blank to the left of each definition.

omnivore animal that eats both plants and animals; mammals with specialized teeth for eating plants and animals
radial symmetry arrangement of body parts in a circle around a center point
invertebrate an animal without a backbone
carnivore animal that eats only other animals or the remains of other animals
bilateral symmetry arrangement of body parts into halves that are nearly mirror images of each other
herbivore animal that eats only plants or parts of plants
vertebrate an animal that has a backbone

Use a dictionary to define definite to show its scientific meaning.

having exact limits in size, shape, or number of parts
Main Idea

Animal Characteristics

I found this information on page ________.
SE, p. 330
RE, p. 157

Summarize the characteristics of animals by completing the following main points.

Animals get their food from ___________________________ other living things.

Many animals move from place to place to find _______ food, _______ mates, and/or _______ shelter/places to live.

All animals can reproduce _______ sexually. Some also can reproduce _______ asexually.

Animal cells have a _______ nucleus and other parts inside called _______ organelles.

How Animals Meet Their Needs

I found this information on page ________.
SE, pp. 331–333
RE, pp. 158–160

Compare animal adaptations by completing the chart.

<table>
<thead>
<tr>
<th>How Animals Meet Their Needs</th>
<th>Adaptations</th>
<th>Animal Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ways to get energy</td>
<td>eat plants</td>
<td>deer, some fishes</td>
</tr>
<tr>
<td></td>
<td>eat animals</td>
<td>lion, hawk, buzzard</td>
</tr>
<tr>
<td></td>
<td>eat plants and animals</td>
<td>bear, robin, human being</td>
</tr>
<tr>
<td>Physical features</td>
<td>large size</td>
<td>moose, bison</td>
</tr>
<tr>
<td></td>
<td>mimicry</td>
<td>scarlet king snake</td>
</tr>
<tr>
<td></td>
<td>camouflage</td>
<td>trout, cuttlefish</td>
</tr>
<tr>
<td>Behaviors</td>
<td>run away from predators</td>
<td>Thompson’s gazelle</td>
</tr>
<tr>
<td></td>
<td>live in groups</td>
<td>herring, wolf</td>
</tr>
</tbody>
</table>
Main Idea

Animal Classification

Complete and label the circle graph to compare the percent of known animals that are vertebrates with the percent of known animals that are invertebrates.

**Animals**

- **Vertebrates**: 3%
- **Invertebrates**: 97%

Details

Compare forms of animal symmetry by identifying and drawing an example of each below. Accept all reasonable examples.

<table>
<thead>
<tr>
<th>Symmetry</th>
<th>Example</th>
<th>Examples</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymmetrical</td>
<td><strong>Example:</strong> sponge</td>
<td><strong>Examples:</strong> sea anemone,</td>
<td><strong>Example:</strong> lobster, butterfly, human</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sea urchin</td>
<td></td>
</tr>
<tr>
<td>Radial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Encourage clear and logical diagrams rather than artistic merit.

**SUMMARIZE IT**

Analyze the physical or behavioral adaptations of an animal that protect it from predators. Accept all reasonable responses.

Some insects are camouflaged to make it difficult for predators to detect them. Some may mimic another insect that tastes bad or can sting.
Introduction to Animals
Section 2  Sponges and Cnidarians

Skim  Section 2 of the chapter. Read the headings and look at the illustrations. Predict three things that you will learn. Accept all reasonable responses.

1. characteristics of sponges and cnidarians
2. how sponges and cnidarians get food and oxygen
3. why living coral reefs are important

Define  flagella using your book or a dictionary.

long, thin, whiplike structures that grow from a cell

Read the definitions below. Write the correct vocabulary term on the blank to the left of each definition.

form of a cnidarian that is bell-shaped and free-swimming

capsule with a threadlike structure containing toxins that help a cnidarian capture food

organisms that remain attached to one place during most of their life

armlike structures that have stinging cells used for getting food

animal that produces both sperm and eggs in the same body

cnidarian body type that is vase-shaped and is usually sessile

Use a dictionary to define source to show its scientific meaning.

any person, place, or thing by which something is supplied
Summarize information about sponges.

Sponges appeared on Earth about 600 million years ago. Most live in salt water. Some have radial symmetry, but most are asymmetrical. Adult sponges are sessile, which means they do not move. Sponges pull water into their bodies, where cells filter out food and oxygen.

Model a sponge’s body. Label the sponge’s central cavity and pores. Show the path followed by water into and out of the sponge.

Sketches should show a sponge as a hollow tube perforated by pores. Water flows in through the pores and out through the end of the central cavity.

Organize information about the two forms of cnidarians by completing the chart.

<table>
<thead>
<tr>
<th></th>
<th>Medusa</th>
<th>Polyp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Form (shape)</td>
<td>like a bell or an umbrella</td>
<td>like a vase</td>
</tr>
<tr>
<td>Mobility</td>
<td>free-swimming; floats along on currents</td>
<td>usually sessile</td>
</tr>
<tr>
<td>Examples</td>
<td>jellyfishes for most of their lives</td>
<td>sea anemones, corals, and hydras for most of their lives</td>
</tr>
</tbody>
</table>
Sequence the steps in reproduction of medusa forms of cnidarians by completing the cycle chart.

1. Medusae bud off polyp.
2. Polyp forms buds that become medusae.
3. Larva develops into polyp.
5. Fertilized egg develops into larva.

Summarize key information about coral reefs in the outline.

I. Coral reefs
   A. Formation of coral reefs
      1. Made of shells or skeletons of polyps
      2. Grow as each new generation builds on top of existing coral skeletons
      3. Can take millions of years to form
   B. Importance of coral reefs
      1. Provide habitat for diversity of life
      2. Protect beaches and shorelines
      3. Provide chemicals used in medical research

SYNTHESIZE IT

Explain how sponges and cnidarians could be mistaken for plants rather than animals. Accept all reasonable responses.

Cnidarians and sponges may seem similar to plants because they are sessile for most of their lives, whereas many animals move from place to place to find food, mates, or shelter. Also, it may not be apparent that they need to get their food from other living things, as all animals do.
Introduction to Animals
Section 3 Flatworms and Roundworms

Scan Section 3 of the chapter. Write four questions that come to mind. Look for answers to your questions as you read the section.

1. What is a worm? Accept all reasonable responses.
2. How are flatworms and roundworms different?
3. How do flukes and tapeworms reproduce?
4. Why are roundworms important?

Review Vocabulary Define cilia using your book or a dictionary.

cilia
short, threadlike structures that aid in locomotion

New Vocabulary Use your book or a dictionary to define each vocabulary term.
Then use each term in a sentence that shows its scientific meaning.

free-living organisms organisms that do not depend on another organism for food or a place to live; Sample sentence: A planarian is a free-living organism that lives under rocks in freshwater and feeds on small organisms or the dead bodies of larger organisms.

anus opening at the end of the digestive tract through which wastes leave the body; Sample sentence: Roundworms are thought to be the first animals to have a digestive system with two body openings, a mouth and an anus.

Academic Vocabulary Use a dictionary to define require to show its scientific meaning.
require to need

organisms that do not depend on another organism for food or a place to live; Sample sentence: A planarian is a free-living organism that lives under rocks in freshwater and feeds on small organisms or the dead bodies of larger organisms.

opening at the end of the digestive tract through which wastes leave the body; Sample sentence: Roundworms are thought to be the first animals to have a digestive system with two body openings, a mouth and an anus.
Main Idea

What is a worm?

I found this information on page ________.

SE, p. 344
RE, p. 170

Flatworms

I found this information on page ________.

SE, pp. 344–346
RE, pp. 170–172

Details

Analyze worms by identifying four characteristics below.

- invertebrates
- soft bodies
- bilateral symmetry
- three tissue layers

Compare characteristics of planarians and flukes by completing the chart below.

<table>
<thead>
<tr>
<th>Flatworms</th>
<th>Planarians</th>
<th>Flukes</th>
</tr>
</thead>
<tbody>
<tr>
<td>How they live</td>
<td>free-living</td>
<td>as parasites</td>
</tr>
<tr>
<td>What they eat</td>
<td>small organisms or dead bodies</td>
<td>cells and fluids of host</td>
</tr>
<tr>
<td>How they move</td>
<td>cilia; slides along on mucus</td>
<td>carried by host</td>
</tr>
<tr>
<td>How they reproduce</td>
<td>asexually and sexually</td>
<td>usually sexually</td>
</tr>
</tbody>
</table>

Model a tapeworm by sketching it. Label its hooks, its suckers, and a mature segment with eggs.

Sketches should indicate that the mature segment is located at the end of a series of segments.
Summarize ways that roundworms are both helpful and harmful.

Accept all reasonable responses. Roundworms are helpful because they can kill other pests and provide nutrients to soil. Roundworms are harmful because they cause disease and damage fiber, agricultural products, and food.
**Tie It Together**

**Preventing Disease**

*You are working on a public health campaign to inform people of the dangers of parasitic flatworms and roundworms. Create a poster with key information about diseases these organisms can cause and how to avoid them. Use words, pictures, and diagrams to get your message across.* Accept all reasonable responses.

Students may wish to describe the life cycle of parasitic worms and how people can come in contact with them. Advice may include washing hands with soap and water after using the bathroom, cooking meat thoroughly, drinking only water that has been treated, and understanding how parasites can affect the body’s organs.
**Introduction to Animals**  Chapter Wrap-Up

*Review the ideas you listed in the chart at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the chart by filling in the third column.*

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
<th>L</th>
<th>What I learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accept all reasonable responses.</td>
</tr>
</tbody>
</table>

**Review**

*Use this checklist to help you study.*

- Review the information you included in your Foldable.
- Study your *Science Notebook* on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

**SUMMARIZE IT**

After reading this chapter, identify three main ideas that you have learned about animals.  Accept all reasonable responses.

1. Most flatworms are parasites, which depend on another organism for food and a place to live.
2. Flukes can infect the eyes, lungs, liver, and other organs.
3. Roundworms are thought to be the first animal with two body openings.
Mollusks, Worms, Arthropods, Echinoderms

Before You Read

Before you read the chapter, think about what you know about the topic. List three things you already know about mollusks, worms, arthropods, and echinoderms in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accept all reasonable responses.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List three animals from each animal group you will be studying: mollusks, worms, arthropods, and echinoderms.

Student responses will vary. Possible responses:
- Mollusks—snail, slug, squid;
- Worms—earthworm, leech, marine worm; arthropod—butterfly, bee, fly;
- Echinoderms—sea star, sand dollar, sea cucumber
Scan the headings in Section 1 of your book. Identify three topics that will be discussed. Accept all reasonable responses.

1. characteristics of mollusks
2. different classifications of mollusks
3. value of mollusks

Define visceral mass using your book or a dictionary.

visceral mass
contains the stomach and other organs

Use your book or a dictionary to define the following terms.

mantle
thin layer of tissue that covers a mollusk’s body organs

gill
organ that exchanges carbon dioxide for oxygen in the water

open circulatory system
blood circulation system in which the heart moves blood out into open spaces around the body organs

radula
in gastropods, a tonguelike organ with rows of teeth used to obtain food

closed circulatory system
blood circulation system in which blood containing food and oxygen moves through the body in a series of closed vessels

Use a dictionary to define relax as it might be used in science.

relax
to become inactive and lengthen
Section 1 Mollusks (continued)

Main Idea

Characteristics of Mollusks

Identify characteristics of mollusks in the chart below.

<table>
<thead>
<tr>
<th>Characteristics of Mollusks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of symmetry</strong></td>
</tr>
<tr>
<td><strong>Body description</strong></td>
</tr>
<tr>
<td><strong>Where they live</strong></td>
</tr>
</tbody>
</table>

Model the body of a mollusk by sketching a snail and labeling its shell, mantle, gill, mantle cavity, foot, radula, and other body parts.

Sketches should identify the following parts: shell, mantle, gill, mantle cavity, foot, radula; other parts that may be identified include visceral mass, mouth, stomach, heart, and anus.

I found this information on page 360.

SE, p. 360
RE, p. 175

As a quiz or in-class knowledge checkpoint, provide an overhead image of a snail with taglines to parts. Have students identify the parts and describe their functions.
Discuss several ways you could protect a boat from being damaged by shipworms. Accept all reasonable responses.

- Coat a wooden boat with a chemical that repels shipworms;
- build the boat from a material other than wood, such as fiberglass or metal;
- or store the boat when it is not in use.

Compare and contrast types of mollusks by completing the chart.

<table>
<thead>
<tr>
<th>Types of Mollusks</th>
<th>Gastropods</th>
<th>Bivalves</th>
<th>Cephalopods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where do they live?</td>
<td>water and land</td>
<td>water</td>
<td>water</td>
</tr>
<tr>
<td>How many shells?</td>
<td>one or none</td>
<td>two</td>
<td>one—an internal shell</td>
</tr>
<tr>
<td>Examples</td>
<td>snails, conchs, garden slugs</td>
<td>clams, oysters, scallops</td>
<td>squid, octopuses</td>
</tr>
</tbody>
</table>

Organize the uses of mollusks and the problems they cause by completing the chart below. Accept all reasonable responses.

- **Uses of Mollusks**
  - Mollusks provide food for fish, birds, and humans.
  - Empty shells serve as homes for other invertebrates.
  - Shells and pearls are used for jewelry and decorations.
  - Land snails and slugs damage plants.
  - Shipworms damage underwater wood of docks and boats.

- **Problems Mollusks Cause**
  - Some species host parasites that infect humans.
Review Vocabulary

Define aerate using your book or a dictionary.

to supply with air

New Vocabulary

Use your book or a dictionary to define the following terms. Then use each term in a sentence to show its scientific meaning.

setae bristle-like structures on the outside of each body segment that segmented worms use to move; Sample sentence: Segmented worms use their setae to move.

crop digestive system sac in which earthworms store ingested soil; Sample sentence: Ingested soil moves to the earthworm’s crop.

gizzard muscular digestive system structure in which earthworms grind soil and organic matter; Sample sentence: An earthworm’s gizzard grinds soil so it can be broken down and used for nutrition.

Academic Vocabulary

Use a dictionary to define survive as it might be used in science.

to continue living

Mollusks, Worms, Arthropods, Echinoderms

Section 2 Segmented Worms

Skim Section 2 of your book. Write three questions that come to mind. Look for answers to your questions as you read the section. Accept all reasonable responses.

1. What do worms eat?

2. How are leeches used in medicine?

3. Are worms useful to humans?

Name ___________________________ Date _______________
Main Idea

Segmented Worm Characteristics

Identify characteristics of segmented worms in the chart below.

<table>
<thead>
<tr>
<th>Characteristics of Segmented Worms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of symmetry</td>
</tr>
<tr>
<td>Body description</td>
</tr>
<tr>
<td>Where they live</td>
</tr>
</tbody>
</table>

Earthworm Body Systems

Sequence and define the functions of an earthworm’s digestive system by completing the flow chart.

- **Mouth**: opening through which worm takes in soil
- **Crop**: sac used for storage of soil
- **Gizzard**: muscular structure that grinds soil and organic matter
- **Intestine**: tubelike structure that breaks down organic matter and absorbs nutrients
- **Anus**: opening through which waste is excreted

Identify three ways that marine worms move.

- burrow
- float
- walk along the ocean floor

Marine Worms

Identify three ways that marine worms move.

Ask students to explain what organic matter is, and why it may be found in soil. (It is plant and animal material and waste.) The chemical definition of organic is “containing carbon.”
**Main Idea**

**Leeches and Leeches and Medicine**

Summarize the process by which leeches feed on the blood of other animals. Then explain how the process is useful in medicine.

A sucker on each end of a leech’s body is used to attach the leech to an animal. The leech bites and sucks out blood. The leech produces several chemicals, including an anesthetic to numb the area. This process is useful after certain types of surgery because the chemicals produced help prevent clotting, dilate blood vessels, and improve blood flow. This helps the area heal more quickly.

**Value of Segmented Worms**

Identify ways segmented worms are helpful in the organizer below.

- Earthworms aerate soil.
- Earthworms speed the return of nitrogen to soil.
- Leech saliva is used to produce drugs.
- Marine worms provide food for fish.

**Origin of Segmented Worms**

Compare three similarities of mollusks and worms which suggest that they share a common ancestor.

- first animals to have a body cavity for organs
- have a one-way digestive system
- larvae are similar

**CONNECT IT**

Explain why there are not many fossils of ancient worms.

Accept all reasonable responses. When worms die, their soft bodies usually decay quickly, leaving no remains to fossilize.
**Mollusks, Worms, Arthropods, Echinoderms**

**Section 3 Arthropods**

**Scan** the What You’ll Learn statements for Section 3 of your book. Identify three topics that will be discussed. Accept all reasonable responses.

1. characteristics that are used to classify arthropods
2. structure and function of the exoskeleton
3. difference between complete and incomplete metamorphosis

**Review Vocabulary**

**Define** venom using your book or a dictionary.

*venom*

toxic fluid injected by an animal

**New Vocabulary**

Use your book or a dictionary to define the following terms.

*appendage*

jointed structure of arthropods, such as a leg, a pincer, or an antenna

*molting*

shedding and replacing of an arthropod’s exoskeleton

*spiracle*

opening in the abdomen and thorax of insects through which air enters and waste gases leave

*metamorphosis*

process in which many insect species change their body form to become adults

**Academic Vocabulary**

Use a dictionary to define individual as it might be used in science.

*individual*

separate
Complete the chart below to identify characteristics of arthropods.

<table>
<thead>
<tr>
<th>Characteristics of Arthropods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of symmetry</td>
</tr>
<tr>
<td>Body description</td>
</tr>
<tr>
<td>Where they live</td>
</tr>
</tbody>
</table>

Organize information about body regions of insects in the outline.

**Insects**

I. Insect body regions

A. Parts of the head

1. pair of antennae
2. eyes
3. mouth

B. Parts of the thorax

1. three pairs of legs
2. two pairs of wings
3. spiracles

C. Parts of the abdomen

1. reproductive structures
2. spiracles

**Arachnids**

Identify three arachnids and one unique characteristic of each.

<table>
<thead>
<tr>
<th>Types of Arachnids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scorpions</td>
</tr>
<tr>
<td>Spiders</td>
</tr>
<tr>
<td>Ticks</td>
</tr>
</tbody>
</table>

- Scorpions: have sharp, venom-filled stinger
- Spiders: cannot chew; release enzyme to digest prey
- Ticks: remove blood from their host with mouthparts
**Main Idea**

### Centipedes and Millipedes

I found this information on page 375.

SE, p. 375

RE, p. 190

### Crustaceans

I found this information on page 377.

SE, p. 377

RE, p. 190

### Value of Arthropods

I found this information on page 377–378.

SE, pp. 377–378

RE, pp. 190–191

### Compare and contrast**
centipedes and millipedes by completing the Venn diagram below with at least six facts.

<table>
<thead>
<tr>
<th>Centipedes</th>
<th>Both</th>
<th>Millipedes</th>
</tr>
</thead>
<tbody>
<tr>
<td>capture and eat prey</td>
<td>reproduce sexually</td>
<td>feed on plants</td>
</tr>
<tr>
<td>have one pair of legs per segment</td>
<td>lay eggs</td>
<td>have two pairs of legs per segment</td>
</tr>
</tbody>
</table>

### Identify two functions of crustaceans’ swimmerets.

1. help crustaceans move
2. are used in reproduction

### Summarize helpful functions and problems caused by arthropods. Accept all reasonable responses.

#### Helpful Arthropod Functions

- feed animals
- pollinate crops

#### Problems Arthropods Cause

- feed on crops
- carry disease
- destroy food, clothing, and property

### Synthesize It

Analyze one method of controlling insect pests. Support your reasoning. Accept all reasonable responses.

Specific insect pests could be controlled by chemicals that interfere with their reproduction. Targeting a particular pest should not affect other animals too severely.
Scan Section 4 of your book. Use the checklist below.

- Read all the headings.
- Read all the bold words.
- Look at the charts, graphs, and pictures.
- Think about what you already know about echinoderms.

Now, write three things that you want to learn about echinoderms.

1. What does the word echinoderm mean?
2. Where do echinoderms live?
3. How are echinoderms different from one another?

Define epidermis using your book or a dictionary.

epidermis
outer, thinnest layer of skin

Write a paragraph that explains the meaning and functions of both of the vocabulary terms.

Sample paragraph: A water-vascular system allows echinoderms to move, to exchange carbon dioxide and oxygen, capture food, and release wastes. The system has thousands of tube feet connected to it. Suction cups at the ends of tube feet push out or pull in as pressure in the feet changes.

Use a dictionary to define network in a way that it might be used in science.

network
a group of related parts
Echinoderm Characteristics

Identify characteristics of echinoderms in the chart below. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Characteristics of Echinoderms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of symmetry</strong></td>
</tr>
<tr>
<td><strong>Body description</strong></td>
</tr>
<tr>
<td><strong>Where they live</strong></td>
</tr>
</tbody>
</table>

Create a graphic organizer to identify the functions of a water-vascular system. Accept all reasonable responses.

