To the Teacher

*Reading Essentials* is designed to help students use recognized reading strategies to improve their reading-for-information skills. Science content is presented by sections within each chapter. Each section is divided into *Before You Read*, *Read to Learn*, and *After You Read*.

In *Before You Read*, students organize their thoughts by drawing from prior knowledge or finding clues in the text about the topics that will be covered.

In *Read to Learn*, the text focuses on key science concepts. Key terms are reinforced and redefined several times after the initial introduction. *Read to Learn* contains margin features (Study Coach, Mark the Text, Foldables, Think It Over, Picture This, and Applying Math) that actively involve students in their own learning by helping them understand, organize, and reinforce new information. In-text references and corresponding margin features about each figure appear throughout the chapter, encouraging students to understand the figure and the science behind it. As students read, a reading check [insert symbol] at the end of the paragraph provides a visual clue for answering the *Reading Check* question in the margin.

*After You Read* presents a Mini Glossary featuring the key terms from the section and an activity using the terms. Additional activities help students organize, summarize, and analyze the content in the *Read to Learn* section.

*Reading Essentials* utilizes reading strategies throughout the interactive textbook. These teaching strategies are integrated into each chapter reinforcing students to actively read and help them to organize information in a variety of ways, write about what they are learning, and access previous knowledge they may have about the subject matter. To reinforce reading strategies, the *Before You Read* and margin features initiate students into a “walk through” of each chapter, drawing their attention to the headings and paragraphs. The supporting activities help students practice basic writing skills, find main ideas, review vocabulary terms, and much more. Two reading specialists have reviewed and edited the workbook.

Teaching support for *Reading Essentials* can be found in your *Teacher Wraparound Edition*. *Reading Essentials* content follows the order in which material is presented in the *Student Edition*. Features in the *Teacher Wraparound Edition* that you may find helpful are *Science Content Background* found on the E page and F page, *Lab Demonstrations*, *Inquiry Labs*, *Make a Model*, *Use an Analogy* and *Active Reading* strategies. For many students, *Fast File Chapter Resource* pages are an excellent way to reinforce material presented in *Reading Essentials*. 
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Foldables

Foldables™ are easy-to-make, three-dimensional, interactive graphic organizers that students create out of simple sheets of paper. These unique hands-on tools for studying and reviewing were created exclusively for Glencoe by education specialist Dinah Zike.

Organizing Foldables to Make Chapter Projects

For each chapter, students use 11"×17" paper or 12"×18" art paper to make projects that act as portfolios for collecting student-made Foldables. These cumulative projects act as study guides and are perfect for continuing to immerse students in concepts and vocabulary as they progress through a chapter.

1. Have students write their names, date, period/class, and a main idea or a title on the front of each chapter project. Some students might choose to illustrate the cover using any of the following: original or traced illustrations or graphics, internet printouts, photocopied pictures, original photographs, newspaper articles pertaining to topic studied, or diagrams, tables, or charts.

2. Quarter sheets and half-sheets of notebook paper are used in place of 3"×5" and 4"×7" index cards. These small sheets of paper are inexpensive and perfect for recording terms and definitions, taking class notes and main ideas, outlining key points, making concept maps or webs, sketching diagrams or observations, and writing general information on a science person, place, or thing.

3. Three of the five projects (Bound Book Project, Half-Book Project, and Shutterfold Project) lend themselves to the use of whole sheets of notebook paper or photocopy paper. Single or multiple sheets of paper can be stapled or braided onto these projects. This allows essays and in-depth research projects to be included in chapter study guides. Or, students can glue maps, charts, tables, photocopied activity sheets, internet print-outs, and any other activities using a whole sheet of paper onto these projects.

4. The Accordion Project lends itself to vertical Foldables such as those with two, three, four, or more tabs. Two quarter sheets of notebook paper also fit on each of the four sections of this project.

   HINT: If you would like to place a whole sheet of paper into this project, fold it in half or into fourths and then glue the folded paper onto one of the four sections.

5. Pocket Projects are perfect for organizing and storing student work. Fold whole sheets of paper and student-made Foldables so they will fit into the two or three pockets of the chapter project. These act as portfolios for student work and notes.

6. Students can use the ideas presented in these chapters to design their own student aids and project formats. It is much easier to store and display a Foldables project than a poster board project.
Teaching Tips for Foldables

Do not ask middle school and high school students to carry glue and scissors from class to class. Instead, set up a small table or rolling cart in the back of the classroom and provide a few containers of glue, several pairs of scissors, containers of colored pencils, a stapler, and anything else the students might need.

Turn one-gallon freezer bags into student portfolios. Students can carry their portfolios in their notebooks if they place strips of two-inch clear tape along one side and punch three holes through the taped edge. Cut bottom corners off the bag so it won’t hold air and will stack and store easily.

For additional information on Dinah Zike publications (Dinah Zike’s Teaching Science with Foldables) or workshops call 1-800-99DINAH or contact www.dinah.com.

Research shows (Bransford, 1979; Corno, 1994), study strategies help students understand, organize, remember and apply new information presented in science textbooks. Some study strategies include concept mapping, highlighting, outlining, note taking, summarizing, and underlining (Peverly, Probst, Graham & Shaw, 2003).

Question

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Chapter 1 The Nature of Science

Dinah Zike’s Foldable™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in The Nature of Science, have them combine their section Foldables into the following chapter project. Have students make a half book project from 12 × 18 or 11 × 17 paper. Have them tape or glue their Foldables as shown.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 1)

Students should list some topics covered in Earth science such as weather, earthquakes, rocks, soil, and space.

Read to Learn

1. Earthquakes would most likely occur along the Cascadia subduction zone. (p. 2)

2. other earthquakes could occur in the northwest region of the United States (p. 2)

3. identify a problem, gather information, and form a hypothesis (p. 3)

4. Science is way of looking at the world in order to gain more knowledge. (p. 3)

5. The dependent variable is how clean the dishes are. (p. 4)

6. to be more confident about the results (p. 5)

7. Examples might include robotic parts, radar, and sonar. (p. 5)

After You Read (p. 6)

1. From the Mini Glossary, students should write a sentence that uses two of the following terms: constant, control, dependent variable, hypothesis, independent variable, variable.

2. On the flowchart, students should link the following: “Identify a problem” to questioning which dishwashing soap does the better job; “Gather information” to finding the different products to test; “Make hypotheses” to guessing which product will be best, or that all products will perform equally; “Test the hypotheses” to using independent variable, constants, dependent variable, and control; “Analyze the results” to recording and thinking about the data; and “Draw conclusions” to deciding which dishwashing soap is best.

3. Answers will vary, but students may respond that summarizing the main ideas helped them follow the flow of information in the section.

Section 2

Before You Read (p. 7)

Students should identify a question and describe steps to find the answer.

Read to Learn

1. the study of the weather (p. 8)
2. humidity (p. 8)
3. satellites, weather balloons, and radar (p. 9)
4. to be confident that the theory is correct (p. 9)
5. Scientists tested Dr. Whipple’s hypothesis by observing, collecting data, reading other scientists’ data, and seeing that the data supported the hypothesis. (p. 10)
6. a system of understanding what is good and what is bad (p. 10)
7. It makes the data easier to understand, analyze, or share. (p. 11)
8. Fraud can hurt science because it can lead to false results. It can also mislead other scientists and the public. This could be dangerous, especially if the results relate to things like health or the environment. (p. 11)

After You Read (p. 12)
1. From the Mini Glossary, students should select a term and explain it.
2. | Science Can Answer | Science Cannot Answer |
   | A               | B               |
   | D               | C               |
3. Science does not have the answer for every question because science is limited to answering questions that can be explained by scientific methods.

Chapter 2 Matter

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Matter, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 X 17 piece of paper to make a shutterfold project. Tape or glue each section’s Foldable as shown. Foldable C can be attached to the back of the chapter project.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 13)

Answers will vary. Students may describe the different materials of an object, or that the material is made of molecules or atoms.

Read to Learn

1. Students should explain that it shows that the same atoms can be joined in different ways to give matter different properties. (p. 14)
2. Answers will vary, but may include coins, jewelry, cookware, or decorative items. (p. 14)
3. a model (p. 15)
4. Students should circle protons and neutrons. Students should place X near the electrons (p. 15)
ANSWER KEY

5. true (p. 16)
6. eight (p. 16)

After You Read (p. 17)
1. Sentences will vary, such as, “An atom has a nucleus made of protons and neutrons. Electrons swarm around the nucleus in a cloud.”

2.

After You Read (p. 22)
1. No, in some mixtures the substances are not spread out evenly.

2.

Section 2

Before You Read (p. 18)
Chlorine changes its properties when it combines with another element.

Read to Learn
1. Students mark the elements correctly (p. 19)
2. two (p. 19)
3. three; ten (p. 20)
4. It is positively charged. (p. 20)
5. metallic bond (p. 21)
6. The sides with the hydrogen atoms should have minus signs. The rounded sides should have plus signs. (p. 21)

Section 3

Before You Read (p. 23)
solid, liquid, gas

Read to Learn
1. solid, liquid, gas, and plasma (p. 24)
2. solid (p. 24)
3. The molecules move more freely. (p. 25)
4. They were carved by flowing water. (p. 25)

After You Read (p. 26)
1. Water has a greater density than ice, this causes ice to float in water.
2. Students’ answers will vary. They should show knowledge of key terms and ideas.

### Chapter 3 Minerals

**Dinah Zike’s Foldables™ Teaching Strategies**

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables*.

To help students reinforce the concepts presented in this chapter, have them place their section Foldables into the following Foldables chapter project.

Have students fold an 11 × 17 piece of paper into a three-fold pocket project. Students can place the Foldable from Section 1 in the first pocket labeled *Minerals*. Place the layered book Foldable from Section 2 in the middle pocket labeled *Mineral Identification*. Place the quarter sheet notes from Section 3 in the 3rd pocket labeled *Uses of Minerals*.

<table>
<thead>
<tr>
<th>STATE</th>
<th>DESCRIPTION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>Particles are packed tightly and don’t change positions.</td>
<td>Rock, ice, metal</td>
</tr>
<tr>
<td>Liquid</td>
<td>Particles have more energy than solid particles. Particles move around and change positions. Particles fit the <em>shape</em> of a container.</td>
<td>Water, milk</td>
</tr>
<tr>
<td>Gas</td>
<td>Particles have more energy than liquid particles. Particles move freely and spread out to fill a container.</td>
<td>Air</td>
</tr>
<tr>
<td>Plasma</td>
<td>Associated with high temperatures Composed of ions and electrons that escape the electron cloud.</td>
<td>Sun, lightning bolt</td>
</tr>
</tbody>
</table>

**Optional Foldable**

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

### Section 1

#### Before You Read (p. 27)

Students may include descriptive words such as shiny, many flat sides, transparent, or hard.

#### Read to Learn

1. The dots in student’s boxes should be in a regular pattern, similar to the one below. (p. 28)

![Dots Pattern](image)

2. orderly pattern that repeats over and over (p. 28)

3. clear quartz on left formed in an *open space*; rose quartz on right formed in a *tight space*. (p. 29)

4. Magma is melted rock inside Earth. (p. 29)

5. Minerals dissolve in water to make a solution. When the water evaporates, crystals form. Crystals also may form when a solution contains too much of a mineral. (p. 29)

6. 25.7 percent of Earth’s crust is made up of other elements. (p. 30)
ANSWER KEY

7. oxygen and silicon (p. 30)

After You Read (p. 31)
1. Students should indicate that minerals are crystals because their atoms are arranged in an orderly, repeating pattern.

2. Student responses will vary as to whether or not this strategy was helpful.

Section 2

Before You Read (p. 32)
Students may include the idea that the gold ring is shiny, bright, a circular shape, and very valuable; while rock salt is dull-looking, with a more regular (cubic) shape, and is not as valuable.

Read to Learn
1. hardness of minerals (p. 33)
2. Answer should include three of the following: talc, gypsum, calcite, fluorite, or apatite. (p. 33)
3. It shines like a bright piece of metal. (p. 34)
4. water (p. 34)
5. It has smooth, flat layers. (p. 35)
6. circle quartz broken into jagged pieces (p. 35)

After You Read (p. 36)
1. Student responses should indicate that glass shatters into pieces of different sizes and shapes. It does not have cleavage; it fractures.

2. 1. galena; 2. hematite; 3. silver
3. Student responses will vary as to the strategy they use to remember vocabulary words.

Section 3

Before You Learn (p. 37)
Student responses will vary, but may describe the stone as shiny, colorful, and light-catching.

Read to Learn
1. hardness (p. 38)
2. hematite (p. 38)
3. Students should draw another item made from aluminum such as a bicycle. (p. 38)
4. in open spaces in natural fractures or cracks, faults, surfaces between rock layers (p. 39)
5. Student answers may include that a titanium racket is lighter or less likely to break than a wood racket. (p. 39)

After You Read (p. 40)
1. Student responses may vary, but should suggest that precious gems are rare and beautiful and are cut to show them off in jewelry.

2.

3. Student responses will vary, but may include the idea that discussing the text with the partner helped the student get new ideas and understand how gems and ores are used in everyday life.
Chapter 4 Rocks

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables*.

To help students reinforce the concepts presented in Rocks, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 or 12 × 18 piece of paper or cardstock to create a chapter project. Tape or glue each section’s Foldable as shown. Title the project *Rocks*.

**Optional Foldable**

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

### Section 1

**Before You Read (p. 41)**

Students may include descriptive words such as shiny, rough, pointed, round, smooth, and hard.

**Read to Learn**

1. Student marking of the figure should follow the model of the rock cycle in Figure 2 of the student text. (p. 42)

2. Mineral material in rock is conserved as rocks change. (p. 42)

**After You Read (p. 43)**

1. Students should indicate that rocks in the rock cycle change form as they’re acted on by weathering, heat, pressure, and cooling.

2. **Weathering**

   erodes rock.

   

   Sediment settles and compacts forming

   sedimentary rock

   Heat and pressure turn it into

   metamorphic rock

   which is then eroded by

3. Student responses will vary depending on whether or not they found underlining a helpful strategy for learning about rocks.

### Section 2

**Before You Read (p. 44)**

Student may describe the red color, the heat, the fire, the smoke, or other feature of an erupting volcano.

**Read to Learn**

1. inside Earth’s surface (p. 45)

2. Students should write *intrusive rock* somewhere under the surface by the magma and *extrusive rock* by the lava flow. (p. 45)

3. outside Earth’s surface (p. 45)

4. Student answers will vary but may include the idea that magma is hot and fiery and igneous rocks are formed from this material. (p. 46)
5. Basaltic rocks are dense and dark-colored; granitic rocks are less dense and light-colored. (p. 46)

After You Read (p. 47)
1. Student sentences should state that igneous rocks come from magma beneath Earth’s surface or from lava above it.

2. Rocks are changed into metamorphic rocks by pressure, heat, and hot fluids.

2. Rocks are changed into metamorphic rocks by

- pressure
- heat
- hot fluids

<table>
<thead>
<tr>
<th>metamorphic rocks</th>
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<tbody>
<tr>
<td>by</td>
</tr>
<tr>
<td>with layered mineral grains have a foliated texture</td>
</tr>
<tr>
<td>with nonlayered mineral grains have a nonfoliated texture</td>
</tr>
</tbody>
</table>

3. Student responses will vary depending on whether or not they thought writing sentences was a helpful strategy for learning the information in this section.

Section 3

Before You Read (p. 48)
Student responses should indicate that the sandwich was crushed or flattened by the weight of the object on top of it.

Read to Learn
1. Students should highlight the rocks surrounding the magma and the cracks in these rocks that liquid can flow through. (p. 49)
2. heat, pressure, and hot fluids (p. 49)
3. Foliated rock has mineral grains in parallel layers. (p. 50)
4. nonfoliated (p. 50)

After You Read (p. 51)
1. Students should describe the difference in arrangement of mineral grains in foliated and nonfoliated rock.

Section 4

Before You Read (p. 52)
Student responses should indicate that the slices of bread are stuck together into a kind of solid stack.