A water-vascular system helps echinoderms to:
- move
- capture food
- exchange carbon dioxide and oxygen
- release wastes
**Main Idea**

**Types of Echinoderms**

*Classify the types of echinoderms, and identify one characteristic of each in the chart below. Accept all reasonable responses.*

<table>
<thead>
<tr>
<th>Echinoderms</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea stars</td>
<td>have at least five arms that can regenerate if broken off</td>
</tr>
<tr>
<td>Brittle stars</td>
<td>have brittle arms that allow them to escape predators quickly</td>
</tr>
<tr>
<td>Sea urchins</td>
<td>have sacs near the ends of their spines that hold toxic fluid</td>
</tr>
<tr>
<td>Sand dollars</td>
<td>have a five-pointed pattern on their surface</td>
</tr>
<tr>
<td>Sea cucumbers</td>
<td>have a soft body with a leathery covering</td>
</tr>
</tbody>
</table>

**Value of Echinoderms**

*Summarize four reasons that echinoderms are important to ocean environments. Accept all reasonable responses.*

1. Echinoderms feed on dead organisms and help recycle materials.
2. Sea urchin eggs and sea cucumbers are used for food.
3. Echinoderms are used in research and are a potential source of medicines.
4. Sea stars are predators that control other animal populations.

**CONNECT IT**

*Predict in what part of the ocean echinoderms probably live. Support your reasoning. Accept all reasonable responses.*

Echinoderms probably live on the ocean floor and coastlines, because their adaptations are best suited for moving along a surface or for burrowing.
# Mollusks, Worms, Arthropods, Echinoderms Chapter Wrap-Up

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K What I know</th>
<th>W What I want to find out</th>
<th>L What I learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Accept all reasonable responses.</td>
</tr>
</tbody>
</table>

## Review

*Use this checklist to help you study.*

- Review the information you included in your Foldable.
- Study your *Science Notebook* on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

## Summarize It

After reading this chapter, identify three main ideas that you have learned that you did not know before. *Accept all reasonable responses.*

1. Mollusks are a food source for many animals.
2. Earthworms condition and aerate the soil, which helps increase crop yields.
3. Arthropods, such as those that carry diseases and eat crops, affect our lives every day.
Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Fish, Amphibians, and Reptiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• All vertebrates are chordates.</td>
</tr>
<tr>
<td></td>
<td>• Scales can be used to classify fish.</td>
</tr>
<tr>
<td></td>
<td>• The health of amphibians can indicate the health of the environment.</td>
</tr>
<tr>
<td></td>
<td>• Reptiles must lay their eggs in water.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List two unique characteristics for each animal group you will be studying.

Students’ responses will vary, but may include these: fish live and breathe in water, amphibians change forms and live near water, and reptiles lay eggs and breathe air.
Fish, Amphibians, and Reptiles
Section 1 Chordates and Vertebrates

Scan the headings in Section 1 of your book. Predict three topics that will be discussed. Accept all reasonable responses.

1. characteristics of chordates
2. characteristics of vertebrates
3. types and numbers of vertebrates

Define motor responses using your book or a dictionary.

motor responses
responses that involve muscular movement

Read the definitions below. Write the correct vocabulary term on the blank to the left of each definition.

chordate
animal that at some point in its development has a notochord, postanal tail, nerve cord, and pharyngeal pouches

pharyngeal pouches
pairs of openings between the mouth and the digestive tube found in developing chordates

vertebrae
bones that surround and protect the spinal nerve cord

endoskeleton
internal supportive and protective framework found in all vertebrates

erve cord
tubelike structure that develops into the brain and spinal cord

postanal tail
muscular structure at the end of a developing chordate

notochord
flexible, firm structure that extends along the upper part of chordate’s body

cartilage
tough, flexible tissue that joins vertebrae and makes up all or part of the vertebrate endoskeleton

Use a dictionary to define external as it might be used in science.

external
on, or for use on, the outside of the body
Main Idea

Chordate Characteristics

Model a developing chordate. Label its pharyngeal pouches, postanal tail, notochord, and nerve cord.

Vertebrate Characteristics

Summarize how the nerve cord develops in most chordates.

Distinguish vertebrate chordates from nonvertebrate chordates. List characteristics of vertebrates that nonvertebrates do not have.

1. internal framework or endoskeleton
2. a backbone with vertebrae that protect the spinal cord
3. a head with a skull that protects the brain
4. most internal organs in the central part of the body
5. skin covering the body
6. sometimes have hair, feathers, scales, or horns

Sketches should resemble the illustration in the text and identify the characteristics listed.
Identify the 7 main groups of vertebrates.

Define ectotherm and endotherm. Provide a synonym (or word that means the same) and examples for each.

Create a timeline to show when vertebrates, amphibians, reptiles, and mammals first appeared. Use a scale of 500 million years ago to the present time.
Fish, Amphibians, and Reptiles

Section 2 Fish

**Skim** Section 2 of your book. Write three questions that come to mind. Look for answers to your questions as you read the section.

1. What are scales? 
2. What are gills? 
3. How do fish rise or sink in water?

**Define** streamline using your book or a dictionary.

- **streamline** formed to reduce resistance to motion through a fluid or air

**New Vocabulary**

- **lateral line** shallow canal-like structure that runs the length of the fish’s body and is filled with sensory organs
- **fin** fanlike structure attached to the endoskeleton that helps fish steer, balance, and move
- **spawning** release of sperm by male fish over eggs that have been released by a female into water; done by most fish
- **scales** hard, thin plates that cover and protect the skin; used to classify fish
- **swim bladder** in most bony fish, an air sac that allows a fish to adjust its density in response to the surrounding water

**Academic Vocabulary**

- **detect** to catch or discover; to perceive

Use a dictionary to define detect as it would be used in science.
Main Idea

Fish Characteristics

I found this information on page ____________.
SE, p. 399
RE, p. 201

Details

Summarize information about structures and functions of fish fins and scales.

Fins are fanlike structures attached to the endoskeleton. Those on the sides allow movement right, left, forward, and backward. Those on the top and bottom provide stability.

Scales are hard, thin plates made of bone that cover the skin and protect the body. They may be tooth-shaped, diamond-shaped, cone-shaped, or round. Scientists use them to classify fish.

Sequence the steps of fish respiration that take place when a fish obtains oxygen and gets rid of carbon dioxide.

1. A fish takes water into its ____________.
2. Water passes over the ____________, which contain many tiny ____________.
3. ____________ from the water is exchanged with ____________ from the blood.
4. Water containing ____________ passes out through openings on the sides of the fish.

Compare internal and external fertilization in fish by completing the Venn diagram with at least three facts.

<table>
<thead>
<tr>
<th>Internal</th>
<th>Both</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>inside the female’s body</td>
<td>joining of egg and sperm</td>
<td>in water outside the female’s body</td>
</tr>
</tbody>
</table>

I found this information on page ____________.
SE, p. 400
RE, p. 202

I found this information on page ____________.
SE, p. 401
RE, p. 202
Main Idea

Types of Fish

Organize information about the 3 groups of fish by completing the chart.

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawless fish</td>
<td>round, toothed mouths; long, tubelike bodies; slimy skin, no scales; skeletons made of cartilage; earliest fish</td>
<td>lampreys, hagfish</td>
</tr>
<tr>
<td>Jawed cartilaginous fish</td>
<td>movable jaws; teeth usually well-developed; tiny scales</td>
<td>sharks, skates, rays</td>
</tr>
<tr>
<td>Bony fish</td>
<td>include 95 percent of all fish; skeletons made of bone; bony flap covers gills; have swim bladder to regulate depth</td>
<td>lungfish, salmon, tuna, swordfish</td>
</tr>
</tbody>
</table>

Model the body of a typical bony fish by sketching a cutaway view of one. Label its nostrils, mouth, gills, brain, heart, liver, stomach, intestine, scales, bony vertebrae, and swim bladder.

Sketches should resemble the body structure and include the parts shown in the illustration on SE p. 403 or RE p. 203.

CONNECT IT

Analyze how other organisms in a lake might be affected if all the fish living in it disappeared. Accept all reasonable responses.

There would be no more fishing; wildlife that depend on fish for food would decline; insects and water plants kept in check by fish would increase.
Fish, Amphibians, and Reptiles

Section 3 Amphibians

Scan the What You’ll Learn statements for Section 3 of your book. Identify three topics that will be discussed. Accept all reasonable responses.

1. amphibian adaptations for land and water
2. characteristics of different kinds of amphibians
3. how amphibians reproduce and develop

Review Vocabulary

Define habitat using your book or a dictionary.

place where an organism lives and that provides the types of food, shelter, moisture, and temperature needed for survival

New Vocabulary

Read the definitions below. Write the correct vocabulary term on the blank to the left of each definition.

estivation
inactivity in hot, dry months

metamorphosis
developmental process in which most amphibians change their body form to become adults

hibernation
time of inactivity and slowed metabolism during cold weather

biological indicator
species whose overall health reflects the health of the ecosystem in which it lives

Academic Vocabulary

Use a dictionary to define contact as it might be used in science. Then write a sentence that includes the term.

act or state of touching or meeting; Sample sentence: Some frogs can poison animals that come in contact with their skin.
Main Idea

Amphibian Characteristics

I found this information on page __________.
SE, p. 407
RE, p. 206

Have students use dictionaries to find and define other words that contain the roots amphi or bios.

I found this information on page __________.
SE, pp. 407–408
RE, pp. 206–207

Details

Complete the chart about amphibians.

<table>
<thead>
<tr>
<th>Amphibians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
</tr>
<tr>
<td>Origin of name</td>
</tr>
<tr>
<td>Examples</td>
</tr>
</tbody>
</table>

Compare and contrast amphibian hibernation with estivation by completing the Venn diagram with at least four facts.

I. Gas exchange

A. Skin is thin, __________, and lined with __________ capillaries.

B. Lungs are small and __________.

II. Three-chambered heart

A. First chamber __________ receives oxygen-filled blood from skin and lungs.

B. Second chamber __________ receives carbon dioxide-filled blood from tissues.

C. Third chamber __________ pumps oxygen-filled blood to tissues and carbon dioxide-filled blood to lungs.

Summarize amphibian respiration and circulation in the outline.

Fish, Amphibians, and Reptiles 157
Main Idea

Amphibian Characteristics

Sequence reproduction and development in amphibians.

Eggs are laid in ___________ water and fertilized ___________ externally → Eggs hatch into ___________ tadpoles with fins, ___________ gills, and a two-chambered heart → Tadpoles develop legs, ___________ lungs, and ___________ a three-chambered heart → Adults can live on ___________ land ___________.

Frogs and Toads and Salamanders

Classify amphibians by completing the chart.

<table>
<thead>
<tr>
<th>Amphibian Groups</th>
<th>Frogs and Toads</th>
<th>Salamanders and Newts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body structure</td>
<td>short, wide bodies; strong hind legs; large eyes and nostrils</td>
<td>long, slender bodies; short legs</td>
</tr>
<tr>
<td>Feeding habits</td>
<td>sticky tongue; eat insects, worms, and spiders</td>
<td>eat worms and insects</td>
</tr>
<tr>
<td>Reproduction</td>
<td>external fertilization in water</td>
<td>internal fertilization on land, external fertilization in water</td>
</tr>
</tbody>
</table>

Importance of Amphibians

Identify four ways that amphibians are important to humans.

Why Amphibians are Important

control insects source of food medical research biological indicators

CONNECT IT

Think about where amphibians spend their lives. Analyze how this might make them important biological indicators. Accept all reasonable responses.

Amphibians spend part of their lives in water and part on land. Because amphibians live in both water and on land, their health will be affected by problems in either or both places.
Fish, Amphibians, and Reptiles
Section 4 Reptiles

Skim Section 4 of your book. Write three questions that come to mind. Look for answers to your questions as you read the section.

1. What is a skink? Accept all reasonable responses.
2. What are some characteristics of reptiles?
3. How are reptiles important?

Define bask using your book or a dictionary.

to warm by continued exposure to heat

Use your book or a dictionary to define the vocabulary term. Then use the term in a sentence that shows its scientific meaning.

amniotic egg
egg covered with a shell that provides a complete environment for the embryo’s development; for reptiles, a major adaptation for living on land; Sample sentence: The amniotic egg provides food for a developing organism and protects it from drying out with a shell.

interpret
to explain the meaning of; make understandable; to translate
**Main Idea**

**Reptile Characteristics**

I found this information on page _______.

SE, p. 412  
RE, p. 211

**Details**

**Summarize** reptiles by completing the chart.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description or Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>thick, dry, waterproof</td>
</tr>
<tr>
<td>Scales</td>
<td>reduce water loss</td>
</tr>
<tr>
<td>Movement</td>
<td>reptiles with legs: turtles, crocodiles, most lizards; reptiles without legs: snakes, some lizards</td>
</tr>
<tr>
<td>Body Temperature</td>
<td>ectotherms; move into or out of the Sun to maintain body temperature</td>
</tr>
<tr>
<td>Circulation</td>
<td>more highly developed than amphibians; most have a three-chambered heart; crocodiles have a four-chambered heart</td>
</tr>
<tr>
<td>Respiration</td>
<td>breathe with lungs; reptiles that live in water must come to the surface to breathe</td>
</tr>
</tbody>
</table>

**Model** the structure of the amniotic egg. **Label** the embryo, shell, yolk sac, egg membrane, and air space.

Students’ drawings should use the appropriate labels and resemble illustrations on SE p. 413 or RE p. 212.
Types of Modern Reptiles

I. Lizards
   A. Body:
      1. Jaw has ________ joint that hinges to enlarge mouth
      2. Toes have ________ claws
   B. Feeding: eat ________ plants, reptiles, insects, worms, mammals

II. Snakes
   A. Jaw:
      1. Has joint that ________ hinges to enlarge mouth
      2. Lower jaw bone used to ________ sense vibrations
   B. Have no legs

III. Turtles
   A. Body:
      1. Jaw is ________ beaklike to crush food
      2. Shell consists of ________ two hard, bony plates
   B. Feeding: eat ________ insects, worms, fish, plants

IV. Crocodilians
   A. Body:
      1. Shape is ________ lizardlike
      2. Head
         a. Crocodile: ________ narrow with triangular snout
         b. Alligator: ________ wide with rounded snout
         c. Gavial: ________ very slender snout; rounded growth on end
   B. Feeding: eat ________ large prey, fish, turtles, waterbirds

V. The Importance of Reptiles
   A. Snakes eat rats and mice that destroy grain.
   B. Some reptiles eat insect pests.
Fish, Amphibians, and Reptiles
Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Fish, Amphibians, and Reptiles</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All vertebrates are chordates.</td>
<td>A SE, p. 395 RE, p. 198</td>
</tr>
<tr>
<td>• Scales can be used to classify fish.</td>
<td>A SE, p. 399 RE, p. 201</td>
</tr>
<tr>
<td>• The health of amphibians can indicate the health of the environment.</td>
<td>A SE, p. 411 RE, p. 209</td>
</tr>
<tr>
<td>• Reptiles must lay their eggs in water.</td>
<td>D SE, p. 413 RE, p. 212</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

- Review the information you included in your Foldable.
- Study your Science Notebook on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

Summarize It

After reading this chapter, identify three main ideas that you have learned that you did not know before. Accept all reasonable responses.

1. Vertebrates are either ectotherms or endotherms. 2. Most female fish release large numbers of eggs into the water. The eggs are then fertilized when the male releases sperm. 3. One of the most important adaptations that helped reptiles live on land was the development of the amniotic egg.
### Before You Read

*Before you read the chapter, respond to these statements.*

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Birds and Mammals</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A bird has a crop instead of a stomach.</td>
<td></td>
</tr>
<tr>
<td>• Wings are important for nonflying birds.</td>
<td></td>
</tr>
<tr>
<td>• Marsupials are mammals that lay eggs.</td>
<td></td>
</tr>
<tr>
<td>• Bats help pollinate flowers.</td>
<td></td>
</tr>
</tbody>
</table>

### Construct the Foldable as directed at the beginning of this chapter.

**Science Journal**

List similar characteristics of a mammal and a bird. What characteristics are different?

- Student responses will vary. Similar—warm-blooded; live on every continent on Earth; give parental care. Different—birds have feathers; mammals have hair or fur; birds lay eggs and most mammals do not; most birds fly, most mammals do not.
Scan the headings in Section 1. Identify three topics that will be discussed. Accept all reasonable responses.

1. Bird characteristics
2. Body systems of birds
3. Why birds are important

Define thrust using your book or a dictionary.

for an object moving through air, the horizontal force that pushes or pulls the object forward

Use your book or a dictionary to define the following terms. Then use each term in a sentence to show its scientific meaning.

**contour feather**
strong, lightweight feather that gives birds their coloring and shape and that is used for flight; Sample sentence: The bird’s contour feathers made flying look easy.

**endotherm**
vertebrate animal whose internal temperature does not change when the temperature of environment changes; Sample sentence: Birds are able to survive in cold environments because they are endotherms.

**preening**
process in which a bird rubs oil from an oil gland over its feathers to condition them; Sample sentence: The bird was preening itself to keep its feathers healthy.

Use a dictionary to define migrate to reflect its scientific meaning.

to move from one place to another place
Complete the graphic organizer below with three common bird characteristics. Accept all reasonable responses.

1. lay amniotic eggs with hard shells
2. have wings; most birds fly
3. are the only animals with feathers

Summarize how each structure of a bird’s body is adapted for flight. Complete the chart.

<table>
<thead>
<tr>
<th>Adaptation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skeleton</td>
<td>bones are almost hollow</td>
</tr>
<tr>
<td></td>
<td>some bones are joined together, making them stronger</td>
</tr>
<tr>
<td></td>
<td>large breastbone supports chest muscles needed for flight</td>
</tr>
<tr>
<td>Contour feathers</td>
<td>strong and lightweight</td>
</tr>
<tr>
<td></td>
<td>give birds their shape</td>
</tr>
<tr>
<td></td>
<td>tail feathers help steer and balance the bird when flying and landing</td>
</tr>
<tr>
<td>Wings</td>
<td>attached to strong chest muscles</td>
</tr>
<tr>
<td></td>
<td>curved on top, flat on bottom to create lift when flapped, provide power to go forward and to stay in the air</td>
</tr>
</tbody>
</table>

Have students infer why well-developed eyesight is important for both flight and survival (to find prey and to avoid running into obstacles that fast-flying birds may quickly approach).
Section 1 Birds (continued)

Main Idea

**Body Systems**

I found this information on page ________.

SE, p. 432  
RE, p. 217

**Details**

**Sequence** the steps in a bird’s digestive process in the flow chart.

<table>
<thead>
<tr>
<th>Food is taken into <strong>mouth</strong></th>
<th>Enters <strong>crop</strong> un chewed; there it <strong>takes on moisture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Moves to <strong>stomach</strong>, where it is <strong>partially digested</strong></td>
<td>Moves to <strong>gizzard</strong>, where it is <strong>crushed by small stones</strong></td>
</tr>
<tr>
<td></td>
<td>Travels through <strong>intestines</strong>, where nutrients are absorbed into bloodstream</td>
</tr>
</tbody>
</table>

**Summarize** how birds’ respiratory and circulatory systems provide muscles with sufficient oxygen.

<table>
<thead>
<tr>
<th><strong>Respiratory System</strong></th>
<th><strong>Circulatory System</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled air passes into air sacs.</td>
<td>Heart is large compared to body.</td>
</tr>
<tr>
<td>When bird exhales, air passes from air sacs to lungs.</td>
<td>Heart beats rapidly.</td>
</tr>
<tr>
<td>Air enters lungs when both inhaling and exhaling.</td>
<td>Blood carrying oxygen is kept separate from blood carrying carbon dioxide.</td>
</tr>
</tbody>
</table>

**The Importance of Birds**

I found this information on page ________.

SE, p. 433  
RE, p. 218

**Summarize** three ways birds positively affect human life.

1. Provide a source of food  
2. Control pests  
3. Pollinate flowers

**SYNTHESIZE IT**

List at least three products used in homes that come from birds.

Accept all reasonable responses. Eggs, meat; feathers for pillows; down for parkas and comforters

Name ___________________________________________ Date ________________

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**Birds and Mammals**

**Section 2 Mammals**

**Skim** Section 2 of your book. Write three questions that come to mind. Look for answers to your questions as you read the section.

1. How do the main types of mammals differ?  
2. Where do monotremes live?  
3. What does “placental” mean?

**Define** gland using your book or a dictionary.

- **gland**: cell or group of cells that releases fluid

**Use your book to define the following terms.**

- **mammary gland**: gland of a mammal; in females, produces milk to feed their young
- **gestation period**: period during which an embryo develops in the uterus; the length of time varies among species
- **umbilical cord**: connects the embryo to the placenta; moves food and oxygen from the placenta to the embryo and removes the embryo’s waste products
- **carnivore**: animal that eats only other animals or the remains of other animals
- **herbivore**: animal that eats only plants or parts of plants
- **omnivore**: animal that eats plants and animals or animal flesh

**Use a dictionary to define attach to reflect its scientific meaning.**

- **attach**: to connect

Accept all reasonable responses.
Create a graphic organizer to identify at least four characteristics of mammals. Accept all reasonable responses.

Characteristics of Mammals
- are endothermic vertebrates
- have hair or fur
- produce milk to feed their young
- care for their young

Summarize mammal body systems. Write two facts for each.

<table>
<thead>
<tr>
<th>Mammal Body Systems</th>
<th>System</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulatory</td>
<td>four-chambered heart</td>
<td>oxygen-filled blood travels through blood vessels</td>
</tr>
<tr>
<td>Respiratory</td>
<td>lungs made up of millions of air sacs</td>
<td>sacs allow greater exchange of oxygen and carbon dioxide</td>
</tr>
<tr>
<td>Nervous</td>
<td>made up of brain, spinal cord, and nerves</td>
<td>brains involved in learning and controlling muscles</td>
</tr>
<tr>
<td>Digestive</td>
<td>used to digest food</td>
<td>vary depending on the kinds of foods the particular mammal eats</td>
</tr>
</tbody>
</table>

Body Systems
I found this information on page ___________.
SE, p. 438
RE, pp. 222–223
Section 2 Mammals (continued)

**Main Idea**

**Types of Mammals**

Compare the 3 types of mammals by completing the chart below. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Types of Mammals</th>
<th>How Bear Young</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monotremes</td>
<td>lay eggs with leathery shells</td>
<td>platypus</td>
</tr>
<tr>
<td>Marsupials</td>
<td>give birth to immature young that usually crawl into pouch on female’s abdomen</td>
<td>kangaroo</td>
</tr>
<tr>
<td>Placentals</td>
<td>an embryo completely develops inside the female’s uterus</td>
<td>human</td>
</tr>
</tbody>
</table>

Have students brainstorm additional examples of each type of mammal.

**Importance of Mammals**

Complete the outline below.

A. Mammals help keep balance in the ecosystem
   - Carnivores, like tigers, help control populations of other animals.
   - Bats help pollinate flowers and control insects.

B. Some mammals are in danger
   - Many of their habitats are being destroyed by housing, roads, and shopping centers.
   - Many mammals are left without food, shelter, and space to survive.

CONNECT IT

A drought kills many of the plants upon which the local herbivores rely upon. Might this affect the local carnivores as well? Explain.

Accept all reasonable responses. Students should recognize that a rise or fall in a population that carnivores rely upon will result in a rise or fall in the population of carnivores.
Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Birds and Mammals</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A bird has a crop instead of a stomach.</td>
<td>D SE, p. 432</td>
</tr>
<tr>
<td></td>
<td>RE, p. 217</td>
</tr>
<tr>
<td>• Wings are important for nonflying birds.</td>
<td>A SE, p. 431</td>
</tr>
<tr>
<td></td>
<td>RE, p. 217</td>
</tr>
<tr>
<td>• Marsupials are mammals that lay eggs.</td>
<td>D SE, p. 440</td>
</tr>
<tr>
<td></td>
<td>RE, p. 222</td>
</tr>
<tr>
<td>• Bats help pollinate flowers.</td>
<td>A SE, p. 444</td>
</tr>
<tr>
<td></td>
<td>RE, p. 223</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three key facts that you have learned that you did not know before. Accept all reasonable responses.

1. Most birds demonstrate structural and behavioral adaptation for flight.
2. Some birds are sources of food and raw materials.
3. Mammals, including humans, have many characteristics in common.
Animal Behavior

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Animal Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>A bird must learn how to build a nest.</td>
<td></td>
</tr>
<tr>
<td>A gosling follows the first moving object it sees after hatching.</td>
<td></td>
</tr>
<tr>
<td>Some animals may show submissive behavior to prevent another animal from attacking.</td>
<td></td>
</tr>
<tr>
<td>Many animals move to new locations when the seasons change.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

FOLDABLES
Study Organizer

Science Journal

What behaviors might an animal use to signal that a territory is occupied?

Animals may call, sing, leave scent marks, or display to other animals to indicate the territory is occupied.
**Animal Behavior**

**Section 1 Types of Behavior**

**Skim** the What You’ll Learn statements in Section 1. Predict three topics that you expect will be discussed in this section. Accept all reasonable responses.

1. examples of innate and learned behavior
2. what reflexes are
3. how imprinting occurs

**Review Vocabulary**

**Define** salivate to show its scientific meaning.

*salivate*

to secrete saliva in anticipation of food

**New Vocabulary**

Read the definitions below. Write the correct vocabulary terms on the blanks in the left column.

**behavior**

way an organism interacts with other organisms and its environment

**innate behavior**

behavior that an organism is born with and that does not need to be learned

**imprinting**

animal’s formation of a social attachment to another organism during a specific period following birth or hatching

**conditioning**

modifying behavior so that a response to one stimulus becomes associated with a different stimulus

**insight**

form of reasoning that allows animals to use past experiences to solve new problems

**Academic Vocabulary**

*internal*

Use a dictionary to define internal to show its scientific meaning.

of or on the inside
Section 1 Types of Behavior (continued)

**Main Idea**

**Behavior**

I found this information on page ________.

SE, p. 456
RE, p. 225

**Innate Behavior**

I found this information on page ________.

SE, pp. 457–458
RE, pp. 225–226

**Details**

**Complete the flow charts with examples of internal and external stimuli and responses.**

**Stimulus**

**Response**

**External**

- person greeting a dog
- dog wagging its tail

**Internal**

- thirst
- getting a drink of water

**Identify two types of innate behavior. Define them and provide at least two examples of each.**

<table>
<thead>
<tr>
<th>Innate Behaviors</th>
<th>Type of Behavior</th>
<th>What It Is</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reflex</td>
<td>automatic response that does not involve a message from the brain</td>
<td>sneezing, shivering, yawning, jerking hand away from a hot surface, blinking eyes</td>
</tr>
<tr>
<td></td>
<td>Instinct</td>
<td>complex pattern of innate behavior</td>
<td>spider spinning a web</td>
</tr>
</tbody>
</table>
Section 1  Types of Behavior (continued)

Main Idea

Learned Behavior

I found this information on page _________.
SE, p. 458
RE, p. 226

Have students identify and discuss specific examples of each type of learned behavior.

Details

Analyze the importance of learned behavior for animals.

Learned behaviors help animals respond to changing situations. Animals that can learn are more likely to survive than those that cannot. Learned behavior is most commonly found in animals with long life spans.

Summarize four ways behaviors are learned.

<table>
<thead>
<tr>
<th>Behavior Name</th>
<th>Example</th>
<th>Behavior Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imprinting</td>
<td>gosling follows first moving object it sees</td>
<td>An animal forms a social attachment within a short time after birth or hatching.</td>
</tr>
<tr>
<td>Trial-and-error</td>
<td>learning to tie shoes</td>
<td>Behavior changes with experience.</td>
</tr>
<tr>
<td>Conditioning</td>
<td>Pavlov’s dogs salivating at the sound of a bell</td>
<td>Behavior changes to link the response to one stimulus to a different stimulus.</td>
</tr>
<tr>
<td>Insight</td>
<td>chimpanzee stacking boxes to reach bananas</td>
<td>An animal uses past experiences to solve new problems.</td>
</tr>
</tbody>
</table>

CONNECT IT

Moths move toward light. Cockroaches move away from it. What type of behavior is this? Would these animals be able to change this behavior?
Accept all reasonable responses. It is instinct. No, they can’t change this behavior because these animals do not have complex enough brains to learn a new behavior.
Scan Section 2 by reading the headings and examining the illustrations. Then write three questions that you hope to answer as you read the section. Look for the answers as you read.

1. What is social behavior?
2. Which animals show territorial behavior?
3. What is chemical communication?

**Review Vocabulary**

**Define** nectar to show its scientific meaning.

nectar
sweet liquid produced in a plant’s flower that is the main raw material of honey

**New Vocabulary**

**Use your book to define the following terms. Then use each term in a sentence.**

pheromone
powerful chemical produced by an animal to influence the behavior of another animal of the same species; Sample sentence: Insects use pheromones to signal each other.

**cyclic behavior**
behavior that occurs in repeated patterns; Sample sentence: Hibernation during the winter is a cyclic behavior.

**migration**
instinctive seasonal movement of animals to find food or to reproduce in better conditions; Sample sentence: Birds flying south for the winter is an example of migration.

**Academic Vocabulary**

**Define** dominate to show its scientific meaning.

dominate
to control or rule
Section 2 Behavioral Interactions (continued)

Main Idea

Instinctive Behavior Patterns

Identify two instinctive ritual animal behaviors.
1. ________________ courtship
2. ________________ mating

Social Behavior

Identify three advantages for animals living in groups.

Summarize the key features of a society in the paragraph below.

A society is ________________ a group of animals of the same species living together in an organized way _________________. Members of societies have specific roles. In societies that are organized by dominance, ________________ the top animal controls the other ________________ members of the society ________________.

Territorial Behavior

Organize information about territorial behavior. Identify how animals mark their territories and why and how they defend them.

Animal Territories

Identified by: making sounds, leaving scent marks, or attacking other members of the same species

Why defended: contain food, shelter, and possible mates; instinctive behavior that improves offspring’s survival rate

How defended: showing aggression to dominate or control another animal
Communication

I found this information on page pp. 464–468.
SE, pp. 232–233

Encourage students to describe examples of animal communication that they have seen in pets or other animals.

Classify types of animal communication. Complete the table below.

<table>
<thead>
<tr>
<th>Type of Communication</th>
<th>What It Is</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courtship behavior</td>
<td>behaviors that allow males and females of a species to recognize and mate with each other</td>
<td>bird of paradise spreading its tail feathers and strutting</td>
</tr>
<tr>
<td>Chemical communication</td>
<td>pheromones influence members of the same species; used to mark territory, warn of danger, and attract mates</td>
<td>ants leaving trails; dogs urinating on plants and objects</td>
</tr>
<tr>
<td>Sound communication</td>
<td>Animals make sounds to communicate with other animals of the same species.</td>
<td>crickets rubbing forewings together to make a chirping sound</td>
</tr>
<tr>
<td>Light communication</td>
<td>bioluminescence gives off light to communicate with other organisms</td>
<td>firefly giving off a flash of light to attract a mate</td>
</tr>
</tbody>
</table>

Cyclic Behavior

I found this information on page pp. 468–469.
SE, pp. 233

Define each of the following cyclic behaviors.

circadian rhythm: 24-hour cycle of sleeping and wakefulness

hibernation: inactivity during cold temperatures and in response to a limited food supply

estivation: reduced activity during a period of heat, lack of food, or drought

Name ____________________________ Date ____________________________

Section 2 Behavioral Interactions (continued)
Animal Behavior Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Animal Behavior</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>A bird must learn how to build a nest.</td>
<td>D SE, p. 457 RE, p. 225</td>
</tr>
<tr>
<td>A gosling follows the first moving object it sees after hatching.</td>
<td>A SE, p. 459 RE, p. 227</td>
</tr>
<tr>
<td>Some animals may show submissive behavior to prevent another animal from attacking.</td>
<td>A SE, p. 463 RE, p. 231</td>
</tr>
<tr>
<td>Many animals move to new locations when the seasons change.</td>
<td>A SE, p. 469 RE, p. 233</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.

☐ Study your Science Notebook on this chapter.

☐ Study the definitions of vocabulary words.

☐ Review daily homework assignments.

☐ Re-read the chapter and review the charts, graphs, and illustrations.

☐ Review the Self Check at the end of each section.

☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things that you have learned about animal behavior.

Accept all reasonable responses. 1. Animals can have both innate and learned behaviors. 2. Animals communicate by using chemicals as well as sound and light. 3. Animals can learn through imprinting, conditioning, trial and error, and insight.
Structure and Movement

Before You Read

Preview the chapter title, section titles, and section headings. Complete the first two columns of the chart by listing at least two ideas for each section in each column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Imagine that your body did not have a support system. Describe how you might perform your daily activities.

Student responses will vary, but may be creative. It would be impossible for humans to exist without structure and movement.

---

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
Structure and Movement
Section 1 The Skeletal System

**Skim** the headings in Section 1. Write three questions that come to mind about bones and joints. Accept all reasonable responses.

1. Why are bones an important part of the body?
2. How is cartilage different from bone?
3. How do joints help the body move?

Define **skeleton** to show its scientific meaning.

**skeleton**
framework of living bones that supports the body

Write the correct vocabulary word next to each definition.

- **cartilage**
  smooth, slippery, thick layer of tissue that covers the ends of bones

- **ligament**
  tough band of tissue that holds bones together at joints

- **periosteum**
  tough, tight-fitting membrane that covers a living bone’s surface

- **skeletal system**
  all of the bones in the body

- **joint**
  place where two or more bones come together

Use a dictionary to define **transfer** as a verb.

**transfer**
to convey or transport from one place to another
Section 1 The Skeletal System (continued)

Main Idea

Living Bones

Organize information about the functions of the skeletal system. Complete the concept web.

Details

Functions of the Skeletal System

It gives shape and support to the body.

It protects internal organs.

Muscles are attached to bones.

Blood cells are formed in the center of bones.

It stores calcium and phosphorus.

Bone Structure

Summarize the functions of the following five parts of a bone.

Periosteum: The periosteum has blood vessels to carry nutrients, cells for growth and repair of bone, and nerves that signal pain.

Compact bone: This bone tissue gives bone strength and makes it hard.

Spongy bone: This tissue makes bones lightweight and holds the marrow cavities.

Marrow cavity: The marrow cavity holds yellow marrow, made up of fat cells, and red marrow, which produces red blood cells.

Cartilage: Cartilage protects joints, absorbs shock, and reduces friction between bones.
Suppose that the joints in your shoulders were hinge joints. Evaluate how this would change your daily life.

Accept all reasonable responses. Ball-and-socket joints provide a greater range of motion. Hinge joints would reduce the range of motion available in the shoulders.

Sequence the steps of bone formation.

1. Before birth, the skeleton is made of cartilage.
2. Over time, the cartilage is replaced by bone.
3. Osteoblasts deposit calcium and phosphorus in bones, making them hard.

Classify the five types of joints. Describe and give an example of each. Accept all reasonable examples.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immovable</td>
<td>allows little or no movement</td>
<td>joints in the skull</td>
</tr>
<tr>
<td>Pivot</td>
<td>one bone rotates in a ring of another bone that does not move</td>
<td>arm</td>
</tr>
<tr>
<td>Ball-and-socket</td>
<td>a bone with a rounded end fits into a cuplike cavity on another bone</td>
<td>shoulders</td>
</tr>
<tr>
<td>Hinge</td>
<td>back-and-forth movement like that of door hinges</td>
<td>elbows, knees</td>
</tr>
<tr>
<td>Gliding</td>
<td>one part of a bone slides over another bone</td>
<td>wrists, ankles</td>
</tr>
</tbody>
</table>

Analyze the role of cartilage in bone movement and what happens if bones cannot move smoothly.

Cartilage allows bones to move more easily by reducing friction.

If bones cannot move smoothly, conditions such as arthritis can develop.
Predict three topics that will be covered in Section 2. Read the section headings, and look at the illustrations to help you make your predictions. Accept all reasonable responses.

1. how the human body moves
2. what the different types of muscle tissue are
3. how muscles work

Review Vocabulary

Define bone to show its scientific meaning.

bone

dense, calcified tissue of the skeleton that is moved by muscles

New Vocabulary

Write the correct vocabulary term next to each definition.

<table>
<thead>
<tr>
<th>Vocabulary Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cardiac muscle</td>
<td>involuntary striated muscle found only in the heart</td>
</tr>
<tr>
<td>voluntary muscle</td>
<td>muscle that can be consciously controlled</td>
</tr>
<tr>
<td>skeletal muscle</td>
<td>muscle that moves bones</td>
</tr>
<tr>
<td>involuntary muscle</td>
<td>muscle that cannot be consciously controlled</td>
</tr>
<tr>
<td>tendon</td>
<td>thick band of tissue that attaches muscles to bones</td>
</tr>
<tr>
<td>muscle</td>
<td>organ that can relax, contract, and provide the force to move bones and body parts</td>
</tr>
<tr>
<td>smooth muscle</td>
<td>involuntary, nonstriated muscle found in intestines, bladder, blood vessels, and other organs</td>
</tr>
</tbody>
</table>

Academic Vocabulary

Define flexible as an adjective.

flexible

able to bend or flex
Main Idea

Movement of the Human Body

I found this information on page 490.
SE, p. 490
RE, p. 240

Details

Summarize the role of muscles in the body.

Muscles make all movements possible. They provide the force to move body parts.

Contrast voluntary and involuntary muscles. Complete the chart.

<table>
<thead>
<tr>
<th>Muscle Type</th>
<th>Consciously controlled</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary</td>
<td>yes</td>
<td>muscles in face, hands, arms, and legs</td>
</tr>
<tr>
<td>Involuntary</td>
<td>no</td>
<td>muscles that pump blood and move food through the digestive system</td>
</tr>
</tbody>
</table>

Model the types of levers found in the human body.

- Draw each type of lever, and label the fulcrum, load, and direction of force.
- Give an example of where the lever is located in the body.

First-class lever

Drawings should resemble the one in the text.

Example: neck and head

Second-class lever

Drawings should resemble the one in the text.

Example: foot and ankle

Third-class lever

Drawings should resemble the one in the text.

Example: shoulder and elbow

Your Body’s Simple Machines—Levers

I found this information on page 491.
SE, p. 491
RE, pp. 240–241

Encourage students to work in pairs to draw the types of levers. Provide models that students can use to see how each class of lever moves its load.
Suppose a woman began riding her bike more regularly instead of watching TV. Evaluate what kinds of changes in her leg muscles she might start seeing. Explain why this occurs. Accept all reasonable responses.

Her leg muscles will get larger. As she uses her leg muscles to ride her bike, the muscle cells get larger. Also, she gains new muscle cells.
Structure and Movement
Section 3 The Skin

Preview the What You’ll Learn statements for Section 3. Predict three topics that you will study in this section. Accept all reasonable responses.
1. the difference between the dermis and epidermis
2. what the skin’s functions are
3. how the skin protects the body and heals itself

Review Vocabulary
Define vitamin to show its scientific meaning.

vitamin inorganic nutrient needed by the body in small quantities for growth, disease prevention, and/or regulation of body functions

New Vocabulary
Define each vocabulary term.

epidermis outer, thinnest layer of the skin

melanin pigment that protects the skin and gives it color

dermis layer of cells directly below the epidermis

Academic Vocabulary
Use a dictionary to define layer as a noun. Then find a sentence in Section 3 that uses the term.

layer one thickness of something; Sample sentence: Skin is made up of three layers of tissue—the epidermis, the dermis, and a fatty layer.
Main Idea

Your Largest Organ and Skin Structures

Create a cross-section drawing of the skin. Label the following structures.

- blood vessels
- dermis
- epidermis
- fatty layer

- hairs
- hair follicles
- nerve endings
- oil glands
- sweat gland
- sweat pore

Drawings should resemble the one in the text.

Write captions summarizing key facts about the dermis and epidermis.

Dermis: The dermis is the layer of cells directly below the epidermis. It contains many blood vessels, nerves, muscles, oil glands, and sweat glands.

Epidermis: The epidermis is the thinnest layer of the skin. Its outermost cells are dead. New cells are made to replace the dead cells.

Analyze the role of melanin in the body.

Melanin protects the skin and gives it color. When the skin is exposed to ultraviolet rays, more melanin is made. This makes the skin darker. The lighter a person’s normal skin color, the less protection that person’s skin has from the Sun.
## Main Idea

### Skin Functions

I found this information on page 497–498.

- **SE, pp. 497–498**
- **RE, pp. 245–246**

### Skin Injuries and Repair

I found this information on page 499–500.

- **SE, pp. 499–500**
- **RE, p. 247**

I found this information on page 499.

- **SE, p. 499**
- **RE, p. 247**

## Details

**Distinguish the five primary functions of the skin.**

1. protection
2. sensory response
3. formation of vitamin D
4. control of body temperature
5. ridding the body of wastes

**Summarize how bruises form.**

A bruise forms after blood vessels under the skin burst. The cells break down and release hemoglobin, which breaks down into pigments.

**Sequence the steps as a cut heals.**

- A cut occurs in the skin.
- Blood flows from the cut.
- A clot forms over the cut.
- A scab forms.
- Cells fight infection.
- The scab falls off, leaving new skin.

## Connect It

Analyze why people with severe burns or other damage to large areas of their skin are especially vulnerable to infections. Explain how skin grafts help prevent infections. Accept all reasonable responses.

The skin of burn patients is too damaged to protect the body from bacteria. This increases the risk of infections. Skin grafts cover the body and prevent bacteria from entering.
Tie It Together

Structure and Movement

Design a model that shows how the skeletal and muscular systems work together to allow you to bend your elbow. Present your model to the class and explain how it works.

Models should include a rigid framework for the bones in the arm, a representation of muscles in the arm that work in pairs to bend and extend the elbow joint, and a hinge joint to represent the elbow.
Structure and Movement

Chapter Wrap-Up

Review the ideas you listed in the chart at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the chart by filling in the third column. How do your ideas now compare with those you provided at the beginning of the chapter?

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
<th>L</th>
<th>What I learned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accept all reasonable responses.</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

What are the three most important ideas in this chapter?

Accept all reasonable responses. 1. The skeleton supports the body and allows it to move. 2. Muscles always pull, never push, and they work in pairs. 3. Skin is the largest organ in the body.
Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Nutrients and Digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• All foods provide the body with the same amount of energy.</td>
</tr>
<tr>
<td></td>
<td>• What you eat does not affect your health.</td>
</tr>
<tr>
<td></td>
<td>• Sixty percent of your body weight is made up of water.</td>
</tr>
<tr>
<td></td>
<td>• There are bacteria in your digestive tract that make vitamins needed for health.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Make a list of all the organs you think are part of your digestive system.

Student responses should include some or all of the following: mouth, esophagus, stomach, small intestine, large intestine, rectum, and anus.
**Nutrients and Digestion**

**Section 1 Nutrition**

**Skim** the headings in Section 1 of this chapter. Write three questions that come to mind. Accept all reasonable responses.

1. How does each class of nutrients differ from the others?
2. How is each type of nutrient important?
3. What types of food are in each food group?

**Review Vocabulary**

Define molecule to show its scientific meaning.

- **molecule**: the smallest particle of a substance that retains the properties of the substance and is composed of one or more atoms

**New Vocabulary**

- **nutrient/food group**: Eating foods from all five of the food groups provides you with the nutrients you need to be healthy.

- **protein/amino acid**: Proteins are made of amino acids.

- **carbohydrate/fat**: Carbohydrates and fats provide sources of energy for the body.