Read to Learn
1. detrital, chemical, and organic (p. 53)
2. Students should color the spaces in each picture, realizing that these spaces become smaller as the sediments are compacted. (p. 53)
3. Students should trace areas between sediments where cementation is taking place. (p. 54)
4. water (p. 54)
5. conglomerate rocks (p. 54)
6. dissolved minerals (p. 55)
7. the remains of living things (p. 55)
After You Read (p. 56)

1. Student sentences should describe how the processes of cementation and compaction form sedimentary rocks.

2.  

3. Student responses will vary.

Chapter 5 Earth’s Energy and Mineral Resources

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Earth’s Energy and Mineral Resources, have them combine their section Foldables into the following Foldables chapter project.

Use two 11 × 17 pieces of paper as the base. Tape or glue each Foldable to a page in the project. Title the front of the project Earth’s Energy and Mineral Resources.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activity page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 57)

Students may mention such fuels as coal, gasoline, oil, and natural gas. Other answers are possible.

Read to Learn

1. Students should mark where they live and state whether or not coal is found in the area. (p. 58)
2. heat and pressure (p. 58)
3. It has the highest amount of carbon. (p. 59)
4. \[22.7\% + 39.4\% + 23.6\% = 85.7\%; \quad 100\% - 85.7\% = 14.3\%\] (p. 59)
5. in tilted or folded layers of rock (p. 60)
6. drift mines, slope mines (p. 60)
7. The difference is in profit. Both a resource and a reserve have available fossil fuels. A resource can become a reserve if the fossil fuel can be removed at a profit. (p. 61)
8. nuclear energy (p. 61)
9. Students should circle the two kinds of rods: fuel rods and control rods. (p. 62)
10. Students should include one: It is nonrenewable, and it produces radioactive waste. (p. 62)

After You Read (p. 63)

1. A resource is a deposit that contains enough of a fuel to be worth taking out of the ground. A reserve is a deposit that contains enough of a fuel to be taken out at a profit. A resource can become a reserve if removing the fuel becomes profitable.
2. Suggested answers are given in the table. Others are possible.

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<tr>
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</thead>
<tbody>
<tr>
<td>Coal</td>
<td>yes/no</td>
<td>yes/no</td>
<td>250 years</td>
<td>Heating, industry, electric power</td>
</tr>
<tr>
<td>Oil</td>
<td>yes/no</td>
<td>yes/no</td>
<td>100 years</td>
<td>Heating, travel, industry, electric power</td>
</tr>
<tr>
<td>Natural gas</td>
<td>yes/no</td>
<td>yes/no</td>
<td>60 years</td>
<td>Heating, industry, electric power</td>
</tr>
</tbody>
</table>

3. The answers will vary depending on whether or not they found it helpful to highlight the key terms and their meanings.

### Section 2

**Before You Read (p. 64)**
The answers will vary from student to student. If students cannot get the rest they need, they become exhausted. Point out that when certain resources are exhausted, the activities that require those resources must stop. If the resources are renewed, the activities can resume. Other answers are possible.

**Read to Learn**
1. to produce electricity (p. 65)
2. Students should draw arrows from the top of the dam, through the plant, to the discharge pipe. (p. 65)
3. hot rocks or magma (p. 66)
4. 7 km; 7,000 meters (p. 66)
5. It can be replaced by nature or by people within a person’s normal lifetime. (p. 67)
6. air pollution (p. 67)

### Section 3

**Before You Read (p. 69)**
Some students participate in recycling and others don’t. Things that can be recycled include soft drink cans, paper, batteries, glass, plastics, and metals.

**Read to Learn**
1. waste rock removed during concentrating (p. 70)
2. industrial minerals; building minerals (p. 70)
3. Students mention ore: reduces need for new mineral resources; costs less (p. 71)
4. copper (p. 71)
After You Read (p. 72)

1. A mineral resource is a deposit of useful minerals. An ore is a mineral that exists in large enough amounts to be mined at a profit. It might not be profitable to mine the minerals in a mineral resource.

2. The following are suggested answers. Others are possible.

3. Student answers will vary depending on whether or not the flash cards helped them learn vocabulary terms and unknown words and whether or not they would use this strategy again.

Chapter 6 Views of Earth

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Views of Earth, have them place their section Foldables into a Shutterfold Project made from 11 × 17 or 12 × 18 paper. Tape or glue each Foldable as shown. Foldable C can be attached to the back of the project. Title the project Views of Earth.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 73)

Student responses will vary, but should describe visual details about the appearance of a landform, such as flat, hilly, steep, rocky.

Read to Learn

1. range, basin, plateau, mountains, uplands, lowlands, plains (p. 74)

2. They are high above sea level. (p. 74)

3. The four kinds of mountains are: fault-block, folded, upwarped, and volcanic. (p. 75)

4. wavy (p. 75)

5. the vertical movements that cause faults to form (p. 76)

6. Upwarped mountains are block shaped and peaked. (p. 76)

After You Read (p. 77)

1. Student responses will vary depending on which two mountains they discuss and should reflect an understanding of the differences.
3. Student responses will vary but may include the idea that taking notes on the main ideas and details helped them learn about and remember information on the various landforms discussed in the section.

Section 2

Before You Read (p. 78)

Student answers will show that their heads are north, as the north pole is, and their feet are south, like the south pole.

Read to Learn

1. Students should trace the equator in red. (p. 79)
2. the prime meridian (p. 79)
3. Answers will vary but should include a difference based on these facts: Longitude lines run north and south and refer to the distance in degrees east and west of the prime meridian. Latitude lines run east and west parallel to the equator and measure the distance in degrees north or south of the equator. (p. 79)
4. 24 time zones (p. 80)
5. 180° (p. 80)

After You Read (p. 81)

1. Answers will vary. Possible answers include: The equator is the imaginary line that wraps around Earth at 0° latitude, halfway between the north and south poles. The prime meridian is the imaginary line that represents 0° longitude and runs from the north pole through Greenwich, England, to the south pole.

Section 3

Before You Read (p. 82)

Student responses should indicate they need to know the address or location before they set out to find a place.

Read to Learn

1. Students should trace around Greenland and South America. Greenland looks larger because longitude lines are projected parallel to each other. (p. 83)
2. because the lines of longitude curve as on a globe (p. 83)
3. like a cone (p. 84)
4. an experienced hiker (p. 84)
5. map scale (p. 85)
6. length, width, and depth (p. 85)
After You Read (p. 86)

1. Student responses may vary, but should include something like this: Map legends are useful because they explain the meaning of symbols used on a map. Map scales are useful because they show the relationship between distances on a map and distances on Earth’s surface.

2. Map Projections

- **Robinson projection**
  - shows correct shapes of continents
  - shows correct areas of continents
  - shows lines of longitude curving as they are on a globe

- **Mercator projection**
  - shows correct shapes of continents
  - shows distorted areas of continents
  - projects lines of longitude parallel

- **Conic projection**
  - made by projecting points and lines from a globe onto a cone
  - used for smaller areas
  - road maps and weather maps

3. topographic

Chapter 7 Weathering and Soil

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables*.

To help students reinforce the concepts presented in Weathering and Soil, have them combine their section Foldables into the following Foldables chapter project.

Fold an 11 × 17 or 12 × 18 piece of paper into a shutterfold. Tape or glue each section’s Foldables as shown. Title the project *Weathering and Soil*.

Optional Foldable

You may want to have students make up the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 87)

Student responses will vary but may state that wind, water, people, wild animals, or erosion carried the soil down the mountain.

Read to Learn

1. Small rocks and sediment are loosened and moved. (p. 88)

2. Students should highlight the cracks between the rocks. (p. 88)

3. both change the size and shape of rocks (p. 89)

4. carbonic acid (p. 89)

5. They give off acids that help dissolve minerals in rock. (p. 90)

6. Low temperatures slow chemical weathering. (p. 90)

After You Read (p. 91)

1. Student sentences will vary, but should include the explanation of how ice wedging, the frequent freezing and thawing of water in rock cracks, causes weathering of rocks.

2. 

3. Student responses will vary.
ANSWER KEY

Section 2

Before You Read (p. 92)
Student answers will vary, depending on where they live and what the soil is like.

Read to Learn
1. large plants, thick grass, many small animals and other organisms (p. 93)
2. Possible answers may include: becomes humus and enriches the soil; traps water and keeps soil moist; prevents erosion (p. 94)
3. Students should trace over arrows. Water seeping into the soil begins the process of leaching. (p. 94)
4. Glaciers deposited thick layers of sediment. (p. 95)
5. A (p. 95)
6. Possible answers may include: Rock type affects type of plants that grow, which in turn affects the type of soil that forms; when rock weathers, the soil that forms is similar to the type of rock. (p. 96)
7. Students should label the darker A horizon, which is thickest at the bottom of the hill. (p. 96)

After You Read (p. 97)
1. Student sentences should explain that the A horizon is richer than other horizons because it contains the most humus.
2. Students should fill in the five circles with air, water, weathered rock, decayed organic matter, and minerals.

Section 3

Before You Read (p. 98)
Student responses will vary but may state that the heavy rain might wash the soil and the seeds away.

Read to Learn
1. decaying plants add nutrients to the soil as plant roots take nutrients from the soil (p. 99)
2. Rain forest land only has nutrients in the top few centimeters. (p. 99)
3. Sediment fills the stream channel. (p. 100)
4. The plants left in the field may be food or shelter for wildlife during the winter. (p. 100)
5. Students trace rows that follow the contour. (p. 101)
6. Possible answers may include: Spray water on construction site; plant vegetation; replace soil after strip mining (p. 101)

After You Read (p. 102)
1. Students sentences will vary but should state that no-till farming helps to prevent erosion by keeping a cover of plant material on the field.
Chapter 8 Erosional Forces

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Erosional Forces, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of construction paper or cardstock as the base. Tape or glue each section’s Foldable as shown. Title the front of the project Erosional Forces.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 103)

Students may list household items such as clothing, appliances, toys, furniture. The causes for things wearing out include heavy use, overuse, abuse, and accidents. Some students may mention friction as a cause of wearing out. Friction is also connected to erosion.

Read to Learn

1. sediment (p. 104)
2. Name any two mass movements: slump, creep, rockfall, rock slide, mudflow (p. 104)
3. gravity (p. 104)
4. creep (p. 105)
5. Label left side of figure steep rock layers and right side of figure rock slide. (p. 105)
6. on steep slopes (p. 106)
7. by growing plants and building walls. (p. 106)

After You Read (p. 107)

1. Erosion and deposition are alike because they both change the features of the land. Erosion and deposition are different because erosion wears down the land and deposition builds up the land.
ANSWER KEY

2. Labels should be similar to the following ones.

After You Read (p. 113)

1. Student answers will vary. One possible answer: Glaciers move over the land plucking loose sediment. When glaciers retreat, they deposit this mix of sediment or till.

2. Answers should be similar to the following ones.
   A. Glaciers erode rock
      1. By plucking
      2. By transporting
      3. By scouring
   B. Glaciers deposit rocks and soil
      1. As till
      2. As outwash
   C. There are two kinds of glaciers
      1. Continental glaciers
      2. Valley glaciers
   D. Glaciers are important because they:
      1. Change Earth’s surface
      2. Deposit valuable sediments

3. Student answers will vary about whether or not strategy was helpful.

Section 3

Before You Read (p. 114)

Students may mention that the dust or sand stung and felt unpleasant. Windblown dust or sand can scrape the eyes and skin. Windblown dust or sand can also scrape the features of the land.

Read to Learn

1. No plants hold the soil in place. (p. 115)
2. silt and clay (p. 115)
3. by planting windbreaks (p. 116)
4. Strong wind can carry small particles great distances. (p. 116)
5. Arrow should point in the same direction as the dune migration arrow. (p. 117)
6. barchan (curved), transverse, star (p. 117)

Section 2

Before You Read (p. 108)

Students may mention such things as ice, snow, mountains, ice ages, icebergs, ice caps, and Earth’s polar regions. They may describe a glacier as snowy, icy, slow-moving, large, cold, and rugged.

Read to Learn

1. Student answers may include an idea similar to one of these: The glacier moves over rocks that are not plucked; The glacier might grind them into smaller rock. (p. 109)
2. grooves and striations (p. 109)
3. ridge of soil and rocks (p. 110)
4. Students should put an X in the diagram by the tunnel and meltwater stream to show where eskers will eventually form. (p. 110)
5. Ten percent of 150,000,000 km² is 15,000,000 km². (p. 111)
6. Answers may be yes, no, or partially. (p. 111)
7. grooves and plucking (p. 112)
8. The valleys are U-shaped, not V-shaped. (p. 112)
After You Read (p. 118)

1. Deflation is the carrying away of soil by the wind. Abrasion is the wearing down of features of the land by the wind.

2. B windbreak
   C dust storms
   A moving dune

3. Answers will depend on the method each student found most useful. Creating a quiz required the most effort and interaction with the text. Highlighting and underlining required less effort initially and may have been less helpful.

Chapter 9 Water Erosion and Deposition

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Water Erosion and Deposition, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 or 12 × 18 inch piece of paper to make a pocket project. Place each Foldable in the pocket. Title the front of the project Water Erosion and Deposition.

Optional Foldable

You may want to have students make up the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 119)

Students’ answers will vary but may include descriptions of large, wide, calm rivers or perhaps faster moving streams with rapids.

Read to Learn

1. runoff (p. 119)
2. amount of rain, length of time rain falls, slope of land, vegetation, gravity (p. 120)
3. sheet erosion (p. 121)
4. Students should write bed load in the space provided. (p. 121)
5. runoff, small streams, larger streams, rivers (p. 122)
6. mountains (p. 122)
7. Answers may vary but may include that mature streams have curves or meanders whereas old streams are straight and wide. (p. 123)
8. Dams are built across rivers. Levees are built along rivers. (p. 124)
10. sediment is dropped to the bottom of the stream (p. 125)
11. like a triangle or fan (p. 125)

After You Read (p. 126)

1. When runoff flows down the same path over and over it wears grooves, or channels, in the soil.
ANSWER KEY

2. Students may use the table provided or their own. The following answers are suggestions.

<table>
<thead>
<tr>
<th>Type of Erosion</th>
<th>Location</th>
<th>Cause</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rill</td>
<td>On a slope</td>
<td>Rainfall or snowmelt</td>
<td>Shallow grooves on the slope; mild loss of soil</td>
</tr>
<tr>
<td>Gully</td>
<td>On an eroded slope</td>
<td>Heavy rainfall</td>
<td>Deep channels are cut and great loss of soil</td>
</tr>
<tr>
<td>Sheet</td>
<td>On flat land</td>
<td>Sudden heavy rainfall</td>
<td>Land is covered by a thin layer of water for a short time; mild loss of soil</td>
</tr>
<tr>
<td>Stream</td>
<td>In stream channels and along the banks</td>
<td>Normal water flow in the channel</td>
<td>Stream bed may be deepened; banks may be eroded</td>
</tr>
</tbody>
</table>

After You Read (p. 132)

1. Groundwater moves freely through aquifers which are layers of permeable rock.

2. [Diagram of caves and rock formations]

3. Answers may vary depending on whether or not students found it helpful to highlight words and their definitions.

Section 3

Before You Read (p. 133)

Students may describe the shore, beach, water, or a combination of them all. The shore may have been calm, stormy, rugged, or smooth.

Read to Learn

1. in pores and empty spaces (p. 127)
2. permeable (p. 128)
3. (1) permeable layer (2) impermeable layer (p. 128)
4. If the water table drops, the well won’t go dry. (p. 129)
5. The aquifer slopes and puts pressure on the water in the well. (p. 129)
6. spring (p. 130)
7. Students should trace the path of water and steam up through geyser. Water has to boil before it can turn to steam. (p. 130)
8. carbon dioxide (p. 131)
9. stalactites and stalagmites (p. 131)

After You Read (p. 136)

1. A longshore current runs along the shore. A tide runs toward or away from the beach. Both carry sediments. Both can deposit sediments. Both reshape the shoreline.
2. Answer Key

3. Answers will vary depending on whether or not the students would use this strategy again and why or why not.

Chapter 10 Plate Tectonics

Dinah Zike’s Foldables Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Plate Tectonics, have them place their section Foldables into the following Foldables bound book project.