- **vitamin/mineral**: It is important that your diet contains the vitamins and minerals you need to stay healthy.

**Academic Vocabulary**

Use a dictionary to define energy to show its scientific meaning.

- **energy**: capacity to perform some type of work or activity
Define calorie by completing the statement below.

Calorie: the amount of heat necessary to \( \text{raise} \) the temperature of 1 kg of water 1°C.

Complete the graphic organizer with key information about proteins.

Complete Proteins: proteins that provide all of the essential amino acids.

Incomplete Proteins: proteins that are missing one or more essential amino acids.

Compare carbohydrates and fats by completing the chart.

<table>
<thead>
<tr>
<th></th>
<th>Carbohydrates</th>
<th>Fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main function(s)</td>
<td>main source of energy for the body</td>
<td>supply energy; help the body absorb vitamins; cushion internal organs</td>
</tr>
<tr>
<td>Groups</td>
<td>simple</td>
<td>unsaturated</td>
</tr>
<tr>
<td></td>
<td>complex</td>
<td>saturated</td>
</tr>
<tr>
<td>Examples</td>
<td>sugar, starch, fiber</td>
<td>vegetable oils, fats found in meat and animal products</td>
</tr>
</tbody>
</table>
Classify vitamins by completing the chart.

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Soluble in</th>
<th>Most Beneficial to</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>fat</td>
<td>eyes and skin</td>
</tr>
<tr>
<td>B</td>
<td>water</td>
<td>nervous system and red blood cells</td>
</tr>
<tr>
<td>C</td>
<td>water</td>
<td>bones and teeth</td>
</tr>
<tr>
<td>D</td>
<td>fat</td>
<td>bones and teeth</td>
</tr>
<tr>
<td>E</td>
<td>fat</td>
<td>cell membranes</td>
</tr>
<tr>
<td>K</td>
<td>fat</td>
<td>blood</td>
</tr>
</tbody>
</table>

Summarize why water is an important nutrient.

Cell functions require water. Also, many nutrients need to be dissolved in water before your body can use them.

Model serving size for different food categories.

<table>
<thead>
<tr>
<th>Group</th>
<th>Servings per Day</th>
<th>Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>bread and cereal</td>
<td>6–11 servings</td>
<td>1 slice of bread 1 oz. ready-to-eat cereal</td>
</tr>
<tr>
<td>fruits</td>
<td>2–4 servings</td>
<td>1 medium apple, orange, or banana</td>
</tr>
<tr>
<td>vegetables</td>
<td>3–5 servings</td>
<td>1 cup raw vegetables 1/2 cup cooked or chopped</td>
</tr>
<tr>
<td>milk</td>
<td>2–3 servings</td>
<td>1 cup of milk or yogurt</td>
</tr>
<tr>
<td>meat, poultry, fish, beans, eggs</td>
<td>2–3 servings</td>
<td>2 oz. of meat, fish, poultry 1 egg</td>
</tr>
</tbody>
</table>

What is the purpose of the food pyramid?

Accept all reasonable responses. Its shape helps people to select the foods they need every day for essential nutrients. Those foods that you need a lot of form the base of the pyramid. Those foods that you need only a little of form the upper levels.
Nutrients and Digestion
Section 2 The Digestive System

Preview Section 2 by restating the What You’ll Learn statements as questions. Answer each question as you study.

1. What are the differences between mechanical digestion and chemical digestion?

2. What are the organs of the digestive system, and what takes place in each organ?

3. How is homeostasis maintained during digestion?

Define bacteria to show its scientific meaning.

bacteria

one-celled organisms without membrane-bound organelles

Read the definitions below. Write the correct vocabulary term on the blank in the left column.

digestion

process that breaks down food into small molecules

mechanical digestion

breakdown of food through chewing, mixing, and churning

chemical digestion

occurs when chemical reactions break down large molecules of food into smaller ones

enzyme

protein that speeds up chemical reactions in the body

peristalsis

muscular contractions that move food through the digestive tract

chyme

watery liquid released by the stomach to the small intestine

villi

fingerlike projections covering the wall of the small intestine

Use a dictionary to define area to show its scientific meaning.

area

amount or extent of a surface
Main Idea

Functions of the Digestive System

I found this information on page 523.  
SE, p. 523  
RE, p. 256

Enzymes

I found this information on page 524.  
SE, p. 524  
RE, p. 257

Organs of the Digestive System

I found this information on page 525–529.  
SE, pp. 525–529  
RE, pp. 257–259

Details

Identify the four stages of processing food that occur in the human body.
1. __________ ingestion
2. __________ digestion
3. __________ absorption
4. __________ elimination

Organize information about digestive enzymes.

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Role in digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amylase</td>
<td>breaks down complex carbohydrates into simpler carbohydrates</td>
</tr>
<tr>
<td>Pepsin</td>
<td>helps break down proteins</td>
</tr>
<tr>
<td>Pancreatic enzymes</td>
<td>some continue process of breaking down starches; some break down fats into fatty acids; others help break down proteins</td>
</tr>
</tbody>
</table>

Draw and label the parts of the human digestive system.
- Color the organs through which food passes one color.
- Color the accessory organs another color. Include: tongue, mouth, rectum, small intestine, pancreas, anus, stomach, gallbladder, liver, large intestine, esophagus, and salivary glands.

Drawings should show a labeled diagram of the digestive system. The mouth, esophagus, stomach, small intestine, large intestine, rectum, and anus should be colored one color. The rest of the labeled structures should be a different color.
**Main Idea**

I found this information on page ___________.
SE, pp. 526–529
RE, pp. 257–259

Have students work in pairs to organize the details of what happens to food in each digestive organ.

**Details**

**Organize** information about what happens in the digestive tract.

- List the sections of the digestive tract in the first column.
- Place a checkmark in the appropriate columns showing what occurs in each section.

<table>
<thead>
<tr>
<th>Section of Digestive Tract</th>
<th>What Occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mechanical Digestion</td>
</tr>
<tr>
<td>Mouth</td>
<td>✔</td>
</tr>
<tr>
<td>Esophagus</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td>✔</td>
</tr>
<tr>
<td>Small intestine</td>
<td></td>
</tr>
<tr>
<td>Large intestine</td>
<td></td>
</tr>
</tbody>
</table>

**Complete** the table on two types of essential vitamins made by bacteria in the digestive tract.

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Function in Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin K</td>
<td>blood clotting</td>
</tr>
<tr>
<td>B vitamins</td>
<td>important for nervous system and other body functions</td>
</tr>
</tbody>
</table>

**ANALYZE IT**

Choose one organ of the digestive system and describe its role in digestion. Accept all reasonable responses.

Mechanical and chemical digestion occur in the stomach. Peristalsis mixes food in the stomach. This form of mechanical digestion helps break down food. Acids and enzymes in the stomach chemically digest food. The stomach also produces mucus. It makes the food more slippery. This mucus also protects the stomach. Food exits the stomach as a watery liquid called chyme.
Nutrients and Digestion  Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Nutrients and Digestion</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All foods provide the body with the same amount of energy.</td>
<td>D SE, p. 512 RE, p. 249</td>
</tr>
<tr>
<td>• What you eat does not affect your health.</td>
<td>D SE, pp. 513–521 RE, pp. 249–254</td>
</tr>
<tr>
<td>• Sixty percent of your body weight is made up of water.</td>
<td>A SE, p. 519 RE, p. 253</td>
</tr>
<tr>
<td>• There are bacteria in your digestive tract that make vitamins needed for health.</td>
<td>A SE, p. 529 RE, p. 259</td>
</tr>
</tbody>
</table>

Review
Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
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☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

Summarize It
List three important ideas in the chapter.

Accept all reasonable responses. 1. Water is an important nutrient. 2. The purpose of digestion is to break down food. 3. Enzymes speed up chemical reactions in the body.
Circulation

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The human heart has four chambers.</td>
<td></td>
</tr>
<tr>
<td>Arteries are blood vessels that carry blood to the heart.</td>
<td></td>
</tr>
<tr>
<td>Platelets are cell fragments that help fight bacteria and viruses.</td>
<td></td>
</tr>
<tr>
<td>Lymphatic vessels are like veins in that they have valves.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Infer how the circulatory system provides your body with the nutrients it needs to stay healthy.

Student responses may vary, but may include statements about blood, the heart, and the intestines.
Scan Section 1 of your book. Read the headings and look at the illustrations. Predict three things that will be discussed. Accept all reasonable responses.

1. what happens during a heartbeat
2. the functions of arteries, capillaries, and veins
3. blood pressure and cardiovascular diseases

Define heart using your book or a dictionary.

organ that circulates blood through the body continuously

Read the definitions below. Write the correct vocabulary terms on the blanks in the left column.

- atrium
- ventricle
- coronary circulation
- pulmonary circulation
- systemic circulation
- artery
- vein
- capillary

Use a dictionary to define transport as it would be used in science.

to carry from one place to another; the act, process, or means of transporting
Compare and contrast diffusion and active transport by completing the Venn diagram with at least five facts.

- **Diffusion**
  - Material moves from an area where there is more of it to an area where there is less of it.
  - Does not require input of energy.

- **Active Transport**
  - Material moves from an area where there is less of it to an area where there is more of it.
  - Requires input of energy from cell.

Sequence the stages in pulmonary circulation by completing the flow diagram. Include aorta, pulmonary veins, pulmonary arteries, right atrium, left atrium, and right ventricle.

Summarize the exchange that occurs between a systemic capillary and the tissue cells it serves.

The blood flowing through the capillary delivers nutrients and oxygen to the tissue cells. These are exchanged for carbon dioxide and wastes which are removed from the tissue cells.
Main Idea

Blood Vessels

I found this information on page ________.
SE, pp. 544–545
RE, pp. 263–264

Details

Classify blood vessels by completing the chart.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arteries</td>
<td>carry blood away from the heart</td>
<td>have thick, elastic walls</td>
</tr>
<tr>
<td>Capillaries</td>
<td>connect arteries and veins; deliver nutrients and oxygen to cells and remove wastes</td>
<td>microscopic</td>
</tr>
<tr>
<td>Veins</td>
<td>carry blood back to the heart</td>
<td>contain one-way valves that keep blood moving toward the heart</td>
</tr>
</tbody>
</table>

Blood Pressure

I found this information on page ________.
SE, p. 545
RE, p. 264

Define blood pressure and the two numbers used to measure it.

Blood pressure is ________ the force of blood on the walls of vessels ________.

First number measures pressure when ventricles contract and blood is pushed out of the heart.

Second number measures pressure when ventricles fill with blood again.

CONNECT IT

A doctor may advise a patient to make lifestyle changes to help prevent cardiovascular disease. Identify several healthful habits the doctor might suggest. Accept all reasonable responses.

Get more exercise, lose weight, stop smoking, switch to a healthier diet.
Skim Section 2 of your book. Write three questions that come to mind. Look for answers to your questions as you read the section.

1. What is plasma? Accept all reasonable questions.
2. How does blood clot?
3. What do blood types have to do with transfusions?

**Review Vocabulary**

Define blood vessels using your book or a dictionary.

**blood vessels**
structures that include arteries, veins, and capillaries, which transport blood

**New Vocabulary**

Use your book or a dictionary to define the following terms.

**platelet**
irregularly shaped cell fragment that helps clot blood

**plasma**
liquid part of blood, which is mostly water; contains nutrients, minerals, oxygen being transported to cells, and wastes from cells

**hemoglobin**
type of molecule in red blood cells that can carry oxygen and carbon dioxide; contains iron, which gives blood its red color

**Academic Vocabulary**

Use a dictionary to define series as it would be used in science.

**series**
a number of similar things coming one after another
Functions of Blood

I found this information on page _______.

SE, p. 550
RE, p. 267

Parts of Blood

I found this information on page _______.

SE, pp. 550–551
RE, pp. 267–268

This is a good pair-up activity.

Blood Clotting

I found this information on page _______.

SE, p. 552
RE, p. 268

Create a graphic organizer with facts about the functions of blood.

![Diagram of blood functions]

Summarize information about the parts of blood in the chart below.

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma</td>
<td>carries nutrients, minerals, and oxygen to cells; carries waste from cells</td>
</tr>
<tr>
<td>Red blood cells</td>
<td>carry oxygen to cells; carry carbon dioxide to lungs</td>
</tr>
<tr>
<td>White blood cells</td>
<td>fight bacteria and viruses within tissues; absorb dead cells</td>
</tr>
<tr>
<td>Platelets</td>
<td>help clot blood</td>
</tr>
</tbody>
</table>

Sequence the steps in wound healing by completing the blanks.

__________ Platelets stick to the wound and release ________ clotting factors. Next, ________ fibrin forms a sticky net. The net traps ________ blood cells and ________ plasma to form a clot. The ________ clot forms a ________ scab. Then, ________ skin cells form under the ________ scab. Finally, the ________ scab falls off.
Compare and contrast the 2 sets of chemical identification tags in blood by completing the Venn diagram with at least five facts.

**ABO Identification System**

- Inherited chemical identification tag found on red blood cells
- Can cause clots if a person receives wrong type during transfusion

**Rh Factor**

- Two types: Rh-positive and Rh-negative
- The two types cannot be mixed.

**Identify causes and effects of two diseases of the blood.**

<table>
<thead>
<tr>
<th>Causes</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>loss of blood</td>
<td>insufficient oxygen to body tissues</td>
</tr>
<tr>
<td>lack of certain vitamins or iron in diet</td>
<td></td>
</tr>
<tr>
<td>diseases such as sickle-cell anemia</td>
<td></td>
</tr>
<tr>
<td>excessive numbers of white blood cells</td>
<td>immature cells unable to fight infection well normal blood cells crowded out</td>
</tr>
</tbody>
</table>

**Diseases of Blood**

- Causes of Anemia:
  - lack of certain vitamins or iron in diet
  - diseases such as sickle-cell anemia
- Causes of Leukemia:
  - excessive numbers of white blood cells

**CONNECT IT**

Almost immediately after being born, a baby received a blood transfusion of Rh+ blood. Predict the mother's Rh factor. Why did the baby need a blood transfusion?

The mother's Rh factor is Rh–. The baby needed a transfusion because it was Rh+. The antibodies passed from the mother would have destroyed the baby’s red blood cells without the transfusion.
**Circulation**

**Section 3 The Lymphatic System**

### What You’ll Learn

Identify three topics that will be discussed. Accept all reasonable responses.

1. the functions of the lymphatic system
2. where lymph comes from
3. how lymph organs help fight infections

### Define

**smooth muscles**

- muscles found in the internal organs and digestive tract

**lymph**

- tissue fluid that has diffused into the lymphatic capillaries; Sample sentence: Lymph contains water and other materials.

**lymphatic system**

- system that carries lymph through a network of capillaries and larger lymph vessels; Sample sentence: The lymphatic system has valves that keep lymph from flowing backward.

**lymphocyte**

- type of white blood cell; Sample sentence: Lymphocytes defend the body against disease-causing organisms.

**lymph node**

- bean-shaped organs found throughout the body; Sample sentence: Lymph nodes filter microorganisms and foreign materials that have been attacked by lymphocytes.

### Academic Vocabulary

**occur**

- to take place; to be found

---

*Scan the What You’ll Learn statements for Section 3 of your book.*
Main Idea

Functions of the Lymphatic System

I found this information on page _________.

SE, p. 556
RE, p. 272

Details

Define tissue fluid and describe its relationship to the lymphatic system.

Tissue fluid is _______ the water _______ and other substances _______ found between cells _______.

The lymphatic system collects tissue fluid and returns it to the blood _______. While in the lymphatic system, the fluid is called _______ lymph _______.

Sequence the stages by which lymph travels through the lymphatic system.

Tissue fluid enters a network of _______ lymph capillaries _______.

The _______ lymph capillaries _______ carry lymph to larger _______ lymph vessels _______.

The _______ lymph vessels _______ drain into _______ large veins _______ near the heart.

Summarize how the lymphatic system transports lymph. Discuss the role of smooth muscles and valves.

Lymph is propelled through the system by the contraction of _______ skeletal muscles and of smooth muscles in lymph vessels _______.

One-way valves in the lymph vessels prevent the lymph from flowing backward.
Main Idea

**Lymphatic Organs**

*I found this information on page________.  
SE, pp. 556–557  
RE, p. 273*

Encourage students to focus on making clear and logical diagrams rather than beautiful works of art.

---

Details

**Model** the lymphatic system by drawing it within an outline of the human body. *Indicate and label* lymph nodes, lymph vessels, lymphatic duct, thoracic duct, tonsils, thymus, and spleen.

Diagrams may resemble the one on SE p. 557 or RE p. 273 with correct labels. Accept all reasonable variations.

---

**A Disease of the Lymphatic System**

*I found this information on page________.  
SE, p. 557  
RE, p. 273*

**Summarize** how HIV affects the lymphatic system.

Lymph contains lymphocytes, which are white blood cells that make antibodies to fight specific diseases. The HIV virus attacks lymphocytes.

---

**Connect It**

Analyze why people who have HIV are at higher risk from the flu or pneumonia than people who are HIV-negative? Accept all reasonable responses.

Because HIV destroys lymphocytes, people who are HIV-positive may lack the antibodies to fight other diseases. These include diseases that might not place people who are HIV-negative at high risk.
Tie It Together

A Checklist for Health

You know that a healthy lifestyle is important for the health of your cardiovascular system.

• Work with a partner to develop a checklist of daily actions to protect your cardiovascular health.

• List actions that are beneficial and actions that should be avoided.

• Provide concrete examples.

• Then make a poster using your checklist.

Accept all reasonable responses.

Checklists should recommend healthy diets and daily exercise, as well as behaviors to avoid, such as obesity and smoking or exposure to secondhand smoke.
Circulation Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Circulation</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The human heart has four chambers.</td>
<td>A SE, p. 541 RE, p. 261</td>
</tr>
<tr>
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<td>D SE, p. 544 RE, p. 264</td>
</tr>
<tr>
<td>• Platelets are cell fragments that help fight bacteria and viruses.</td>
<td>D SE, p. 551 RE, p. 268</td>
</tr>
<tr>
<td>• Lymphatic vessels are like veins in that they have valves.</td>
<td>A SE, p. 556 RE, p. 272</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

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- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

Summarize It

After reading this chapter, identify three main concepts that you have learned about circulation. Accept all reasonable responses.

1. The heart pumps blood throughout the body. 2. Blood carries oxygen and nutrients to cells and carries carbon dioxide and wastes away from cells. 3. The lymphatic system helps the body fight infections.
Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Respiration and Excretion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Breathing is the process in which the body obtains oxygen and releases energy from food.</td>
<td></td>
</tr>
<tr>
<td>• The respiratory system contains structures that allow humans to speak.</td>
<td></td>
</tr>
<tr>
<td>• If wastes are not removed from the body, they can build up and damage organs.</td>
<td></td>
</tr>
<tr>
<td>• The bladder filters wastes from blood.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

How do you think your body adapts to meet your needs while you are playing sports?

Student responses will vary, but may include questions about breathing harder or faster and questions about perspiring.
Respiration and Excretion
Section 1 The Respiratory System

**Skim** the headings of Section 1. Write questions about the respiratory system that you think will be answered in the section. Accept all reasonable responses.

1. What are the functions of the respiratory system?
2. How do the organs of the respiratory system work together?
3. What are common diseases of the respiratory system?

**Review Vocabulary**

Define **lungs** to show its scientific meaning.

- **lungs**: saclike respiratory organs that function with the heart to remove carbon dioxide from blood and provide it with oxygen

**New Vocabulary**

Write four sentences, each containing two of the vocabulary terms. Use each word at least once. Accept all reasonable responses.

- **pharynx**: When you inhale, air passes through the pharynx before the larynx.
- **larynx**: As the diaphragm contracts and relaxes, air passes through different respiratory structures, including the lungs and trachea.
- **trachea**: Air enters the lungs through the bronchi and eventually makes its way to the alveoli.
- **bronchi**: Emphysema and asthma are both diseases that affect the respiratory system.

**Academic Vocabulary**

Use a dictionary to define **generate** as a verb.

- **generate**: to originate or bring into existence
Main Idea

Functions of the Respiratory System

I found this information on page ____________.  
SE, pp. 568–569  
RE, pp. 275–276

Details

Classify each process involved in obtaining, transporting, and using oxygen as breathing, circulation, or respiration.

- **breathing**
  - Oxygen is supplied to the body.

- **circulation**
  - Oxygen is transported to body cells.

- **respiration**
  - Body cells use oxygen and release carbon dioxide.

- **circulation**
  - Carbon dioxide is transported to lungs.

- **breathing**
  - Carbon dioxide waste is expelled.

Summarize respiratory system structures and functions by completing the chart.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharynx</td>
<td>food, liquid, and air share this passage after the nose and mouth</td>
</tr>
<tr>
<td>Epiglottis</td>
<td>stops food from entering airway</td>
</tr>
<tr>
<td>Larynx</td>
<td>directs air through vocal cords</td>
</tr>
<tr>
<td>Trachea</td>
<td>provides passageway for air; mucus and cilia in trachea trap dust, bacteria, and pollen</td>
</tr>
<tr>
<td>Bronchi</td>
<td>take air into and out of lungs</td>
</tr>
<tr>
<td>Alveoli</td>
<td>provide places for oxygen and carbon dioxide to be exchanged between the lungs and the blood</td>
</tr>
</tbody>
</table>
### Main Idea

**Why do you breathe?**

*I found this information on page __________.*

- **SE**, p. 572
- **RE**, p. 278

### Diseases and Disorders of the Respiratory System

*I found this information on page __________.*

- **SE**, pp. 574–576
- **RE**, pp. 278–280

### Model the processes of inhaling and exhaling in the boxes below.

<table>
<thead>
<tr>
<th></th>
<th>Inhaling</th>
<th>Exhaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>contracts and air is drawn into the lungs.</td>
<td>Diaphragm expands and gases are expelled from the lungs.</td>
</tr>
</tbody>
</table>

### Summarize respiratory system diseases and disorders.

<table>
<thead>
<tr>
<th>Disease/Disorder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory infections</td>
<td>can be caused by bacteria and viruses; include the common cold and pneumonia</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>sometimes caused by bacteria; develops when the bronchial tubes are irritated and swell and too much mucus is produced; lasts for a long time</td>
</tr>
<tr>
<td>Emphysema</td>
<td>disease in which the alveoli enlarge, causing an enzyme that breaks down alveoli walls to be produced; alveoli do not function well and blood receives less oxygen; causes shortness of breath</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>uncontrolled growth of cells in the lungs; can be caused by smoking</td>
</tr>
<tr>
<td>Asthma</td>
<td>can cause shortness of breath, wheezing, or coughing; often an allergic reaction</td>
</tr>
</tbody>
</table>

### CONNECT IT

Identify respiratory diseases and disorders described in this chapter that are related to smoking. List symptoms of these diseases.

Accept all reasonable responses. Chronic bronchitis, emphysema, lung cancer, and asthma are associated with smoking.
Scanned the headings and illustrations in Section 2 to determine three processes that are involved in the urinary system’s function.

1. regulation of body fluids
2. filtration in the kidneys
3. urine collection and release

Define blood to show its scientific meaning.

blood: tissue that transports oxygen, nutrients, and waste materials throughout your body

Write a paragraph using all seven of the new vocabulary terms. Try to use sentences that show the meaning of each term.

Accept all reasonable responses. The urinary system removes wastes from the blood. The main organs of the urinary system are the kidneys. Special structures inside the kidneys, called nephrons, filter blood. The waste fluid that is left behind after filtration is called urine. Urine flows out of the kidneys and through the ureters to the bladder. It is then released from the bladder and carried by the urethra to the outside of the body.

Use a dictionary to define remove.

remove: to get rid of
Complete the following statement with the words provided.

damage illness wastes death toxic

If ____ wastes ____ are not removed from the body, ____ toxic ____ substances build up and ____ damage ____ organs. Serious ____ illness ____ or ____ death ____ may occur.

Model the urinary system. Draw and label the organs of the urinary system.

Drawings should include the kidneys, renal artery, renal vein, aorta, ureter, bladder, and urethra.

Summarize how blood is processed in the kidneys. Identify substances that pass through the filter and substances that are left behind. Identify the structures involved in each stage.

First stage: Water, sugar, salt, and wastes from the blood pass into a cuplike structure in the nephrons. Red blood cells and proteins are left behind in the blood.

Second stage: Liquid in the cuplike structure flows into a narrow tubule. Most of the water, sugar, and salt are reabsorbed and returned to the blood. The liquid left behind flows into the collecting tubules in each kidney.
Describe how blood helps rid the body of wastes.

Accept all reasonable responses. Blood collects waste from body cells. Blood then carries this waste to the kidneys, where the waste is filtered out and removed from the body.
Respiration and Excretion
Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
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<th>After You Read</th>
</tr>
</thead>
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</tr>
<tr>
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<td>A SE, pp. 570–571 RE, p. 276</td>
</tr>
<tr>
<td>• If wastes are not removed from the body, they can build up and damage organs.</td>
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</tr>
<tr>
<td>• The bladder filters wastes from blood.</td>
<td>D SE, p. 580 RE, p. 284</td>
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Review

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SUMMARIZE IT

List three processes of excretion described in this chapter.

Accept all reasonable responses. 1. Wastes are filtered from blood by the kidneys.
2. The liver also removes waste from the blood. 3. Undigested material is removed by the digestive system.
Control and Coordination

Before You Read

*Before you read the chapter, respond to these statements.*

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Control and Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• You are subjected to thousands of stimuli every day.</td>
</tr>
<tr>
<td></td>
<td>• The brain is made up of about 10,000 neurons.</td>
</tr>
<tr>
<td></td>
<td>• You can’t control reflexes because they occur before you know what has happened.</td>
</tr>
<tr>
<td></td>
<td>• You can smell food because it gives off molecules into the air.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

**Science Journal**

Which senses do you think are involved when you respond to a glass crashing on a tile floor?

Responses may include hearing, sight, and also touch, if parts of the glass or its contents come in contact with the skin.
Control and Coordination
Section 1 The Nervous System

Scan the headings in Section 1 of your book. Write three questions that come to mind. Accept all reasonable responses.

1. Which parts of the brain are responsible for which functions?
2. What is the nervous system?
3. How do nerves transmit signals?

Define response using its scientific meaning.

response
reaction to a specific stimulus

Use your book to define the following vocabulary terms.

homeostasis
regulation of an organism’s internal, life-maintaining conditions

neuron
basic functioning unit of the nervous system, made up of a cell body, dendrites, and axons

synapse
small space across which an impulse moves from an axon to the dendrites or cell body of another neuron

reflex
automatic, involuntary response to a stimulus; controlled by the spinal cord

central nervous system
brain and spinal cord

peripheral nervous system
all the nerves outside the central nervous system

Use a dictionary to define coordinate using its scientific meaning.

coordinate
to cause to work well together
Define stimulus and describe the relationship between stimuli and the nervous system.

A stimulus is any change that brings about a response. The nervous system helps the body adjust to changing stimuli. It is one of the body’s control systems that helps keep its internal conditions steady despite changes in the environment.

Sequence the passage of an impulse through a nerve cell. Start with receiving the impulse at a dendrite and end with the part of the nerve cell that carries the impulse to muscles, neurons, and glands.

Organize information about the parts of the brain and their functions by completing the chart below.

<table>
<thead>
<tr>
<th>Part of the brain</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrum</td>
<td>where thinking takes place; interprets the meaning of impulses that come from sensory neurons</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>interprets stimuli from the eye, ears, muscles, and tendons</td>
</tr>
<tr>
<td>Brain stem</td>
<td>connects the brain to the spinal cord</td>
</tr>
</tbody>
</table>

Describe the function of the spinal cord.

Spinal cord: carries nerve impulses to and from the brain and all other body parts.
Main Idea

The Peripheral Nervous System

I found this information on page ____________.

SE, p. 599
RE, p. 290

Safety and the Nervous System

I found this information on page ____________.

SE, p. 601
RE, p. 291

Drugs and the Nervous System

I found this information on page ____________.

SE, p. 602
RE, p. 292

Compare and contrast the two major parts of the peripheral nervous system by completing the graphic organizer below.

Peripheral Nervous System

Parts

somatic system
autonomic system

Functions

controls voluntary actions
controls involuntary actions

Analyze the diagram of the reflex arc provided in your book. List in order the three neurons involved in the reflex pathway, or arc.

1. sensory neuron
2. interneuron
3. motor neuron

Distinguish between alcohol and caffeine by completing the Venn diagram with at least two facts for each drug.

Alcohol

Both

Caffeine

depressant

stimulant

slow activities of CNS

speeds up activities of CNS

CONNECT IT

Infer why alcohol is a controlled substance and caffeine is not.

Accept all reasonable responses. Alcohol’s effects can include unsafe behavior and lead to serious disease, but caffeine’s effects usually do not.
Control and Coordination

Section 2 The Senses

**Skim** the headings of Section 2 to determine the four senses that will be discussed in detail.

1. vision
2. hearing
3. smell
4. taste

**Define** sense organ using a dictionary or your book.

**sense organ**
specialized organ that, when stimulated, enables you to keep safe and enjoy your environment

**Write the correct vocabulary term beside the definition.**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>retina</td>
<td>light-sensitive tissue at the back of the eye; contains rods and cones</td>
</tr>
<tr>
<td>cochlea</td>
<td>fluid-filled structure in the inner ear in which sound vibrations are converted into nerve impulses that are sent to the brain</td>
</tr>
<tr>
<td>olfactory cells</td>
<td>nasal nerve cells that become stimulated by molecules in the air and send impulses for interpretation of odors</td>
</tr>
<tr>
<td>taste bud</td>
<td>major sensory receptor on the tongue; contains taste hairs that send impulses for interpretation of tastes</td>
</tr>
</tbody>
</table>

**Use a dictionary to define interpret. Use the term in a sentence to show its scientific meaning.**

to tell the meaning of; to understand; Sample sentence: The scientist used his data to interpret the results of the experiment.
Main Idea

The Body's Alert System

Create a graphic organizer to identify three common stimuli that the senses are able to detect. Accept all reasonable responses.

Vision

Identify the functions of each part of the eye.

<table>
<thead>
<tr>
<th>Part of Eye</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cornea</td>
<td>refracts light</td>
</tr>
<tr>
<td>Lens</td>
<td>directs the light onto retina</td>
</tr>
<tr>
<td>Retina</td>
<td>cones—respond to bright light and color; rods—respond to dim light and distinguish shapes and movement</td>
</tr>
<tr>
<td>Optic nerve</td>
<td>carries impulses to cortex of brain</td>
</tr>
</tbody>
</table>

Hearing

Sequence the parts of the ear in the order that a signal travels.

outer ear → ear canal → ear drum → hammer → anvil → stirrup → cochlea
Main Idea

Smell

I found this information on page 609.
SE, p. 609
RE, p. 298

Taste

I found this information on page 610.
SE, p. 610
RE, p. 299

Details

Summarize how food is smelled by the nose.
Food gives off molecules into the air. The molecules stimulate the olfactory cells in nasal passages. When the molecules dissolve on the moist olfactory cells, the cells are stimulated and produce impulses. These impulses are sent to the brain to be interpreted.

Distinguish the five kinds of tastes in the graphic organizer below.

Other Sensory Receptors in the Body

I found this information on page 611.
SE, p. 611
RE, p. 299

Summarize the kinds of stimuli to which the receptors in internal organs and in fingertips can respond by listing them below.

<table>
<thead>
<tr>
<th>Internal Organs</th>
<th>Fingertips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch</td>
<td>rough or smooth</td>
</tr>
<tr>
<td>Pressure</td>
<td>hard or soft</td>
</tr>
<tr>
<td>Pain</td>
<td>hot or cold</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
</tbody>
</table>

Evaluate It

Identify some advantages of having fingertips and skin with many types of receptors for touch.
Accept all reasonable responses. Answers may address concerns for safety and increased sensitivity to the environment.
Control and Coordination
Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Control and Coordination</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• You are subjected to thousands of stimuli every day.</td>
<td>A SE, p. 594 RE, p. 287</td>
</tr>
<tr>
<td>• The brain is made up of about 10,000 neurons.</td>
<td>D SE, p. 598 RE, p. 289</td>
</tr>
<tr>
<td>• You can’t control reflexes because they occur before you know what has happened.</td>
<td>A SE, p. 601 RE, p. 291</td>
</tr>
<tr>
<td>• You can smell food because it gives off molecules into the air.</td>
<td>A SE, p. 609 RE, p. 298</td>
</tr>
</tbody>
</table>

Review

*Use this checklist to help you study.*

- Review the information you included in your Foldable.
- Study your *Science Notebook* on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

**SUMMARIZE IT**

Describe how your nervous system helps protect you.

Accept all reasonable responses. The stimulus-response actions of the body allow the body to respond in ways that maintain homeostasis and prevent injury.
Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Regulation and Reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Endocrine glands are tissues that produce hormones.</td>
<td></td>
</tr>
<tr>
<td>• Testosterone is the male sex hormone and sperm is the male reproductive cell.</td>
<td></td>
</tr>
<tr>
<td>• Identical twins are not always the same sex.</td>
<td></td>
</tr>
<tr>
<td>• Adulthood is the final stage of human development.</td>
<td></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a paragraph describing how an emergency call might be handled at a fire station.

Student responses will vary, but may include dispatchers answering an incoming emergency call, dispatching emergency crews to the scene, and monitoring the situation to see if additional help is needed.
Scan the headings, charts, and illustrations in Section 1. Find two glands of the endocrine system that are involved in regulating blood sugar levels and two glands that are involved in regulating calcium levels.

<table>
<thead>
<tr>
<th>Helps Regulate Blood Sugar Levels</th>
<th>Helps Regulate Calcium Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>adrenal gland</td>
<td>thyroid</td>
</tr>
<tr>
<td>pancreas</td>
<td>parathyroid</td>
</tr>
</tbody>
</table>

Define tissue to show its scientific meaning. Then use the word in an original sentence.

tissue
group of similar cells that all do the same work; Sample sentence: Skin is made up of several different tissues.

Define hormone to show its scientific meaning.

Hormone
in humans, chemical produced by the endocrine system, released directly into the bloodstream by ductless glands; affects specific target tissues, and can speed up or slow down cellular activities.

Define distribute to show its scientific meaning. Then use the word in an original sentence.

distribute
to divide among several or many; Sample sentence: Blood distributes hormones from the glands that produce them to the tissues that need them.
Section 1 The Endocrine System (continued)

Main Idea

Functions of the Endocrine System

Organize information about the body’s control systems by completing the chart below.

<table>
<thead>
<tr>
<th>Body System</th>
<th>Function</th>
<th>Body’s Response Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nervous system</td>
<td>sends impulses to and from the brain and throughout the body</td>
<td>reacts very quickly</td>
</tr>
<tr>
<td>Endocrine system</td>
<td>sends chemical messages to different parts of the body</td>
<td>reacts more slowly</td>
</tr>
</tbody>
</table>

Endocrine Glands

Sequence the events that occur when a gland produces a hormone and sends it to a target tissue.

gland releases hormone into the blood

blood transports hormone to other parts of the body

specific body tissue responds to hormone

Distinguish the four main functions of the endocrine glands by completing the graphic organizer below.

- help the body handle stressful situations
- help the body grow and develop
- coordinate circulation of blood
- help the body digest and absorb food

Functions of the Endocrine Glands

Have students investigate and describe the role of the endocrine system in the “fight or flight” response.
A Negative Feedback System

I found this information on page SE, p. 626, RE, p. 302.

Model a negative-feedback system by completing the cycle chart below.

- A meal is eaten.
- Intestines take in glucose during digestion.
- Glucose level in pancreas increases.
- Pancreas responds to high glucose level by producing the hormone insulin.
- Glucose level decreases to normal level in bloodstream.
- Homeostasis is restored.
- Insulin is released into bloodstream, causing the liver and other tissues to take up more glucose.

CONNECT IT

Draw an outline of the human body on a separate sheet of paper. Label it male or female. Using information provided in your book, show where endocrine glands are located and then describe their functions.

Glands and their functions should be indicated in the brain, upper chest, below the larynx, on top of each kidney, between the kidneys, and in the scrotum in males or the pelvic cavity in females.
Regulation and Reproduction
Section 2 The Reproductive System

**Predict** three things that might be discussed in Section 2 as you read the headings. Accept all reasonable responses.

1. how reproduction involves the endocrine system
2. the organs and functions of the male reproductive system
3. the organs and functions of the female reproductive system

**Review Vocabulary**

**Define** cilia as it relates to this section.

* cilia
  - short, hairlike structures that extend from a cell

**New Vocabulary**

Identify the vocabulary terms that match the definitions.

* testis
  - male organ that produces sperm and testosterone

* sperm
  - male reproductive cells

* semen
  - mixture of sperm and a fluid that helps sperm move and supplies the sperm with an energy source

* ovary
  - in humans, female reproductive organ that produces eggs

* ovulation
  - monthly release of an egg from an ovary in a hormone-controlled process

* uterus
  - hollow, pear-shaped, muscular organ in which a fertilized egg develops

* menstruation
  - monthly flow of blood and tissue cells that occurs when the lining of the uterus breaks down and is shed

**Academic Vocabulary**

Define respond using its scientific meaning. Write a sentence that reflects this meaning.

* respond
  - to react in response; Sample sentence: The nervous system helps the body respond to stimuli.
Main Idea

Reproduction and the Endocrine System

I found this information on page __________.
SE, p. 627
RE, p. 304

Details

**Complete** the graphic organizers below to differentiate the role of the pituitary gland in females and males.

- **Pituitary Gland in Females** produces: **female sex hormone** stimulates: **egg production in ovaries**

- **Pituitary Gland in Males** produces: **male sex hormone** stimulates: **sperm production in testes**

Summarize information about the male reproductive organs in the graphic organizer below.

```
Male Reproductive Organs

- penis
- scrotum contains testes

  - testes make testosterone
  - testes make sperm

- scrotum
```

The Male Reproductive System

I found this information on page __________.
SE, p. 628
RE, p. 305
Describe how the menstrual cycle would differ in phase 3 if the egg were fertilized. Then infer how future cycles would be affected.

Responses should explain that the uterus wall would not break down and would remain to support and nourish the developing embryo, and that the cycle would stop during pregnancy.
Skim the headings in Section 3. Then write three questions that you have about human life stages. Accept all reasonable responses.

1. How does the process of fertilization occur?
2. What are the stages of development before birth?
3. What is cesarean section?

Define nutrient to show its scientific meaning.

**nutrient**

substance in food that provides energy and materials for cell development, growth, and repair

Define the new vocabulary terms to show their scientific meaning.

**embryo**

fertilized egg that has attached to the wall of the uterus

**amniotic sac**

thin, liquid-filled protective membrane that forms around the embryo

**fetus**

in humans, a developing baby after the first two months of pregnancy until birth

**fetus stress**

can occur during the birth process or after birth as an infant adjusts from a watery, dark, constant-temperature environment to its new environment

Define capable. Use capable in an original sentence to show its scientific meaning.

**capable**

able to do things; fit; Sample sentence: People become capable of reproduction during puberty.
**Main Idea**

**Fertilization**  
*I found this information on page _______.*  
SE, p. 633  
RE, p. 309

**Details**

**Sequence the events that result in the formation of a zygote by completing the following graphic organizer.**

1. Sperm enter the vagina and come in contact with chemical secretions in the vagina.
2. The chemicals cause changes in the sperm that make it possible for them to fertilize the egg.
3. A sperm that touches the egg releases an enzyme.
4. This enzyme helps the sperm enter the egg and their nuclei unite to form a fertilized cell called a zygote.

**Multiple Births**  
*I found this information on page _______.*  
SE, p. 634  
RE, p. 309

**Classify the following descriptions as applying to either identical twins or fraternal twins. Write either for a description that could fit both categories.**

- **fraternal twins**  
  Two eggs are released and both are fertilized.
- **identical twins**  
  A fertilized zygote divides into two separate zygotes.
- **either**  
  Twins of the same sex are born.
- **fraternal twins**  
  Twins with different sexes are born.

**Development Before Birth**  
*I found this information on page _______.*  
SE, pp. 634–636  
RE, pp. 310–311

**Create a time line to indicate when the following events occur:**

- **a)** embryo forms  
- **b)** amniotic sac forms  
- **c)** head forms  
- **d)** fingers and toes form. Not all weeks will be filled in.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Weeks of Pregnancy**
**Main Idea**

**The Birthing Process**

I found this information on page ___________.

SE, p. 636
RE, p. 311

**Sequence** the events that occur during the birthing process. The first one has been completed for you.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Contractions increase.</td>
</tr>
<tr>
<td>2.</td>
<td>Amniotic sac breaks.</td>
</tr>
<tr>
<td>3.</td>
<td>Opening of the uterus gets wider.</td>
</tr>
<tr>
<td>4.</td>
<td>Forceful contractions push baby through the vagina.</td>
</tr>
<tr>
<td>5.</td>
<td>More contractions push the placenta out.</td>
</tr>
</tbody>
</table>

**Stages After Birth**

I found this information on page ___________.

SE, pp. 638–641
RE, pp. 312–313

**Summarize** information about the stages after birth using the chart below.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Period in Life</th>
<th>Changes That Occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infancy</td>
<td>from birth to 18 months</td>
<td>learns to coordinate movement; grows rapidly</td>
</tr>
<tr>
<td>Childhood</td>
<td>18 months to about 12 years</td>
<td>learns to control bladder and bowels; develops ability to speak, read, write, and reason</td>
</tr>
<tr>
<td>Adolescence</td>
<td>about age 12 to age 20</td>
<td>experiences puberty; final growth spurt occurs</td>
</tr>
<tr>
<td>Adulthood</td>
<td>about age 20 until age 60</td>
<td>growth of muscular and skeletal system stops</td>
</tr>
<tr>
<td>Older Adulthood</td>
<td>over age 60</td>
<td>may experience overall decline in physical body systems</td>
</tr>
</tbody>
</table>
Tie It Together

Synthesize It

Create a journal that reflects your own stages of development. Interview your parents to record information about your size at various ages (including birth weight and length) and when you learned certain skills such as the ability to crawl and walk, when you lost your baby teeth, and so on. Try to find pictures of yourself at various ages to include in your journal.

Journals should chronicle changes that occurred during infancy, childhood, and perhaps adolescence. Ensure the privacy of the content of each student’s journal.
Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Regulation and Reproduction</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Endocrine glands are tissues that produce hormones.</td>
<td>A SE, p. 622 RE, p. 301</td>
</tr>
<tr>
<td>• Testosterone is the male sex hormone and sperm is the male reproductive cell.</td>
<td>A SE, p. 628 RE, p. 305</td>
</tr>
<tr>
<td>• Identical twins are not always the same sex.</td>
<td>D SE, p. 634 RE, p. 310</td>
</tr>
<tr>
<td>• Adulthood is the final stage of human development.</td>
<td>A SE, p. 640 RE, p. 312</td>
</tr>
</tbody>
</table>

Review
Use this checklist to help you study.