Use two sheets of 11 × 17 or 12 × 18 paper. Tape or glue each Foldable to a page in the book. Title the project Plate Tectonics.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 137)
Student answers will vary. Some may answer that the pieces of orange peel won’t fit back together because they’re too damaged or in too many pieces. Others may think that the pieces will fit back together like a puzzle.

Read to Learn
1. Students will trace over the boundaries separating the continents. (p. 138)
2. Wegener didn’t provide enough evidence. (p. 138)
3. Students will draw leaves on the continents named. (p. 139)
4. glacial deposits and scarring (p. 139)
5. Similar rock structures are found on different continents. (p. 140)
6. Student should label North America on the drawings of the drifting continents. (p. 140)

After You Read (p. 141)
1. Student responses should demonstrate that they understand the hypothesis of continental drift by explaining that originally all continents were joined in one large landmass named Pangaea which broke apart and the individual pieces, or continents, drifted to their present locations.
2. First

<table>
<thead>
<tr>
<th>Pangaea broke apart.</th>
</tr>
</thead>
</table>

Second

<table>
<thead>
<tr>
<th>Continents began to drift.</th>
</tr>
</thead>
</table>

Third

| Climates on continents changed. |
3. Answers will vary but should include one of these:
   • Animal fossils found on different continents suggest the continents were once connected.
   • Plant fossils that grow in warm climates have been found in cold areas far away. Continents were once connected and had warm climates.
   • Glacial deposits are found in warm climates. Ice-covered landmass broke apart and part (continent) drifted into a warmer area.
   • Rocks have been found with similar structure on two different continents. Continents must have once been connected and then drifted apart.

3. Student answers will vary as how marking the text with sticky notes for later discussion helped them understand seafloor spreading.

Section 2

Before You Read (p. 142)
Student answers will vary on whether they’ve ever looked at tree rings. Rings closest to the center are oldest because the tree grows outward.

Read to Learn
1. Students should circle the system of mid-ocean ridges and trace over the arrows. (p. 143)
2. Older rocks are located farther away. (p. 143)
3. north to south (p. 144)
4. Iron in rocks are magnetized in the same direction as the magnetic field. The direction changes when there is a reversal. (p. 144)

After You Read (p. 145)
1. Student answers should demonstrate that they understand that magma or melted rock that pushes up to the surface at mid-ocean ridges comes from under Earth’s crust.
2. Effect: New seafloor is created.

Section 3

Before You Read (p. 146)
Student answers will vary as to whether they have been swimming and have felt that the water has colder and warmer areas. Their explanations for this will vary but may include that deeper water feels colder and shallower water feels warmer.

Read to Learn
1. Students should circle opposite arrows. (p. 147)
2. divergent boundaries (p. 147)
3. getting larger because of volcanic activity (p. 148)
4. They crash and fold into mountain ranges. (p. 149)
5. Students should highlight arrows showing plates moving in the same direction. (p. 149)
6. convection current (p. 150)
7. Students should label uppermost arrow cooling, followed by sinking, heating, and rising. (p. 150)
8. Students should circle the two arrows showing tension forces at the top of the figure and should color arrows blue that show fault movement. (p. 151)
9. Students should circle arrows showing compression forces on top of the figure. (p. 152)
10. volcanoes and mountains (p. 152)
11. indirect evidence (p. 153)
12. Students should respond that the laser is reflected from the satellite to Earth. (p. 153)
After You Read (p. 154)

1. Student answers should demonstrate they understand that the rigid lithosphere moves and floats on the plasticlike layer called the asthenosphere.

2. divergent boundaries, convergent boundaries, transform boundaries

3. Student answers will vary but should include one of these possibilities. Normal faults are caused by tension forces that pull in opposite directions. Fault block mountains can form. Reverse faults are caused by squeezing or compression forces. Mountains can form. Strike-slip faults occur when two plates slide past each other. Earthquakes can result.

Chapter 11 Earthquakes

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldable suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Earthquakes, have them combine their section Foldables into the following Foldable chapter project.

Use an 11 × 17 or 12 × 18 piece of construction paper as the accordion base. Tape or glue each section’s Foldable as shown. Tape or glue Foldable E to the back of the project. Title the project Earthquakes.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 155)

Student responses will vary, but may state that the rubber band broke because it had reached the limit of its ability to stretch.

Read to Learn

1. tension, compression, and shear (p. 156)

2. Students should trace over the direction of motion arrows. (p. 156)

3. In a reverse fault, forces push the rocks toward each other; in a strike-slip fault, forces slide the rocks past each other. (p. 157)

After You Read (p. 158)

1. Student sentences will vary, but should describe how Earth forces act on rock to form the faults explained in this section.

2. Types of Faults

| strike slip caused by shear forces | normal caused by tension forces | reverse caused by forces of compression |

3. Student responses will vary depending on whether or not summarizing the main idea was a helpful strategy.

Section 2

Before You Read (p. 159)

Student responses will vary, but may state that the whole rope becomes wavy or moves in curves all along its length.
ANSWER KEY

Read to Learn
1. primary, secondary, surface (p. 160)
2. Answers will vary, but may include that surface waves cause intense shaking on the surface of Earth which causes buildings to collapse. (p. 160)
3. primary waves (p. 161)
4. to measure horizontal and vertical movements inside Earth (p. 161)
5. The difference in the times they arrive is used to determine the distance between the seismograph and the epicenter. (p. 162)
6. Students should mark the intersection of the three circles. (p. 162)
7. Students should mark the lithosphere—the crust and upper region of the mantle. (p. 163)
8. the inner core (p. 164)
9. density of the different layers (p. 164)

After You Read (p. 165)
1. Student sentences will vary, but one possibility: Primary, secondary, and surface waves are all seismic waves that are produced by an earthquake. They cause rocks to move in different ways and they travel at different speeds.
2. 

Section 3

Before You Read (p. 166)
Student responses may describe collapsed buildings, rubble, or other earthquake damage.

Read to Learn
1. scientists who study earthquakes and seismic waves (p. 166)
2. Students should circle the tall (long) irregular lines on the seismogram. (p. 167)
3. Richter scale (p. 167)
4. about 3.0 (p. 168)
5. tsunamis (p. 169)
6. Loose soil may be affected by liquefaction, and the house may collapse. (p. 169)

After You Read (p. 170)
1. Student sentences will vary, but should describe how an undersea earthquake generates a tsunami.
2. Seismologists use two scales to measure earthquakes

<table>
<thead>
<tr>
<th>Mercalli scale</th>
<th>Richter scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• measures intensity</td>
<td>• measures magnitude</td>
</tr>
<tr>
<td>• scale of I to XII</td>
<td>• scale of 1.0 to about 9.5</td>
</tr>
</tbody>
</table>
3. Student responses will vary depending on whether or not underlining was a helpful strategy.

Chapter 12 Volcanoes

Dinah Zike’s Foldables Teaching Strategies
Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.
To help students reinforce the concepts presented in Volcanoes, have them place their section Foldables into the following Foldables chapter project.

Use two sheets of 11 × 17 or 12 × 18 paper. Tape or glue each section’s Foldable as shown. Title the project Volcanoes.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 171)

Student answers will vary. They might describe the heat from the flame melting the wax, and the wax rolling down the sides of the candle. They may describe the wax cooling after the candle is blown out. Repeated lightings may cause layers of wax to form at the candle’s base.

Read to Learn

1. Student answers will vary but should include two of these effects of volcanic eruptions: cities and towns are buried; property is damaged; people may be killed; vegetation is destroyed; animals that feed on vegetation die or move; acid rain falls; acid rain kills fish in lakes and streams. (p. 172)

2. heat and pressure (p. 172)

3. Students should draw arrows along the path traveled by magma through the volcano. (p. 173)

4. Students should highlight plate boundaries. Then they should indicate that they understand hot spots do not always occur in plate boundary areas. They can occur in the middle of a plate. (p. 174)

5. Students should circle the plate going under the other plate. (p. 175)

6. a hot spot (p. 175)

After You Read (p. 176)

1. Student responses should demonstrate that they understand the concept that in volcanoes, magma, ash, dust and pyroclastic flows can blow through the vent and crater and out onto Earth’s surface.