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☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT
Explain how the title “Regulation and Reproduction” fits with the content of this chapter. Accept all reasonable responses.

Regulation relates to the role of the endocrine glands in controlling certain cellular processes. Reproduction relates to the organs and functions of the reproductive systems and the process of fertilization and development.
Immunity and Disease

Before You Read

*Before you read the chapter, respond to these statements.*

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Immunity and Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Your skin is one of your body’s first lines of defense against disease.</td>
</tr>
<tr>
<td></td>
<td>• A vaccine is given to cure a disease.</td>
</tr>
<tr>
<td></td>
<td>• AIDS and HIV are the same thing.</td>
</tr>
<tr>
<td></td>
<td>• You can catch diabetes from another person.</td>
</tr>
</tbody>
</table>

**Construct the Foldable as directed at the beginning of this chapter.**

**Science Journal**

*Write a paragraph describing a battle between your white cells and a foreign invader.*

*Student responses should include a foreign substance invading the blood and being attacked by white blood cells.*
Immunity and Disease
Section 1 The Immune System

Read the title and headings of the section. Predict two topics that will be discussed in this section. Accept all reasonable responses.

1. the body’s lines of defense
2. specific, active, and passive immunity

Define enzyme to show its scientific meaning.

enzyme
type of protein that speeds up chemical reactions in the body

Write the vocabulary term that matches each definition.

immune system complex group of defenses that protects the body against pathogens
antigen molecule that is foreign to the body
antibody protein made in response to a specific antigen
active immunity immunity in which the body makes its own antibodies in response to an antigen
passive immunity immunity in which antibodies that have been produced in another animal are introduced to the body
vaccination process of giving a vaccine by injection or by mouth

Use a dictionary to define specific to show its scientific meaning.
specific exact; particular
### Main Idea

**Lines of Defense**

I found this information on page SE, pp. 652–653
RE, pp. 315–316

**Details**

**Summarize** your body’s first-line defense strategies.

<table>
<thead>
<tr>
<th>Skin</th>
<th>Respiratory System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops many pathogens from entering the body; sweat and oils can slow the growth of some pathogens.</td>
<td>Cilia and mucus trap pathogens; enzymes in mucus weaken cell walls of some pathogens; coughs and sneezes help get rid of pathogens.</td>
</tr>
</tbody>
</table>

**First-line Defenses**

<table>
<thead>
<tr>
<th>Digestive System</th>
<th>Circulatory System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saliva kills bacteria; enzymes help destroy pathogens; hydrochloric acid kills bacteria and stops viruses; mucus prevents bacteria from attaching to inner lining.</td>
<td>White blood cells surround and destroy foreign organisms and chemicals; fever speeds up body defenses.</td>
</tr>
</tbody>
</table>

**Sequence** what happens when an antigen enters the body.

1. The immune system recognizes an antigen in the body and releases lymphocytes.
2. Killer T cells release enzymes that help destroy antigens.
3. Helper T cells produce B cells.
4. B cells form antibodies, which can attach to the antigen and make it harmless.
5. Memory B cells stay in the blood to destroy the pathogen if it invades the body again.
Main Idea

I found this information on page ___________.
SE, p. 655
RE, p. 317

Have students work in pairs to identify the characteristics of each type of immunity.

Details

**Contrast** active and passive immunity. Complete the chart.

<table>
<thead>
<tr>
<th>Active Immunity</th>
<th>Passive Immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What It Is</strong></td>
<td>immunity in which the body produces antibodies in response to an antigen</td>
</tr>
<tr>
<td><strong>How You Get It</strong></td>
<td>when an antigen enters the body, the immune system produces antibodies</td>
</tr>
<tr>
<td><strong>How Long It Lasts</strong></td>
<td>can last for a long time</td>
</tr>
</tbody>
</table>

**Summarize** how a vaccine helps protect your body against a pathogen. Complete the flow chart.

A vaccine is injected or given by mouth.

The body forms antibodies against the antigen in the vaccine.

If the antigen later enters the body, the antibodies are already present in the bloodstream.

CONNECT IT

Many schools require children to be vaccinated against diseases such as measles before they begin school. Analyze why the schools might have this requirement. Accept all reasonable responses.

If students are vaccinated, the disease cannot spread through the school.
### Immunity and Disease

**Section 2: Infectious Diseases**

**Skim Section 2. Write three questions you would like to have answered. Then look for the answers as you read.**

1. How do microorganisms cause disease?
2. How do surgeons prevent infection?
3. How do diseases spread?

**Define protist using your book or a dictionary.**

protist

one- or many-celled organism that lives in moist or wet surroundings

**New Vocabulary Use your book to define each vocabulary term.**

- **pasteurization**
  - process of heating a liquid to a specific temperature in order to kill most bacteria

- **virus**
  - tiny piece of genetic material surrounded by a protein coating that infects host cells and multiplies inside them

- **infectious disease**
  - disease that is spread from an infected organism or the environment to another organism

- **biological vector**
  - disease-carrying organism

- **sexually transmitted disease (STD)**
  - disease passed from person to person during sexual contact

**Academic Vocabulary Use a dictionary to define complex using its scientific meaning.**

complex

composed of two or more parts; complicated
Main Idea

Disease in History

I found this information on page __________.
SE, pp. 658–660
RE, pp. 320–321

Details

Distinguish the important contributions of Louis Pasteur, Robert Koch, and Joseph Lister to the treatment of infectious diseases.

Pasteur: discovered that microorganisms spoiled milk and wine; realized that microorganisms could cause disease in the human body; developed process of pasteurization to kill microorganisms

Koch: developed a way to isolate and grow one type of bacterium at a time; developed rules for identifying which organism causes a disease

Lister: identified the relationship between cleanliness and preventing disease; used carbolic acid to wash skin, hands, and instruments

I found this information on page __________. 
SE, p. 658
RE, p. 321

How Diseases Are Spread

I found this information on page __________.
SE, p. 661
RE, p. 322

Identify examples of diseases caused by each type of organism.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Diseases Caused</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>tetanus, tuberculosis, strep throat</td>
</tr>
<tr>
<td>Protists</td>
<td>malaria, sleeping sickness</td>
</tr>
<tr>
<td>Fungi</td>
<td>athlete’s foot, ringworm</td>
</tr>
<tr>
<td>Viruses</td>
<td>colds, influenza, AIDS, measles, mumps</td>
</tr>
</tbody>
</table>

Identify four ways in which diseases can be transmitted.

1. direct contact with an infected organism
2. through water, air, and food
3. by contact with contaminated objects
4. by disease-carrying organisms called biological vectors

I found this information on page __________.
SE, pp. 661–662
RE, pp. 322–323

Section 2 Infectious Diseases (continued)
Main Idea

Sexually Transmitted Diseases

I found this information on page ____________.
SE, p. 662
RE, pp. 322–323

Make sure that students understand that HIV is the pathogen and AIDS is the disease caused by the pathogen. A person can have HIV in their body without having AIDS.

HIV and Your Immune System

I found this information on page ____________.  
SE, p. 663  
RE, p. 323

Details

Identify examples of each type of sexually transmitted disease and list its symptoms and possible effects.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Symptoms</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>gonorrhea or chlamydia</td>
<td>pain, sores, discharge</td>
<td>damages reproductive organs</td>
</tr>
<tr>
<td>syphilis</td>
<td>sores, rash, fever, swollen glands</td>
<td>damage to body organs; can cause death</td>
</tr>
<tr>
<td>genital herpes</td>
<td>painful blisters on sex organs</td>
<td>hides in body for long periods of time and then reappears</td>
</tr>
</tbody>
</table>

Analyze how HIV harms the immune system. Explain how HIV causes AIDS and what happens when a person has AIDS.

HIV destroys helper T cells, so the T cells cannot produce B cells. This means that B cells do not produce antibodies. This causes AIDS, in which the immune system cannot fight pathogens.

Summarize It

Describe several things that you can do to prevent infections.

Accept all reasonable responses. wash hands and body, brush and floss teeth, exercise, eat healthful foods, get plenty of rest
Scan the section headings, bold words, and illustrations in Section 3. Write two facts you discovered as you scanned the section. Accept all reasonable responses.

1. Allergens are substances that cause allergies.
2. Cancer is caused when cells grow uncontrollably.

Define gene using your book or a dictionary.

**gene**

A section of DNA on a chromosome that carries instructions for making a specific protein.

Use your book to define each vocabulary term.

**noninfectious disease**

Disease or disorder that is not spread from one person to another.

**allergy**

Overly strong reaction of the immune system to a foreign substance.

**allergen**

Substance that causes an allergic response.

**chemotherapy**

Use of chemicals to destroy cancer cells.

Use a dictionary to define react. Then write what you predict reaction means. Check your definition in the dictionary.

**react**

To act because something has happened; respond.

A reaction is an action in response to something that has happened.
Section 3  Noninfectious Diseases (continued)

Main Idea

Chronic Disease
I found this information on page _________.
SE, p. 666
RE, p. 326

Allergies
I found this information on page _________.
SE, pp. 666–667
RE, pp. 326–327

Diabetes
I found this information on page _________.
SE, p. 667
RE, p. 327

Students in your class may have diabetes or allergies. Be sensitive to students’ privacy when discussing these topics.

Details

Contrast infectious disease and noninfectious disease.
Infectious disease is spread from one organism to another or from the environment to an organism. Noninfectious disease does not spread.

Sequence what happens during an allergic reaction. Then list some typical symptoms of an allergy.

An ______ allergen _______ enters the body.
The immune system produces antibodies.
The body releases histamines that cause red, swollen tissues.

Typical symptoms: rashes, sneezes, hives; asthma; can cause shock and death

Compare and contrast Type 1 and Type 2 diabetes. Complete the chart. Then list common symptoms of both types of diabetes and the possible long-term effects of the disease.

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>too little or no insulin produced</td>
<td>body unable to properly use insulin</td>
</tr>
<tr>
<td>Treatment</td>
<td>daily injections of insulin</td>
<td>usually controlled by diet and weight</td>
</tr>
<tr>
<td>Symptoms:</td>
<td>tiredness, thirst, need to urinate often, tingling in hands and feet</td>
<td></td>
</tr>
<tr>
<td>Long-term effects:</td>
<td>blurred vision, kidney failure, heart attack, stroke, loss of feeling in the feet, diabetic coma</td>
<td></td>
</tr>
</tbody>
</table>
Main Idea

Chemicals and Disease

I found this information on page ________.
SE, p. 668
RE, p. 327

Cancer

I found this information on page ________.
SE, p. 669
RE, p. 328

Details

Identify the possible harmful effects of the chemicals listed.
Asbestos: lung disease
Lead-based paints: damage to central nervous system
Alcohol: birth defects when consumed during pregnancy

Summarize information about cancer cells below.

Summarize the causes, warning signs, and treatments of cancer.

Complete the chart. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Causes</th>
<th>carcinogens such as asbestos, cleaning products heavy metals, tobacco, alcohol, home and garden products; exposure to X rays and radiation; genetics can increase risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning Signs</td>
<td>changes in bowel movements; a sore that does not heal; unusual bleeding or discharge; thickening or lump in the breast; difficulty in digesting or swallowing food; changes in a wart or mole; cough or hoarseness that will not go away</td>
</tr>
<tr>
<td>Treatments</td>
<td>surgery, radiation, chemotherapy</td>
</tr>
</tbody>
</table>

CONNECT IT

A friend’s family has a history of lung and skin cancer. Evaluate some steps your friend could take to reduce his risk of getting these diseases.
Accept all reasonable responses. My friend could avoid using tobacco, eat a healthful diet, and wear sunscreen.
Every winter, many students miss school as a result of colds, influenza, and other infectious diseases. Plan a campaign for your school to teach other students how to reduce their risk of catching these diseases. You might design posters, plan an assembly, or use other ways to get the information out. Outline your plan below. Accept all reasonable responses.

Encourage creative responses. Students should include tips about handwashing and healthful eating. If possible, have students follow through on their plans and produce materials for the school.
Immunity and Disease Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Immunity and Disease</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your skin is one of your body’s first lines of defense against disease.</td>
<td>A SE, p. 652 RE, p. 315</td>
</tr>
<tr>
<td>A vaccine is given to cure a disease.</td>
<td>D SE, p. 655 RE, p. 318</td>
</tr>
<tr>
<td>AIDS and HIV are the same thing.</td>
<td>D SE, p. 663 RE, p. 323</td>
</tr>
<tr>
<td>You can catch diabetes from another person.</td>
<td>D SE, p. 667 RE, p. 327</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

What are the three most important ideas in this chapter?

Accept all reasonable responses. 1. Washing your hands is an important way to prevent the spread of pathogens. 2. Eating a healthful diet can reduce the risk of some types of disease. 3. Not all diseases are caused by the same kinds of organisms.
### Interactions of Life

#### Before You Read

*Before you read the chapter, respond to these statements.*

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Interactions of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The community includes the top part of Earth's crust, water that covers Earth's surface, and Earth's atmosphere.</td>
</tr>
<tr>
<td></td>
<td>• In nature, most competition occurs between individuals of the same species.</td>
</tr>
<tr>
<td></td>
<td>• Plants and microscopic organisms can move from place to place.</td>
</tr>
<tr>
<td></td>
<td>• Living organisms do not need a constant supply of energy.</td>
</tr>
</tbody>
</table>

---

**Science Journal**

*Describe how a familiar bird, insect, or other animal depends on other organisms.*

Student responses will vary, but may include feeding relationships, such as birds eating fruit or nuts from trees, or other relationships, such as trees providing nesting sites for birds or insects.
Skim through Section 1 of your book. Read the headings and look at the figures. Write three questions that come to mind. Accept all reasonable responses.

1. What is an ecosystem?
2. What is a population?
3. How is population different from a community?

Define adaptation using your book or a dictionary.

adaptation
any variation that makes an organism better suited to its environment

Define each new vocabulary term using your book.

biosphere
part of Earth that supports life

ecology
study of the interactions that take place among organisms and their environment

population
all of the organisms that belong to the same species living in a community

community
all of the populations of different species that live in an ecosystem

habitat
place where an organism lives

Define interact using a dictionary.

interact
to act on one another
Section 1 Living Earth (continued)

Main Idea

The Biosphere

I found this information on page _________.

SE, p. 684
RE, p. 331

I found this information on page _________.

SE, p. 684
RE, p. 331

Encourage students to suggest other environments with which they are familiar and the organisms found there.

Complete this chart to identify three parts of the biosphere.

<table>
<thead>
<tr>
<th>Parts of the Biosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>top portion of Earth’s crust</td>
</tr>
<tr>
<td>all of the waters that cover Earth’s surface</td>
</tr>
<tr>
<td>the atmosphere that surrounds Earth</td>
</tr>
</tbody>
</table>

Contrast the organisms found in different environments as you complete the concept map. Provide examples of both plants and animals. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Environments</th>
<th>Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>little rain</td>
<td>Desert</td>
</tr>
<tr>
<td></td>
<td>cactus, coyotes, lizards</td>
</tr>
<tr>
<td>rain and warm weather</td>
<td>Tropical Rain Forest</td>
</tr>
<tr>
<td></td>
<td>parrots, monkeys, lush jungle</td>
</tr>
<tr>
<td>ice and snow</td>
<td>Arctic</td>
</tr>
<tr>
<td></td>
<td>polar bears, seals, walruses, lichens</td>
</tr>
</tbody>
</table>

Analyze the amount of solar energy that makes Earth the only planet known to support life. Explain why other planets are not suitable for life.

The amount of energy that reaches Earth is neither too much nor too little to support life. Other planets are too close or too far from the Sun to have conditions that allow life.
Organize the parts of a prairie ecosystem. List three living organisms and three nonliving parts of the ecosystem. Accept all reasonable responses.

**Prairie Ecosystem**

- **Living Organisms**
  - bison
  - birds
  - grass

- **Nonliving Parts**
  - water
  - soil
  - sunlight

**Sequence the four levels of organization of living organisms from smallest to largest.** Then write an example of each one.

<table>
<thead>
<tr>
<th>Smallest</th>
<th>Largest</th>
</tr>
</thead>
<tbody>
<tr>
<td>organism, a deer</td>
<td>ecosystem, all organisms and nonliving parts</td>
</tr>
<tr>
<td>population, a herd of deer</td>
<td>community, deer, + rabbits</td>
</tr>
<tr>
<td>community, organism</td>
<td>ecosystem</td>
</tr>
</tbody>
</table>

**Synthesize It**

Write about your own life. Use the terms habitat, community, population, and ecosystem to describe your everyday interactions.

Accept all reasonable responses. Students may discuss getting food from a garden, interacting with their family and animals, or friends at school. Responses should include information about the student’s habitat, community, population, and ecosystem.
Interactions of Life
Section 2 Populations

Predict Read the headings in Section 2. Predict three topics that you think will be discussed in this section. Accept all reasonable responses.

1. how competition can affect a population
2. how to measure a population in a given area
3. how a population can change over time

Define natural selection using your book or a dictionary. Then use it in a sentence to show its scientific meaning.

natural selection the hypothesis stating that organisms with traits best suited to their environment are more likely to survive and reproduce

Sample sentence: Birds with long, narrow beaks survived in the woodlands when other birds did not because of natural selection.

Create an original sentence using each vocabulary term to show its scientific meaning.

limiting factor Sample sentence: The lack of rain was a limiting factor to plant growth and reproduction.

carrying capacity Sample sentence: The carrying capacity of the swamp limited the number of alligators that could live there.

Define resource using a dictionary. Then write a sentence related to the topic of Section 2 using the term.

resource something used for help or support

Sample sentence: Competition for a particular resource, such as a place to live, can drive many animals from an area.
Complete the chart below to identify how competing for certain limited resources can affect population growth.

<table>
<thead>
<tr>
<th>Limited Resource</th>
<th>Why It Limits Population Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>Some organisms will not have a place in which to raise their young.</td>
</tr>
<tr>
<td>Food</td>
<td>Some organisms may not survive to reproduce.</td>
</tr>
</tbody>
</table>

Compare the two ways of measuring populations by filling in the graphic organizer below.

Measuring Populations

- **trap-mark-release**
  - Methods include
  - to count organisms that look alike, move a lot, or hide

- **sample counts**
  - Definitions
  - to estimate population size in a large area

Contrast carrying capacity and biotic potential. Then identify one factor that can limit each.

<table>
<thead>
<tr>
<th></th>
<th>What It Is</th>
<th>Limiting Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrying capacity</td>
<td>the largest number of individuals of a species that an ecosystem can support</td>
<td>limited resources, such as space</td>
</tr>
<tr>
<td>Biotic potential</td>
<td>the highest rate of reproduction under ideal conditions</td>
<td>the number of offspring that can be produced by parent organisms</td>
</tr>
</tbody>
</table>
Section 2 Populations (continued)

Main Idea

Changes in Populations

I found this information on page ___________.
SE, p. 692
RE, p. 336

Details

Compare the effect of differing birth rates and death rates on population growth as you complete the chart below.

<table>
<thead>
<tr>
<th>Population Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Rate Compared to Death Rate</td>
</tr>
<tr>
<td>much higher</td>
</tr>
<tr>
<td>slightly higher</td>
</tr>
<tr>
<td>lower</td>
</tr>
</tbody>
</table>

Evaluate the effects of exponential growth on a population.

Size of Population increases
leads to
Population grows even faster
leads to

Summarize the environmental effects of the exponential growth of a population.

Accept all reasonable responses. Population growth causes competition for resources, such as crowded living conditions.

This can lead to the spread of disease.

SYNTHESIZE IT

A field is crowded with mice. A new group of mice migrate into the field. Describe how the crowded conditions could affect the mice.

Accept all reasonable responses. Students should indicate that competition for food and space would likely cause the mouse population to decrease as mice die or migrate.
Interactions of Life
Section 3 Interactions Within Communities

Scan the What You’ll Learn statements for Section 3. Rewrite each statement as a question. As you read the section, try to answer your questions. Accept all reasonable responses.

1. How do organisms obtain energy for life?
2. How do organisms interact?
3. What is a niche, and how does an organism occupy it?

Define social behavior using your book or a dictionary. 

social behavior
interactions among members of the same species

Label each definition with the correct vocabulary term.

producer
an organism that can use an outside energy source like the Sun to make energy-rich molecules

consumer
an organism that cannot make its own energy-rich molecules

symbiosis
any close relationship between species

niche
an organism’s role in its environment

Define constant as an adjective. Then use it in a scientific sentence.

constant
not changing; staying the same; Sample sentence: The boy is in a constant state of hunger.
**Main Idea**

**Obtaining Energy**
*I found this information on page __________.*
SE, pp. 696–697
RE, pp. 339–340

**Details**

**Compare and contrast** producers and consumers by describing the processes by which each group gets the energy it needs.

- **Producers gain energy from a nonliving source**
  - Photosynthesis
  - Chemosynthesis

- **Consumers gain energy from eating other organisms**
  - Herbivores eat plants
  - Carnivores eat other animals
  - Omnivores eat plants and animals
  - Decomposers consume wastes and other organisms

**Symbiotic Relationships**
*I found this information on page __________.*
SE, p. 698
RE, pp. 340–341

**Classify** examples of symbiosis by completing the chart below.

<table>
<thead>
<tr>
<th>Type of Symbiosis</th>
<th>Who Benefits?</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>mutualism</td>
<td>both species benefit</td>
<td>alga and fungus forming lichen</td>
</tr>
<tr>
<td>commensalism</td>
<td>one organism benefits and the other is not affected</td>
<td>clown fish protected by a sea anemone</td>
</tr>
<tr>
<td>parasitism</td>
<td>one organism benefits but the other is harmed</td>
<td>roundworms within a cat or dog</td>
</tr>
</tbody>
</table>
Main Idea

Niches

I found this information on page ___________.
SE, p. 699
RE, p. 341

Organize important points about niches by creating an outline of your reading. Accept all reasonable responses.

I. A niche is _______ an organism’s role in its environment _________.
   A. how it obtains food
   B. how it obtains shelter
   C. how it finds a mate
   D. how it cares for its young
   E. how it avoids danger

II. Special adaptations that ________ improve survival ________ can be part of a niche.
   A. Example: Poison in milkweed plants stops many ________ insects from eating them.
   B. Example: Monarch butterfly caterpillars have an ________ adaptation to eat the milkweed plant. Caterpillars become poisonous. Birds avoid eating them.

Synthesize It

Draw and label organisms that are in your food chain. Include at least three organisms. Then show how each of these organisms can get the energy it needs.

Student responses should demonstrate knowledge of energy transferred from the Sun, through producers, to consumers, using a variety of organisms.

Consumers may include:
   Herbivores, Carnivores, Omnivores,
   and Decomposers

Producers may include:
   plants and other organisms
   that make their energy from the Sun.
### Tie It Together

#### Observation

*Observe the behaviors of a species of animal (for example, squirrels in a park) for at least 15 minutes. Use the chart below to take notes on your observations.*

<table>
<thead>
<tr>
<th>Species:</th>
<th>Encourage students to record and describe their observations carefully and thoroughly.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date and time of observation:</td>
<td></td>
</tr>
<tr>
<td>Number of individuals observed:</td>
<td></td>
</tr>
<tr>
<td>Interactions within species:</td>
<td></td>
</tr>
<tr>
<td>Food sources observed:</td>
<td></td>
</tr>
<tr>
<td>Habitat:</td>
<td></td>
</tr>
<tr>
<td>Special adaptations of species:</td>
<td></td>
</tr>
<tr>
<td>Interactions observed with other species:</td>
<td></td>
</tr>
</tbody>
</table>
**Interactions of Life**  Chapter Wrap-Up

*Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.*

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

<table>
<thead>
<tr>
<th>Interactions of Life</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The community includes the top part of Earth’s crust, water that covers Earth’s surface, and Earth’s atmosphere.</td>
<td>D SE, p. 686 RE, p. 332</td>
</tr>
<tr>
<td>• In nature, most competition occurs between individuals of the same species.</td>
<td>A SE, p. 688 RE, p. 334</td>
</tr>
<tr>
<td>• Plants and microscopic organisms can move from place to place.</td>
<td>A SE, p. 693 RE, p. 337</td>
</tr>
<tr>
<td>• Living organisms do not need a constant supply of energy.</td>
<td>D SE, p. 696 RE, p. 339</td>
</tr>
</tbody>
</table>

**Review**

*Use this checklist to help you study.*

- Review the information you included in your Foldable.
- Study your *Science Notebook* on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

**SUMMARIZE IT**

After reading this chapter, identify three things that you have learned about interactions among living organisms. *Accept all reasonable responses.*

1. Competition limits population size. 2. If a population begins to exceed the environment’s carrying capacity, some individuals will die because of lack of resources. 3. One habitat might contain hundreds or even thousands of species.
# The Nonliving Environment

## Before You Read

Preview the chapter title, the section titles, and the section headings. List at least two ideas for each section in each column.

<table>
<thead>
<tr>
<th><strong>K</strong> What I know</th>
<th><strong>W</strong> What I want to find out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accept all responses at this time.</td>
<td></td>
</tr>
</tbody>
</table>

## Science Journal

List all the nonliving things that you might see in a picture of a beach, in order of importance. Explain your reasoning for the order you choose.

Student responses may include water, sand, rocks, and sunlight. Order of importance and explanations will vary.
### The Nonliving Environment

**Section 1 Abiotic Factors**

**Preview** the What You’ll Learn statements for Section 1. Rewrite each statement into a question. Accept all reasonable responses.

1. What are the common abiotic factors in most ecosystems?
2. What components of air are needed for life?
3. How does climate influence life in ecosystems?

**Define** environment to show its scientific meaning.

- **environment**
  - everything, such as climate, soil, and living things, that surrounds and affects an organism

**Define the following terms to show their scientific meanings.**

- **biotic**
  - describes features of the environment that are alive, or were once alive

- **abiotic**
  - describes nonliving, physical features of the environment

- **atmosphere**
  - the air that surrounds Earth

- **soil**
  - mixture of mineral and rock particles, the remains of dead organisms, water, and air

- **climate**
  - an area’s average weather conditions over time

**Use a dictionary to define** fundamental as an adjective.

- **fundamental**
  - serving as an original or generating source; primary
Main Idea

Classify *seven* environmental factors *as* biotic or abiotic.

<table>
<thead>
<tr>
<th>Factors needed for life</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biotic</strong></td>
</tr>
<tr>
<td>1. plants</td>
</tr>
<tr>
<td>2. animals</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Details

**Environmental Factors**

*I found this information on page ______.*

SE, p. 712
RE, p. 343

**Air**

*I found this information on page ______.*

SE, p. 713
RE, pp. 343–344

**Water and Soil**

*I found this information on page ______.*

SE, pp. 713–714
RE, p. 344

Compare and contrast *how gases are used during photosynthesis and respiration.*

<table>
<thead>
<tr>
<th></th>
<th>Photosynthesis</th>
<th>Respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas used</td>
<td>carbon dioxide</td>
<td>oxygen</td>
</tr>
<tr>
<td>Gas released</td>
<td>oxygen</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>Purpose</td>
<td>make food with energy from sunlight</td>
<td>release energy from food</td>
</tr>
</tbody>
</table>

Summarize *how organisms use water and soil.* Complete the sentences.

Most organisms are **50 to 95** percent water. Processes such as **respiration**, **digestion**, and **photosynthesis** need water to occur. Environments with plenty of water usually have a greater variety and larger number of organisms than environments with little water. Organisms also need **soil**. **Bacteria**, **fungi**, **insects**, and **worms** all live in soil. The type of soil influences the types of **plants** that can grow in a region.
Section 1 Abiotic Factors (continued)

Main Idea

**Sunlight**

I found this information on page ______.  
SE, p. 715  
RE, p. 344

**Temperature**

I found this information on page ______.  
SE, pp. 715–716  
RE, pp. 344–345

**Climate**

I found this information on page ______.  
SE, p. 718  
RE, p. 346

Details

**Label** the diagram to show the flow of energy through living things. **Label** consumers, producers, and sunlight.

![Diagram](sunlight → producers → consumers)

**Analyze** how latitude and elevation affect temperature.

**Latitude:** Places near the equator have warmer temperatures than areas near the poles because the sun strikes those areas at more direct angles.

**Elevation:** The atmosphere is thinner at higher elevations, so it holds less heat. Thus areas at higher elevations are cooler than areas at lower elevations.

**Sequence** steps to explain the rain shadow effect. Accept all reasonable responses.

1. Moist air is forced upward by a mountain.
2. As the air rises, it cools.
3. When air cools, the moisture it contains condenses and falls as rain or snow.
4. The other side of the mountain receives much less precipitation.

**CONNECT IT** Describe the climate of your community. Identify its latitude, elevation, temperature, and precipitation characteristics.  
Student responses will vary depending on community, but should reflect an understanding of the factors that affect the local climate.
The Nonliving Environment

Section 2 Cycles in Nature

Skim the headings and illustrations in Section 2. List three kinds of cycles you will learn about in the section.

1. water cycle
2. nitrogen cycle
3. carbon cycle

Define biosphere to show its scientific meaning.

Biosphere: the part of the world in which life can exist

Read the definitions below. Write the correct vocabulary term on the blank to the left.

- **carbon cycle**: model describing how carbon molecules move between the living and the nonliving world
- **condensation**: process that takes place when a gas changes to a liquid
- **nitrogen fixation**: process in which some types of bacteria in the soil change nitrogen gas into a form of nitrogen that plants can use
- **evaporation**: process that takes place when a liquid changes to a gas
- **water cycle**: model describing how water moves from Earth’s surface to the atmosphere and back again through evaporation, condensation, and precipitation
- **nitrogen cycle**: model describing how nitrogen moves from the atmosphere to the soil, to living organisms, and then back to the atmosphere

Define **model** as it is used in the definitions above. Use a dictionary to help you.

Model: a tool used to help visualize something that cannot be directly observed
Main Idea

The Cycles of Matter

I found this information on page ___________.
SE, p. 720
RE, p. 348

The Water Cycle

I found this information on page ___________.
SE, pp. 720–721
RE, p. 349

The Nitrogen Cycle

I found this information on page ___________.
SE, p. 722
RE, p. 350

Details

Summarize the importance of cycles to life on Earth.

Earth has only a certain amount of water, carbon, nitrogen, oxygen, and other materials needed for life. These materials are constantly cycled to provide a continuous supply.

Model the water cycle in a drawing.

• Label phases of the cycle including evaporation, transpiration, condensation, and precipitation.
• Label the sources and forms the water takes.
• Use arrows to show the direction in which water is moving at each part of the cycle.

Drawings should include information about the following processes:
evaporation (water changing to gas);
transpiration (water evaporating from plant leaves);
condensation (water vapor changing to liquid water);
and precipitation (water falling to Earth in various forms).

Identify the three ways that nitrogen is made available to plants.

Lightning and bacteria change nitrogen gas into usable compounds.

Plants and animals die and decompose, releasing nitrogen compounds into the soil.

Plants use nitrogen compounds to build cells.

Animal wastes return some nitrogen compounds to soil.
Main Idea

I found this information on page ___________.

SE, p. 723
RE, p. 351

Details

Describe how harvesting removes soil nitrogen and how fertilizer and nitrogen-fixing crops can increase the amount of nitrogen in soil.

Harvesting: removing all plant material prevents it from decaying and returning nitrogen to the soil.

Fertilizer: contains nitrogen compounds that plants need for growth; can be added to increase soil nitrogen and fertility.

Nitrogen-fixing crops: crops on which nitrogen-fixing bacteria live; bacteria supply nitrogen compounds to the plants and the soil.

The Carbon Cycle

I found this information on page ___________.

SE, p. 725
RE, p. 351

Model the carbon cycle. Identify the role of each item shown in the cycle. Draw arrows showing the flow of carbon through the system.

Air contains carbon as carbon dioxide gas.

Producers (Plants and algae) use carbon dioxide to make sugars.

Consumers break down sugar molecules and release carbon dioxide as waste.

Burning wood and fossil fuels releases carbon dioxide into the air.

Connect It

Choose an organism. Explain its role in the water, nitrogen, and carbon cycles.

Student responses will vary depending on organism chosen. A tree uses water and releases it as water vapor through transpiration. It takes nitrogen compounds from the soil and uses the compounds for its processes. It uses carbon dioxide for photosynthesis and releases oxygen into the air.
Skim Section 3 of your book. Read the headings and look at the illustrations. Write three questions that come to mind. Accept all reasonable responses.

1. What is chemosynthesis?
2. What is a hydrothermal vent?
3. How are food webs different from food chains?

Define energy to show its scientific meaning.

energy
the ability to cause change

Define the following terms to show their scientific meanings.

chemosynthesis
process in which producers make energy-rich nutrient molecules from chemicals

food web
model that shows the complex feeding relationships among organisms in a community

energy pyramid
model that shows the amount of energy available at each feeding level in an ecosystem

Use a dictionary to locate the scientific meaning of convert. Write a sentence using that scientific meaning.

convert
A power plant converts energy from fossil fuels into electrical energy.
**Main Idea**

**Converting Energy**

I found this information on page ___________.
SE, pp. 726–727
RE, pp. 353–354

Encourage students to be as detailed as possible. Students with the SE may be able to provide more detail than students with just the RE.

**Energy Transfer**

I found this information on page ___________.
SE, p. 727
RE, p. 354

**Details**

**Compare and contrast** photosynthesis and chemosynthesis. Complete the Venn diagram with at least seven points of information from your book. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Photosynthesis</th>
<th>Both</th>
<th>Chemosynthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>converts light energy into chemical energy</td>
<td></td>
<td>performed by specialized bacteria living near hydrothermal vents</td>
</tr>
<tr>
<td>performed by plants and algae</td>
<td></td>
<td>use energy from chemical compounds to make food</td>
</tr>
<tr>
<td>requires sunlight</td>
<td></td>
<td>does not need sunlight</td>
</tr>
</tbody>
</table>

**Create an example of a food chain.**

- Include and label a producer, a herbivore, and a carnivore or omnivore that eats the herbivore.
- Use arrows to show the transfer of energy.

Drawings should show plant or bacterial producers, first level consumers, and second-level consumers, and should indicate that energy and matter are transferred up the chain from producers through first-level consumers to second-level consumers.
Synthesize information about food webs. Draw arrows to show the energy transfers in the food web shown.

Eagle

Weasel

Mouse

Plants

Rattlesnake

Squirrel

Sequence the levels of an energy pyramid.

- Label each level as containing carnivores, herbivores, or producers.
- Label each level with the percentage of total energy that is available at that level.

Carnivores

Herbivores

Producers

Describe the flow of matter and energy in a food chain made up of grasses, mice, and hawks, and what might happen to the food chain if a fire destroyed much of the grass. Accept all reasonable responses.

Matter and energy will move from the grasses to the mice to the hawk. When fire burns off some grass, the mice will not have enough food to survive and the population will decline. The hawks will then not have enough food, and that population will decline.
Tie It Together

A developer wants to build homes on land near your community and wants to know how the environment will affect the people who live in the homes, and how the homes will affect the environment.

Prepare an environmental study for the developer, including information about

• the abiotic factors in the area that could affect the people in the home
• how the new homes might affect natural cycles and food webs in the area

Use paragraphs and/or pictures to help you explain your points.

Accept all reasonable responses. Encourage students to research local ecosystems to find out more about the water, soil, organisms, and climate found there.
The Nonliving Environment
Chapter Wrap-Up

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column, then complete the table by filling in the third column. How do your ideas compare with those you provided at the beginning of the chapter?

<table>
<thead>
<tr>
<th>K</th>
<th>What I know</th>
<th>W</th>
<th>What I want to find out</th>
<th>L</th>
<th>What I learned</th>
</tr>
</thead>
</table>

Accept all reasonable responses.

Review

Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

Summarize It

Write three things that you learned while studying this chapter.

Accept all reasonable responses. 1. Living organisms depend on one another for food and energy. 2. Matter is recycled through Earth’s biosphere. 3. Energy can be converted from one form to another and transferred from one organism to another.

274 The Nonliving Environment
### Ecosystems

#### Before You Read

Think about the terms and descriptions below. Infer which term most closely matches the description and write it on the line.

<table>
<thead>
<tr>
<th>biome</th>
<th>ecosystem</th>
<th>estuary</th>
<th>intertidal zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>ecosystem</td>
<td>community of living organisms interacting with each other and their physical environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>intertidal zone</td>
<td>part of the shoreline that is under water at high tide and exposed to the air at low tide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>biome</td>
<td>a large geographic area with an interactive environmental community and similar climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>estuary</td>
<td>extremely fertile area where a river meets an ocean; contains a mixture of freshwater and saltwater and serves as a nursery for many species</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FOLDABLES® Study Organizer**

Construct the Foldable as directed at the beginning of this chapter.

**Science Journal**

What traits might plants on a burning hillside have that enable them to survive and reproduce? Accept all reasonable responses.

Traits of trees would include thick bark and high branches. Shrub traits would include rhizomes and root systems that sprout after they’ve been burned back.
Ecosystems
Section 1 How Ecosystems Change

**Skim** through Section 1 of your text. Write three things that might be discussed in this section. Accept all reasonable responses.

1. succession
2. new soil
3. forest fires

**Define** the following key terms using your book or a dictionary.

- **ecosystem**
  community of living organisms interacting with each other and their physical environment

- **climax community**
  stable, end stage of ecological succession in which balance exists in the absence of disturbance

- **pioneer species**
  first organisms to grow in new or disturbed areas; break down rock and build up organic material so that other plants can grow

- **succession**
  natural, gradual changes in the types of species that live in an area; can be primary or secondary

- **stable**
  firmly established; not changing or fluctuating
**Main Idea**

**Ecological Succession**

*I found this information on page __________.*

**Details**

**Sequence** *the steps in the succession of a lawn to a climax community. The first one has been completed for you.*

<table>
<thead>
<tr>
<th>Succession of a Lawn to Climax Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The grass would get longer.</td>
</tr>
<tr>
<td>2. It would look like a meadow.</td>
</tr>
<tr>
<td>3. Animals and wind would carry seeds into the area.</td>
</tr>
<tr>
<td>4. Plants would grow from the seeds.</td>
</tr>
<tr>
<td>5. Trees might sprout.</td>
</tr>
</tbody>
</table>

**Organize** *the information from your book to compare primary succession with secondary succession.*

<table>
<thead>
<tr>
<th>Primary Succession</th>
<th>Secondary Succession</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lava from a volcano</td>
<td>Fire consumes a forest</td>
</tr>
<tr>
<td>Land consists of</td>
<td></td>
</tr>
<tr>
<td>(\text{barren rock})</td>
<td>(\text{dead trees, ash-covered soil})</td>
</tr>
<tr>
<td>Starts with</td>
<td></td>
</tr>
<tr>
<td>(\text{Lichens}) break down rock and decay, adding organic material</td>
<td>Soil contains (\text{seeds})</td>
</tr>
<tr>
<td>Animals and wind carry</td>
<td></td>
</tr>
<tr>
<td>seeds</td>
<td>more seeds</td>
</tr>
<tr>
<td>Plants add</td>
<td></td>
</tr>
<tr>
<td>organic material</td>
<td>organic material</td>
</tr>
<tr>
<td>Wildlife</td>
<td></td>
</tr>
<tr>
<td>moves in</td>
<td>moves in</td>
</tr>
</tbody>
</table>
Complete the graphic organizer to better understand the characteristics of a climax community.

A climax community

is

has reached

is

stable

undisturbed

an end stage of succession

Identify the three main characteristics of a forest climax community.

1. community remains stable  
2. new trees grow when old trees die  
3. few changes of species occur

Connect It

Use the information you have learned about succession to predict the growth of a community in a flooded river basin. Hypothesize whether the succession would be primary succession or secondary succession. Support your answer with facts from your book. Accept all reasonable responses.

Secondary succession would occur. Seeds and soil would already be present. Animals and wind carry in more seeds. Pioneer species grow and wildlife moves in.
I found this information on page _________.
SE, p. 744
RE, p. 361

**Ecosystems**

**Section 2 Biomes**

**Analyze** Look at the world map of the seven major land biomes in your book. Infer two factors you think scientists might use to classify biomes of the world. Accept all reasonable responses.

1. topography
2. similar climate

**Review Vocabulary**

*climate*

*Use the word climate in a scientific sentence.*

The climate of a region partly determines the types of organisms that can live in it.

**New Vocabulary**

*tropical rain forest*  
*grassland*  
*temperate deciduous forest*  
*tundra*  
*desert*  
*taiga*

**Define** Read the definitions below. Write the key terms on the blanks in the left column.

most biologically diverse biome

ideal biome for growing crops and raising cattle and sheep

biome usually having four distinct seasons

cold, dry, treeless biome with a short growing season and permafrost

biome with thin soil where organisms are adapted to survive extreme conditions

biome containing cone-bearing evergreen trees and dense forests

**Academic Vocabulary**

*mature*

*Use a dictionary to define mature as a verb.*

to become fully developed or ripe
## Section 2 Biomes (continued)

### Main Idea

**Major Biomes**

*I found this information on page ___.*

SE, pp. 744–751  
RE, pp. 360–364

---

**Complete the comparison chart using the world map of seven biomes.**

<table>
<thead>
<tr>
<th>Major Biomes</th>
<th>Physical Description</th>
<th>Average Precipitation</th>
<th>Temperature</th>
<th>Location</th>
<th>Plant and Animal Life</th>
</tr>
</thead>
</table>
| Tundra       | permafrost, cold, dry, treeless | less than 25 cm per year | average daily temperature: $-12\,^\circ C$ | South and North Poles, and on high mountains | Plants: lichens, grass, moss, shrubs  
Animals: mice, reindeer, musk ox, birds |
| Taiga        | cold forest region | 35–100 cm per year | temperature range: $-54^\circ C$ to $21^\circ C$ | $50^\circ N$–$60^\circ N$ latitude, N. America, Northern Europe, Asia | Plants: cone-bearing evergreen trees  
Animals: variety of species |
| Temperate Deciduous Forest | deciduous trees; four distinct seasons | 75–150 cm per year | temperature range: $0^\circ C$–$30^\circ C$ | eastern US, Europe, parts of Asia and Africa | Plants: deciduous trees  
Animals: variety of species; white tail deer |
| Temperate Rain Forest | dense forest with a variety of plants and animals | wet, 200–400 cm per year | average temperature; $9^\circ C$–$12^\circ C$ | New Zealand, Chile, Pacific northwest of U.S. | Plants: lichens, mosses, tall trees  
Animals: variety of species, black bear and bobcats |

---

Students may not be aware that ecosystems consist of parts, subsystems, and many interactions between biotic and abiotic factors.
### Main Idea

<table>
<thead>
<tr>
<th>Ecosystems</th>
<th>Physical Description</th>
<th>Average Precipitation</th>
<th>Temperature</th>
<th>Location</th>
<th>Plant and Animal Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical Rain Forest</td>
<td>warm, wet weather, dense plant growth</td>
<td>more than 200 cm per year</td>
<td>average temperature: 25°C</td>
<td>near equator</td>
<td>4 zones of plant and animal life, Plants: lush plant growth, Animals: variety of species</td>
</tr>
<tr>
<td>Desert</td>
<td>bare ground, sand or thin soil</td>
<td>less than 25 cm per year</td>
<td>extreme heat and cold</td>
<td>western US and S. America, Africa, parts of Australia and Asia</td>
<td>Plants: few plants, spaced far apart, Animals: kangaroos, snakes</td>
</tr>
<tr>
<td>Grasslands</td>
<td>lack of forests, dominated by grasses</td>
<td>dry season, 25–75 cm per year</td>
<td>mild to hot</td>
<td>prairies—N. America, steppes—Asia, savannas—Africa, pampas—S. America</td>
<td>Plants: grasses, Animals: kangaroos, zebras, impalas</td>
</tr>
</tbody>
</table>

### Details

Students may not understand that the majority of deserts are hot, dry places, but a few deserts are cold.