2. (1) Heat and pressure deep inside Earth cause rock to melt.
   (2) Magma slowly rises to Earth’s surface.
   (3) Magma erupts through a vent.
   (4) Lava hardens to rock.

Section 2

Before You Read (p. 177)

Student answers may vary. They should answer that the full balloon was louder. Or they could answer that the partially deflated balloon was less explosive because there was less pressure; the plastic was more flexible.

Read to Learn

1. how much water vapor and other gases are trapped in magma; how much silica is in the magma (p. 177)
2. Water vapor sometimes gets trapped when an oceanic plate sinks under other plate material. (p. 178)
3. low (p. 178)
4. thick magma traps gas, causing pressure to build (p. 178)
5. basaltic magma (p. 179)
6. Students should draw the path of the lava indicating that it flows and spreads in flat layers. (p. 179)
7. basaltic lava (p. 180)
8. Students should draw lava erupting violently from a cinder cone. (p. 180)
9. Two kinds of layers in composite volcanoes are tephra and lava. (p. 181)
10. Krakatoa is a composite volcano with a high eruption force. (p. 181)

After You Read (p. 182)
1. Student answers should demonstrate that they understand that tephra erupts from violent volcanoes. Cinder cone volcanoes are explosive. Composite volcanoes can alternate between quiet and explosive eruptions.
2. There will be a violent eruption.
3. Student answers will vary as to whether the study strategy of taking two-column notes helped them learn the concepts in the section.

Chapter 13 Clues to Earth’s Past

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Clues to Earth’s Past, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 inch piece of paper as the base. Tape or glue each section’s Foldable as shown. Title the project Clues to Earth’s Past.
Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 187)

Pieces of Earth’s history include geologic features such as mountains, valleys, rivers, deltas, plains, layers of rock, and fossils. Other answers are possible.

Read to Learn

1. Student answers should include one of the following: hard parts are not usually eaten; hard parts are slower to decay. (p. 188)
2. groundwater (p. 188)
3. a cavity, or hole, in a rock (p. 189)
4. The substance of the shell has been replaced by a mineral to form the cast. (p. 189)
5. burrows, trails, footprints, or tracks (p. 190)
6. remains of fossils that lived for a short time, were numerous, and were found in many places (p. 190)
7. 410 to 440 million years ago (p. 191)
8. Seas must have covered the mountains long ago. The tops of mountains must have been the bottom of seas. (p. 191)

After You Read (p. 192)

1. A mold and a cast fossil may be found together because a mold is a hollow space in a rock layer and a cast is a fossil formed when a mold has been filled with sediment or minerals.

2.

Section 2

Before You Read (p. 193)

You need to know their birthdays.

Read to Learn

1. relative age (p. 194)
2. Students should highlight the limestone. Oldest fossils are probably found in the layer of sandstone. (p. 194)
3. unconformities (p. 195)
4. Students should highlight the angular unconformity. (p. 195)
5. Students should highlight rock surfaces where erosion took place before new sediments were deposited. (p. 196)
6. Students should color rock being uplifted red and sedimentary rock blue. (p. 196)
7. Two ways to correlate rock layers are walking the layers and using fossil evidence. (p. 196)
ANSWER KEY

After You Read (p. 197)

1. Student answers will vary depending on which glossary term they chose to explain in their own words.
2. Suggested answers are provided. Other answers are possible.

<table>
<thead>
<tr>
<th>Unconformities</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Description</td>
<td>Causes</td>
</tr>
<tr>
<td>Angular unconformity</td>
<td>Tilted older layers under newer sedimentary layers</td>
<td>Uplifting, tilting, erosion, deposition</td>
</tr>
<tr>
<td>Disconformity</td>
<td>Layers missing from the sequence</td>
<td>Erosion of whole layers or no new deposition</td>
</tr>
<tr>
<td>Nonconformity</td>
<td>Sedimentary rock layers over igneous or metamorphic rock</td>
<td>Uplift of igneous or metamorphic rock followed by sedimentary deposition</td>
</tr>
</tbody>
</table>

3. Students answers will vary depending on whether or not they found making flash cards a helpful strategy for learning the information in this section.

Section 3

Before You Read (p. 198)

Students should supply their exact age and give some possible ways their age could be verified such as dated pictures, birth certificate, birth records, family members.

Read to Learn

1. radioactive decay (p. 199)
2. Students should circle the beta particle and alpha particle being released. (p. 199)
3. The parent isotope has to break down or decay. (p. 200)
4. Students should circle the remains of the parent material after 4 half-lives and write 1/16 on the line. (p. 200)
5. Sedimentary rocks are eroded from older rocks. Radiometric dating would give the age of the original rocks. (p. 201)
6. slow, everyday changes; sudden, violent events (p. 201)

After You Read (p. 202)

1. Absolute age is the age of something in years. Relative age is a comparison of older and younger when the absolute ages are not known.

2. [Table showing half-life of Carbon-14]

<table>
<thead>
<tr>
<th>Percent Carbon-14</th>
<th>Years Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>5,730</td>
</tr>
<tr>
<td>25</td>
<td>11,460</td>
</tr>
<tr>
<td>12.5</td>
<td>17,190</td>
</tr>
<tr>
<td>6.25</td>
<td>22,920</td>
</tr>
<tr>
<td>3.125</td>
<td>28,650</td>
</tr>
</tbody>
</table>

3. Student answers will vary as to whether or not highlighting the vocabulary terms was a helpful strategy to help them learn about the absolute age of rocks.

Chapter 14 Geologic Time

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldable suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Geologic Time have them combine their section Foldables into the following Foldables chapter project.
Use two sheets of 11 × 17 paper to create a bound book. Place each Foldable on a page in the bound project. Title the project *Geologic Time.*

**Optional Foldable**

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activity page. This Foldable can be included in the chapter project.

**Section 1**

**Before You Read (p. 203)**

Student responses will vary, but may include the idea that over time, giraffe necks got longer because it helped them in some way, e.g., to get food.

**Read to Learn**

1. an eon (p. 204)
2. mass extinction (p. 204)
3. a species (p. 205)
4. Charles Darwin (p. 205)
5. The animals might have died out as a species. (p. 206)
6. by moving (p. 206)
7. Students should outline the long lobes in red, and circle the head, middle, and tail in blue. (p. 207)
8. became extinct; evolved (p. 207)
9. eye location (p. 208)
10. Students should highlight the body segments on each trilobite. (p. 208)
11. how different species of trilobites adapted to new conditions (p. 209)
12. Students should outline the continents they recognize. (p. 209)

**After You Read (p. 210)**

1. Student sentences will vary, but should describe at least one geologic era and one example of natural selection and should use four vocabulary words.

2. Phanerzoic Eon

<table>
<thead>
<tr>
<th>Mesozoic Era</th>
<th>Cenozoic Era</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triassic Period</td>
<td>Paleocene Epoch</td>
</tr>
<tr>
<td>Jurassic Period</td>
<td>Eocene Epoch</td>
</tr>
<tr>
<td>Cretaceous Period</td>
<td>Paleocene Epoch</td>
</tr>
</tbody>
</table>

- a. eon
- b. era
- c. period
- d. epoch

**Section 2**

**Before You Read (p. 211)**

Student responses will vary, but may state that the world would constantly be rocked by eruptions and it would be hard for organisms to survive.

**Read to Learn**

1. There might not be oxygen, and so no oxygen-breathing animals, including people. (p. 212)
2. The Paleozoic Era had more organisms with hard body parts that preserved well in fossils. (p. 212)
3. fishlike creatures without jaws (p. 213)
4. Students should circle the leglike fins. (p. 213)
5. protective coating around eggs or scales (p. 214)
ANSWER KEY

6. island chains (p. 214)

After You Read (p. 215)
1. Student sentences may vary, but should correctly describe at least one aspect of each geologic time period and use three vocabulary words.