Both the tundra and the desert have very little soil. Animal and plant species are limited. Both biomes have extreme temperatures and little precipitation. However, the tundra is very cold, while the desert is hot during the day and often cold at night.
Ecosystems
Section 3 Aquatic Ecosystems

Read the What You’ll Learn objectives of Section 3. Write questions that come to mind from reading these statements.

1. What is the difference between freshwater and standing freshwater ecosystems? Accept all reasonable responses.

2. What lives in a freshwater ecosystem?

3. What lives in a saltwater ecosystem?

Define the key terms using your book or a dictionary.

aquatic growing or living in water

coral reef structure formed from the calcium carbonate shells secreted by corals

wetland a land region that is wet most or all of the year; swamp, bog

promote to contribute to the growth of; to help bring into being

Organize the four important factors that determine how well a species can survive in an aquatic environment.

1. water temperature

2. amount of sunlight present

3. amount of dissolved oxygen in the water

4. amount of salt in the water
Main Idea

Freshwater Ecosystems

Compare fast-moving streams with slower-moving streams as you complete the sentences below about freshwater environments.

Fast-moving Streams

Currents quickly ______ wash loose particles downstream ______

As water tumbles, air ______ mixes in with it ______

These streams have clearer ______ water ______ and higher ______ oxygen levels ______

Slow-moving Streams

Water moves slowly and debris ______ settles to the bottom ______

These environments have higher ______ nutrient levels ______, more plant ______ growth ______, and organisms ______ not well-adapted ______ to swiftly moving water ______

Classify each statement as a characteristic of pond ecosystems, lake ecosystems, or both. Mark P for pond, L for lake, or B for both ecosystems.

____ B____ more plants than flowing water environments

____ L____ deeper water and colder water temperatures

____ L____ larger body of water

____ B____ plankton floating near the surface

____ P____ ecosystem high in nutrients

____ P____ small, shallow body of water

____ L____ lower light levels at depth limit types of organisms

____ L____ plant growth limited to shallow water near shore

____ B____ water hardly moves
Section 3 Aquatic Ecosystems (continued)

Main Idea

Freshwater Ecosystems

Organize information about wetlands in the concept map.

**Wetlands**

- fish, shellfish, cranberries
- swamps, bogs, fens
- plants and animals

*Details*

**Saltwater Ecosystems**

I. Coral Reef ecosystems are systems that include the areas that surround a reef.
   A. reefs formed by calcium carbonate shells of coral
   B. damaged by run-off, sewage, sediment

II. Seashores
   A. affected by tides and wave action
   B. intertidal zone organisms must adapt to temperature, moisture, and salinity changes

III. Estuaries
   A. contain a mixture of fresh and salt water
   B. are important for seafood, and nurseries for ocean fish

Complete the outline about saltwater ecosystems.

I. Coral Reef ecosystems are systems that include the areas that surround a reef.
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III. Estuaries
   A. contain a mixture of fresh and salt water
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Tie It Together

Interactions within Ecosystems

Select one of the ecosystems discussed in this chapter. You might choose a tundra ecosystem, a rain forest ecosystem, a coral reef ecosystem, or one of the other ecosystems. Take notes about your ecosystem on the lines below. Then, draw a picture of your ecosystem with its animal and plant inhabitants. Show any interactions that you described in your picture.

My ecosystem is a/an _________________________________.

It includes these plants:

________________________________________________________________________

________________________________________________________________________

It includes these animals:

________________________________________________________________________

________________________________________________________________________

Its environment includes these conditions:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Interactions between organisms include these:

________________________________________________________________________

________________________________________________________________________

Interactions between organisms and the environment include these:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Sketch of My Ecosystem

Accept all reasonable responses.
Ecosystems Chapter Wrap-Up

Think about the terms and descriptions below. Write the term that most closely matches the description on the line in front of the description. Compare your previous responses with these.

<table>
<thead>
<tr>
<th>biome</th>
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<th>estuary</th>
<th>intertidal zone</th>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Review
Use this checklist to help you study.

☐ Review the information you included in your Foldable.
☐ Study your Science Notebook on this chapter.
☐ Study the definitions of vocabulary words.
☐ Review daily homework assignments.
☐ Re-read the chapter and review the charts, graphs, and illustrations.
☐ Review the Self Check at the end of each section.
☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things that you have learned about ecosystems. Accept all reasonable responses.

1. Ecosystems change over time.
2. There are seven types of land biomes on Earth.
3. Human impact on ecosystems can be destructive.
Conserving Resources

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Conserving Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• There is an unlimited supply of fossil fuels.</td>
</tr>
<tr>
<td></td>
<td>• Sun, wind, and heat within Earth’s crust can be used to generate power.</td>
</tr>
<tr>
<td></td>
<td>• Acid precipitation washes nutrients from the soil.</td>
</tr>
<tr>
<td></td>
<td>• The ozone layer emits radiation that can harm living cells.</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

List some resources, other than water, air, and fossil fuels, that we depend on and describe how we use them.

Wood, food crops, and soil are examples. Wood can provide shelter and home furnishings, food crops are needed for our own consumption and by other animals, and soil filters water and is needed by farmers to produce crops.
**Conserving Resources**

**Section 1 Resources**

**Predict** the topics that will be discussed in Section 1 after reading the headings and looking at the illustrations. Accept all reasonable responses.

1. what natural resources are
2. what fossil fuels are
3. alternatives to using fossil fuels

**Review Vocabulary**

**Define** geyser to show its scientific meaning.

**geyser**

a spring that emits intermittent jets of heated water and steam

**New Vocabulary**

**Define the following terms to show their scientific meanings.**

**natural resource**

parts of the environment that are useful or necessary for the survival of living organisms

**hydroelectric power**

electricity that is made when the energy of falling water is used to turn the turbines of an electric generator

**nuclear energy**

energy that is released when atomic nuclei are split apart

**geothermal energy**

heat energy contained in Earth’s crust

**Academic Vocabulary**

**Define** modify. Then use it in an original sentence to show its scientific meaning.

**modify**

to undergo change; Sample sentence: Ozone depletion will modify the earth’s atmosphere.
**Main Idea**

**Natural Resources**

*I found this information on page __________.*

SE, pp. 770–771

RE, pp. 371–372

---

**Compare** renewable *and* nonrenewable resources *by completing the chart below.*

<table>
<thead>
<tr>
<th>Type of Resource</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable</td>
<td><em>resource that is recycled or replaced constantly by nature</em></td>
<td>sunlight, water, wind, air, plants</td>
</tr>
<tr>
<td>Nonrenewable</td>
<td><em>resource that is used up more quickly than it can be replaced by natural processes</em></td>
<td>minerals, petroleum</td>
</tr>
</tbody>
</table>

---

**Fossil Fuels**

*I found this information on page __________.*

SE, p. 772

RE, p. 372

---

**Organize** *information about fossil fuels in the concept web below.*

- **How They Form**
  - *form from the remains of organisms in Earth’s crust over millions of years*

- **Fossil Fuels**
  - **Examples**
    - coal, oil, natural gas
  - **Uses**
    - vehicles, generating electricity, heating homes, cooking
Main Idea

I found this information on page .

SE, p. 772
RE, p. 372

Alternatives to Fossil Fuels

I found this information on page .

SE, pp. 773–776
RE, pp. 373–374

Have groups of students do research to determine regions where renewable sources might be good alternatives.

Summarize three reasons that fossil fuels need to be conserved.

1. Supply is limited.
2. Ecosystems can be damaged.
3. Air pollution can be reduced.

Organize information about alternative energy resources below.

<table>
<thead>
<tr>
<th>Alternative Energy Resource</th>
<th>Important Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroelectric power</td>
<td>kinetic energy of falling water turns a turbine; dam must be built; can cause environmental problems, such as flooding land; does not cause air pollution</td>
</tr>
<tr>
<td>Wind energy</td>
<td>wind turns blades of turbine that powers an electric generator; nonpolluting; limited by availability of steady wind</td>
</tr>
<tr>
<td>Geothermal energy</td>
<td>heat beneath Earth’s surface is energy source; can be used only where volcanoes or geysers exist</td>
</tr>
<tr>
<td>Nuclear power</td>
<td>uranium nuclei are split; released heat is used to make steam that turns a generator; disadvantage is the need to dispose of radioactive wastes</td>
</tr>
<tr>
<td>Solar energy</td>
<td>photovoltaic cells are used to produce electricity from the energy of sunlight; only produce electricity when lighted</td>
</tr>
</tbody>
</table>

Examine the circle graph in your book showing energy usage in the United States. Explain why so much of the United States’ energy comes from fossil fuels in spite of the fact that fossil fuels cause pollution and are limited in supply.

Many alternative energy sources, such as wind and flowing water, can be used only in some regions. Using nuclear energy creates radioactive waste, and solar technology is still developing. Fossil fuels also are comparatively cheap.
Skim the headings of Section 2 to determine three main types of pollution that will be discussed.

1. air pollution
2. water pollution
3. soil pollution

Define atmosphere to show its scientific meaning.

atmosphere
the whole mass of air surrounding Earth

Read each definition below. Write the correct vocabulary term in the blank to the left.

pollutant
substance that contaminates the environment

acid precipitation
precipitation that has a pH below 5.6

greenhouse effect
trapping of heat from the Sun by Earth’s atmosphere

hazardous wastes
waste materials that are harmful to human health or poisonous to living organisms

Define affect to show its scientific meaning.

affect
to make something happen; to have an effect on
Complete the graphic organizer below to identify the effects of acid rain and ways to prevent acid rain.

**Acid Rain**

**Effects**
- washes nutrients from the soil; causes plants to die;
- lowers pH of lakes and ponds, killing fish and other organisms

**Prevention**
- use low-sulfur coal and natural gas; use smokestacks that remove sulfur dioxide;
- reduce automobile use

**Greenhouse Effect**

**Ozone Depletion**

**Sequence** the events that cause the greenhouse effect and ozone depletion by completing the following graphic organizers.

**Greenhouse Effect**

- Fossil fuels are burned.
- The level of carbon dioxide in the atmosphere increases.
- More heat is trapped.
- Average temperatures rise.

**Ozone Depletion**

- CFCs are used in cooling systems.
- CFCs leak into the atmosphere.
- CFCs slowly rise to the ozone layer.
- CFCs react chemically with ozone.
- Ozone molecules break apart.

Have students discuss the impact that the greenhouse effect and ozone depletion have on Earth’s flora and fauna populations.
**Main Idea**

**Indoor Air Pollution**

I found this information on page ________.

SE, p. 782

RE, pp. 379–380

**Water Pollution**

I found this information on page ________.

SE, p. 783

RE, pp. 380–381

**Soil Loss and Soil Pollution**

I found this information on page ________.

SE, pp. 785–786

RE, p. 381

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**Details**

**Compare and contrast** carbon monoxide and radon as sources of indoor air pollution by completing the following chart.

<table>
<thead>
<tr>
<th>Gas</th>
<th>Source</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>burning of fuels such as charcoal and natural gas</td>
<td>can cause illness, even death</td>
</tr>
<tr>
<td>Radon</td>
<td>given off by some types of rocks and soils</td>
<td>can cause lung cancer</td>
</tr>
</tbody>
</table>

**Identify causes of the following three examples of water pollution.**

1. Surface water pollution:  
   **Accept all reasonable responses.**
   Pesticides can wash into lakes and streams.

2. Ocean water pollution:  
   Oil spills can cause ocean pollution.

3. Groundwater pollution:  
   Pollutants in soil can pollute aquifers.

**Analyze causes of soil loss and soil pollution.**

A. Causes of soil loss

1. Topsoil is blown away by wind and washed away by rain.
2. Some human activities increase the rate of erosion.

B. Causes of soil pollution

1. Pollutants move from water into the soil.
2. Air pollutants fall to the ground.

**CONNECT IT**

Explain in one sentence why people are concerned about pollution.

Accept all reasonable responses. Six billion people living on Earth put a strain on the environment.
Scan the headings of Section 3. List the three Rs of conservation below.

1. reduce
2. reuse
3. recycle

Define the following terms. Then write a paragraph that includes the scientific meaning of all three terms.

reprocessing

to subject to a special process or treatment in preparation for reuse

recycling

form of reuse that requires changing or reprocessing an item or natural resource

participate
to take part

Paragraph: Accept all reasonable responses. We can all participate in practicing conservation. For example, by reprocessing certain waste materials, we can save natural resources. By participating in recycling, we can reuse materials and decrease the burden on our landfills.
Main Idea

Conservation

Identify reasons for conserving resources by completing the graphic organizer below.

Reasons to Conserve Resources

- prevent shortages
- reduce the need for landfills
- lower levels of pollution

Summary four ways to reduce your own use of natural resources. Accept all reasonable responses.

1. Walk instead of riding in a car.
2. Buy only the things I need.
3. Buy products that use less packaging.
4. Buy products that use recycled materials.

Reduce

Reuse

I found this information on page 788.

I found this information on page 383.

Definition: to use an item more than once without changing it or reprocessing it.

Examples: reusable canvas bags to carry home your purchases; donating outgrown clothes to charity; taking reusable plates and utensils on picnics instead of disposable paper items.
Section 3  The Three Rs of Conservation (continued)

Main Idea

Recycle

I found this information on page ___________.
SE, pp. 789–791
RE, pp. 384–385

Have students investigate current levels of recycling as provided by the EPA.

Details

Summarize recycling in the following chart. Accept all reasonable responses.

<table>
<thead>
<tr>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition: form of reuse in which items or materials are reprocessed into new items</td>
</tr>
<tr>
<td>Items that can be recycled</td>
</tr>
<tr>
<td>Advantages of recycling</td>
</tr>
<tr>
<td>How recycling is done</td>
</tr>
</tbody>
</table>

Analyze the graph that describes the recycling rates of key household items. Then complete the statements.

The percentages of ________________, ________________, and ________________ being recycled increased from 1990 to 2000.
The percentages of ________________, ________________, ________________, and ________________ being recycled decreased from 1995 to 2000.

SYNTHESIZE IT

In a small group, discuss why some people do not recycle. Summarize your discussion in the space below. Accept all reasonable responses.

Students may suggest that sorting materials for recycling takes more time than throwing things away, or that recycling programs are not available in all places.
Tie It Together

Conservation

Brainstorm ways to increase the level of conservation practiced in your school. Set a conservation, reuse, or recycling goal. Write a plan to change the school’s behavior to meet your goal. If new resources would be needed to implement your plan, hypothesize how you could raise money for what you need.

- Decide which method of conservation you are most concerned about.
- Describe the benefits of practicing that method of conservation in your school.
- Identify practical ways that students can practice conservation.

Accept all reasonable responses. Students should present reasonable plans for conservation. Encourage students to prepare posters or brochures explaining their plans to be displayed in the school library.
Conserving Resources Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Conserving Resources</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is an unlimited supply of fossil fuels.</td>
<td>D SE, p. 772 RE, p. 372</td>
</tr>
<tr>
<td>Sun, wind, and heat within Earth’s crust can be used to generate power.</td>
<td>A SE, p. 773 RE, p. 373</td>
</tr>
<tr>
<td>Acid precipitation washes nutrients from the soil.</td>
<td>A SE, p. 779 RE, p. 377</td>
</tr>
<tr>
<td>The ozone layer emits radiation that can harm living cells.</td>
<td>D SE, p. 781 RE, p. 378</td>
</tr>
</tbody>
</table>

Review

Use this checklist to help you study.

- Review the information you included in your Foldable.
- Study your Science Notebook on this chapter.
- Study the definitions of vocabulary words.
- Review daily homework assignments.
- Re-read the chapter and review the charts, graphs, and illustrations.
- Review the Self Check at the end of each section.
- Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three new ways you could practice conservation. Accept all reasonable responses.

1. Walk places instead of riding in a car. 2. Turn off lights when I leave a room or hallway. 3. Recycle cans and bottles instead of throwing them away.
adapt: to change to fit new conditions
affect: to make something happen; to have an effect on
annual: plant that completes its life cycle in one year
apparent: readily seen, visible, readily understood or perceived; evident; obvious
area: amount or extent of a surface
attach: to be connected
benefit: to help
capable: able to do things; fit
chemical: made by chemistry
chemical bond: the force holding atoms together in a molecule
code: (noun) set of signals representing letters or numerals, used to send messages; (verb) to put in the form or symbols of a code
complex: composed of two or more parts; complicated
compound: (adjective) made of two or more separate parts or elements
constant: not changing; staying the same
contact: act or state of touching or meeting
convert: to change from one form or function to another
coordinate: to cause to work well together
cycle: a complete set of events or phenomena recurring in the same sequence
decline: to weaken or lessen
definite: having exact limits in size, shape, or number of parts
detect: to catch or discover; to manage to perceive
distribute: to divide among several or many
dominate: to control or rule
energy: capacity to perform some type of work or activity
environment: living and nonliving factors that surround an organism
estimate: (noun) an opinion of the value, quality, size, or cost of something; (verb) to form an opinion by reasoning
external: on, or for use on, the outside of the body
facilitate: to make easy or easier
flexible: able to bend or flex
function: (noun) a specific job or purpose; (verb) to carry out a specific action
fundamental: serving as an original or generating source; primary
generate: to originate or bring into existence
hypothesis: something that is suggested as being true for the purposes of argument or of further investigation
identical: same
individual: separate
insert: to put or fit (something) into something else
<table>
<thead>
<tr>
<th>Academic Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>interact:</strong> to act on one another</td>
</tr>
<tr>
<td><strong>intermediate:</strong> in the middle or being between</td>
</tr>
<tr>
<td><strong>internal:</strong> of or on the inside</td>
</tr>
<tr>
<td><strong>interpret:</strong> to tell the meaning of; to understand</td>
</tr>
<tr>
<td><strong>involve:</strong> to include; to have as part of itself</td>
</tr>
<tr>
<td><strong>layer:</strong> one thickness of something</td>
</tr>
<tr>
<td><strong>mature:</strong> to become fully developed or ripe</td>
</tr>
<tr>
<td><strong>method:</strong> way of doing something; a process</td>
</tr>
<tr>
<td><strong>migrate:</strong> to move from one place to another place</td>
</tr>
<tr>
<td><strong>model:</strong> a description used to help visualize something that cannot be directly observed</td>
</tr>
<tr>
<td><strong>modify:</strong> to undergo change</td>
</tr>
<tr>
<td><strong>network:</strong> a group of related parts</td>
</tr>
<tr>
<td><strong>obtain:</strong> to get possession of, especially by some effort</td>
</tr>
<tr>
<td><strong>occur:</strong> to take place; to be found</td>
</tr>
<tr>
<td><strong>participate:</strong> to take part; share</td>
</tr>
<tr>
<td><strong>physical:</strong> having to do with the body</td>
</tr>
<tr>
<td><strong>process:</strong> series of steps performed in doing something</td>
</tr>
<tr>
<td><strong>promote:</strong> to contribute to the growth of; to help bring into being</td>
</tr>
<tr>
<td><strong>react:</strong> to act because something has happened; respond</td>
</tr>
<tr>
<td><strong>reject:</strong> to refuse to accept or use</td>
</tr>
<tr>
<td><strong>relax:</strong> to become inactive and lengthen</td>
</tr>
<tr>
<td><strong>release:</strong> to set free; to let go</td>
</tr>
<tr>
<td><strong>remove:</strong> to get rid of</td>
</tr>
<tr>
<td><strong>require:</strong> to be in need of</td>
</tr>
<tr>
<td><strong>resource:</strong> something used for help or support</td>
</tr>
<tr>
<td><strong>respond:</strong> to react in response</td>
</tr>
<tr>
<td><strong>series:</strong> a number of similar things coming one after another</td>
</tr>
<tr>
<td><strong>similar:</strong> almost, but not exactly the same</td>
</tr>
<tr>
<td><strong>soil:</strong> mixture of weathered rock, organic matter, water, and air that supports the growth of plant life</td>
</tr>
<tr>
<td><strong>source:</strong> any person, place, or thing by which something is supplied</td>
</tr>
<tr>
<td><strong>specific:</strong> exact; particular</td>
</tr>
<tr>
<td><strong>stable:</strong> firmly established; not changing or fluctuating</td>
</tr>
<tr>
<td><strong>structure:</strong> arrangement of parts or the way parts are arranged</td>
</tr>
<tr>
<td><strong>survive:</strong> to continue living</td>
</tr>
<tr>
<td><strong>transfer:</strong> to convey or transport from one place to another</td>
</tr>
<tr>
<td><strong>transport:</strong> to carry from one place to another; the act, process, or means of transporting</td>
</tr>
<tr>
<td><strong>visible:</strong> able to be seen</td>
</tr>
<tr>
<td><strong>widespread:</strong> widely scattered or prevalent</td>
</tr>
</tbody>
</table>