2. top to bottom: cyanobacteria; Precambrian; invertebrates; Paleozoic Era; vertebrates

3. Student responses will vary.

Section 3

Before You Read (p. 216)
Student responses will vary, but may describe differences such as size, shape of legs, or size of teeth.

Read to Learn
1. their footprints were far apart (p. 217)
2. Answers will vary but may include: bones don’t have rings; circular; hollow core. (p. 217)
3. Student responses will vary, but may compare fur, legs, body shape with a mouse or other rodent. (p. 218)
4. They’re both plants; produce seeds. (p. 218)
5. Cenozoic Era (p. 219)

6. Homo sapiens (p. 219)

After You Read (p. 220)
1. Student sentences will vary, but should describe one of the eras.
2. Student responses may vary.

3. Student responses will vary as to whether or not this strategy was helpful.

Chapter 15 Atmosphere

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Atmosphere, have them combine their section Foldables into the following Foldables chapter project.

Use 11 × 17 or 12 × 18 inch paper to make the shutterfold project. Tape or glue each section’s Foldable as shown. Title the project Atmosphere. The optional Foldable can be glued to the back of the project.
Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the project.

Section 1

Before You Read (p. 221)

Students may include descriptive words such as clouds, mist, or fog. A few students may use the word atmosphere.

Read to Learn

1. about 1/5 (p. 222)
2. dust, salt, and pollen (p. 222)
3. the troposphere and the stratosphere (p. 223)
4. the exosphere (p. 223)
5. the thermosphere (p. 224)
6. radio waves (p. 224)
7. because they are denser (p. 225)
8. Answers may vary between 400 and 450 millibars. (p. 225)
9. because some layers have gases that easily absorb the Sun’s energy, and other layers do not (p. 226)
10. increases (p. 226)
11. heat from Earth’s surface (p. 226)
12. the Sun’s harmful ultraviolet rays (p. 227)
13. by leaking from appliances or CFCs can escape if they are not properly disposed of (p. 227)
14. in the atmosphere over Antarctica (p. 227)

After You Read (p. 228)

1. Student responses should include the idea that the ozone layer protects us from the Sun’s harmful energy, ultraviolet radiation.
2. Answers in blanks are: exosphere, thermosphere, mesosphere, stratosphere, troposphere

Section 2

Before You Read (p. 229)

Students may include descriptive words such as warm, hot, burning, nice.

Read to Learn

1. Most of the Sun’s energy is absorbed by Earth’s surface. (p. 229)
2. Cooler, denser air sinks. Warmer, less dense air rises. (p. 230)
3. Students should circle precipitation and write the term in the space provided. (p. 231)
4. condensation (p. 231)

After You Read (p. 232)

1. Answers will vary but should include one of the following: Conduction takes place when molecules bump into each other and energy is transferred. Radiation is energy that is transferred from the Sun to Earth in the form of rays or waves. Convection takes place after the atmosphere has already been warmed by radiation or conduction. In convection, energy is transferred by the flow of material.
2. Student responses should indicate that highlighting the main points and details will help them remember important words and ideas that will most likely be covered on a test.

3. Student responses should include the main ideas of whatever definition they chose to restate.

Section 3

Before You Read (p. 233)
Students may include such descriptive words as strong, cold, gusty, windy, chilly, warm, north, and so on.

Read to Learn
1. the Coriolis effect (p. 234)
2. Winds turn to their right north of the equator. (p. 234)
3. doldrums (p. 234)
4. trade winds (p. 235)
5. Trade winds move sailing ships along quickly. (p. 235)
6. jet streams (p. 236)
7. Students should trace the arrow showing direction of the jet stream. The jet stream moves west to east. (p. 236)
8. Jets flying from east to west would be flying against the direction of wind in the jet stream and this would slow them down. (p. 236)
9. The warm air is rising. (p. 237)
10. convection currents (p. 237)

After You Read (p. 238)
1. Student responses should include the main ideas of whatever definition they chose to restate.
2. 

3. The equator is closest to the Sun and therefore receives most of the Sun’s heat. The polar regions are farthest away and receive the least amount of the Sun’s rays and heat.

Chapter 16 Weather

Dinah Zike’s Foldables Teaching Strategies
Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Weather, have them place their section Foldables into the following Foldables project.

Use one sheet of 11 × 17 or 12 × 18 paper to make a Folded Project. Tape or glue each section’s Foldable as shown. Section 3 Foldable can be attached to the back of the project. Title the project Weather.
Optional Foldable
You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 239)
Kites whip around in the wind and move as the wind moves them.

Read to Learn
1. rapidly (p. 240)
2. Figure on left side—low pressure; on right side—high pressure. (p. 240)
3. Wind vane points from where the wind is blowing; wind sock points the direction the wind is blowing. (p. 241)
4. Students should circle the figure on the right. (p. 241)
5. dew point (p. 242)
6. Students should trace arrows showing moist warm air rising. (p. 242)
7. stratus, cumulus, cirrus (p. 243)
8. cumulonimbus (p. 243)
9. Students should circle raindrops, snowflakes, ice, and hail. (p. 244)

After You Read (p. 245)
1. Student responses should demonstrate that they understand the concepts of weather and terms like humidity and precipitation.
2. *Warm moist air rises, expands, and cools.*
   *Water vapor condenses into tiny droplets.*
   *Droplets suspend in the air, forming clouds.*
   *Three types of clouds are stratus, cumulus, and cirrus.*
   *Four kinds of precipitation come from clouds: rain, snow, sleet, and hail.*
3. Student responses will vary as to whether or not working with a partner was helpful.

Section 2

Before You Read (p. 246)
In summer, basement air is usually cooler and attic air is usually hotter. The reverse is true in winter.

Read to Learn
1. stormy weather (p. 247)
2. Students should color the arrow showing cold air movement in the cold front blue and color the arrow showing warm air movement in the warm front red. (p. 247)
3. Students should color arrows red showing warm air closed off from Earth. (p. 248)
4. Students should circle area in between cold air and warm air. (p. 248)
5. by colliding with other water droplets as they fall (p. 249)
6. air movement (p. 249)
7. tornado (p. 250)
8. Students should trace over the updraft. (p. 250)
9. Students should circle F3. (p. 251)
10. typhoons, cyclones (p. 251)
11. Students should highlight counterclockwise arrows. (p. 252)
12. The weather is not dangerous yet, but may be soon. (p. 252)

After You Read (p. 253)
1. Student answers should demonstrate that they understand that hurricanes gain strength from the heat of warm ocean water.
2. cold front
   Cold air goes under warm air.
   Warm air is lifted.
   occluded front
   3 air masses: cold, cool, warm
   Warm air closed off from Earth.
   stationary front
   Neither warm nor cold air is moving.
   warm front
   Lighter, warmer air moves over cold air.

3. Student answers will vary as to whether the study strategy helped them learn the concepts in the section.

Section 3

Before You Read (p. 254)
clouds, wind, humid feel to weather, what weather was like that day, patterns

Read to Learn
1. weather conditions at a specific location (p. 255)
2. Students should circle the low pressure area by Portland in the northwest part of the map. (p. 255)

After You Read (p. 256)
1. An isobar connects two places with same atmospheric pressure; an isotherm connects two places with the same temperature.

To help students reinforce the concepts presented in Climate, have them place their section Foldables into the following Foldables three-pocket chapter project.

Use a sheet of 11 × 17 or 12 × 18 paper as the base. Place each section’s Foldable as shown. Title the project Climate.

Optional Foldable
You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activity page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 257)
Student answers will vary but may describe their climate as warm, cold, sunny, or rainy.

Read to Learn
1. Large bodies of water absorb and give off heat. (p. 258)
2. Student responses will vary depending on their location. (p. 258)
3. Mountain air contains fewer molecules that absorb heat. (p. 259)
4. the dry side (p. 259)

Chapter 17 Climate

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested in each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.
**Answer Key**

**After You Read (p. 260)**

1. Student responses will vary but should demonstrate that they understand the concept that the polar climate zones receive the least amount of solar radiation on Earth and tropical climate zones receive the greatest amount of solar radiation.

2. **How Mountains Affect Climate**
   - **First**
     - Moist air flows toward a mountain and is forced upward, where it cools.
   - **Second**
     - The cool air releases moisture as rain or snow on the windward side of the mountain.
   - **Third**
     - The dry air passes over the mountain to the leeward side.
   - **Fourth**
     - The dry air flows down the leeward side of the mountain and heats up.

3. Student responses will vary.

**Section 2**

**Before You Read (p. 261)**

Student answers will vary but may state that they would wear lightweight clothing, use an air conditioner a lot, or drink a lot of cold drinks.

**Read to Learn**

1. Students should label their region of the map and correctly correlate it with the climate type as shown in the legend. (p. 262)
2. Student responses will vary but may mention the fur or claws on a dog or cat; beak shape on a bird. (p. 263)
3. Animal body processes slow down during estivation. (p. 263)
4. Students should trace the curled-up lungfish in the mud. (p. 263)

**After You Read (p. 264)**

1. Student responses will vary but should demonstrate that they understand that hibernation is a behavioral adaptation. They might name rodents or bears as an example of an animal that hibernates.
2. **Adaptation**
   - **Behavioral Adaptations**
     - hibernation, estivation
   - **Structural Adaptations**
     - fur, claws, beak
3. Student responses will vary as to whether or not highlighting helped them.

**Section 3**

**Before You Read (p. 265)**

Student responses will vary but may state that they could not be as active because it is too hot.

**Read to Learn**

1. Students should highlight the different tilt of the axis for each season. (p. 266)
2. northern hemisphere (p. 266)
3. east to west (p. 267)
4. Fossils from plants or animals usually found in warm climates are sometimes seen at the poles. (p. 267)
5. $15,000 - 11,500 \text{ years} = 3,500 \text{ years to next ice age}$ (p. 268)
6. Solid particles and liquid droplets enter the atmosphere and block the Sun. (p. 268)
7. east to west (p. 269)
8. Europe might have been warmer than usual. (p. 269)
9. about $3^\circ$ (p. 270)
ANSWER KEY

10. many factors (p. 270)
11. Students should circle the arrows showing heat being deflected down toward Earth. (p. 271)
12. global warming (p. 271)
13. carbon dioxide (p. 272)
14. Student responses may vary but may state they can recycle paper so fewer trees are cut; plant more trees on deforested areas. (p. 272)
15. Students should circle the smokestack emissions from the factory. (p. 273)
16. carbon dioxide (p. 273)

After You Read (p. 274)

1. Student responses will vary but should demonstrate that they understand that carbon dioxide is a greenhouse gas that traps heat near Earth’s surface. So, as more of it is put in the atmosphere, more heat will be trapped and the warmer the climate will get.

2.

<table>
<thead>
<tr>
<th>Main Idea: Several factors cause Earth’s climate to change.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detail 1: Earth’s movement in space</td>
</tr>
<tr>
<td>Detail 2: El Niño</td>
</tr>
<tr>
<td>Detail 3: Burning fossil fuels</td>
</tr>
</tbody>
</table>

3. Student responses will vary depending on whether or not they found it helpful to write down questions and comments.

Chapter 18 Ocean Motion

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Ocean Motion, have them combine their section Foldables into the following Foldables accordion.

Use an 11 × 17 piece of paper as the base and fold as shown. Tape or glue each Foldable as shown.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 275)

Students’ answers may vary greatly, but may include the beach, waves, and marine life.

Read to Learn

1. shrimp, fish, crabs, and clams (p. 275)
2. The lowest large land areas filled up with water to become oceans. (p. 276)
3. 85.6% (p. 277)
4. b (p. 277)
5. Students should accurately trace the freshwater and saltwater paths. (p. 278)
**After You Read (p. 279)**

1. Students’ sentences will vary. For example: A basin is a very large low place that can fill up with water to create an ocean.

2. Students choose one of the question heads and write an answer to the question. For example, students may choose: “How does the ocean stay in balance?” The answer would be: “The ocean eliminates materials at the same rate they are added.”

**Section 2**

**Before You Read (p. 280)**

Answers will vary. Sample response: “The milk moves in a circle in the same direction as the spoon is moving. The faster I stir, the faster the milk moves.”

**Read to Learn**

1. Students may name the California, Gulf Stream, or Caribbean currents. (p. 281)

2. Ships that travel in the direction of the current will move faster because the movement of the current will help them. (p. 281)

**After You Read (p. 285)**

1. Students’ sentences should reflect an understanding of the fact that density currents move along the bottom of the ocean, and surface currents move along the top.

2. Coriolis effect causes currents to circle to their right in the northern hemisphere and to their left in the southern hemisphere.

3. Answers will vary. Students should be encouraged to ask for help finding answers to any unanswered questions they still have.

**Section 3**

**Before You Read (p. 286)**

Answers will vary. Sample response: “I saw a wave at the beach. The wave was very tall. It curled up and then crashed back down.”

**Read to Learn**

1. Check that students accurately highlighted crests and troughs. (p. 286)

2. b (p. 287)
ANSWER KEY

3. Higher. Stronger winds create bigger waves. (p. 287)
4. 2.5 m (p. 288)
5. The energy of the wave is greater than the energy of the water in the river. (p. 288)
6. The oceans are at low tide. (p. 289)

After You Read (p. 290)
1. Answers will vary. Sample response: “The highest point of a wave is its crest. The wave’s lowest point is its trough.”
2. Students’ preferences will vary. If the day is windy, the waves will be larger; if there is a storm, the waves can be very large. If there is no wind, the sea will be calmer.

Chapter 19 Oceanography

Dinah Zike’s FoldablesTM Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Oceanography, have them combine their section Foldables into the following Foldables chapter project.

Use two 11 × 17 pieces of paper to make a bound book. Tape or glue each section’s Foldable to a page. Title the project Oceanography.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 291)
Students’ answers will vary. Have volunteers share their answers.

Read To Learn
1. seamount, volcanic island, mid-ocean ridge (p. 292)
2. underwater, inactive volcano (p. 292)
3. approximately 11,000 m (p. 293)
4. It would give the producer a cheap source of the minerals necessary to make steel. (p. 294)

After You Read (p. 295)
1. Students’ answers will vary. Students may explain that the continental shelf is located near shore and that the continental slope is located beyond the continental shelf. They may also explain that abyssal plains and trenches are located on the seafloor.
3. Answers will vary but should attempt to assess create-a-quiz as a study technique. Ask volunteers to explain other strategies they used to better understand this chapter.

Section 2

Before You Read (p. 296)
Students’ answers will vary but may include sharks, whales, jellyfish, shellfish, or starfish.

Read To Learn
1. C (p. 297)
2. sulfur or nitrogen (p. 297)
3. They cannot move and so depend on ocean currents to carry their reproductive cells. (p. 298)
4. It is a consumer. (p. 298)
5. Nekton include all swimming forms of fish and other animals. Students’ answers will vary. (p. 299)
6. They need sunlight to perform photosynthesis. (p. 299)
7. Fewer predators and more food are found in estuaries. (p. 300)

After You Read (p. 301)
1. Students’ answers will vary. Sample responses may include “Plankton live near the surface of the ocean and use photosynthesis to make their food.”

Section 3

Before You Read (p. 302)
Students’ answers will vary. Students may mention fertilizer runoff, plastics, industrial wastes, or insecticides. Allow volunteers to share things they might to do reduce pollution.

Read to Learn
1. They would have no food or shelter and could die. (p. 303)
2. Students should trace all arrows from their source into the water. (p. 303)
3. runoff from land (p. 304)
4. Their habitat might be destroyed, and the fish might die. (p. 304)
5. B (p. 305)
6. false (p. 305)

After You Read (p. 306)
1. Students may describe chemical pollution, air pollution, or land pollution and explain what they might do to help control it.
Chapter 20 Our Impact on Land

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables.*

To help students reinforce the concepts presented in Our Impact on Land, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of paper folded into a shutterfold project. Tape or glue each section’s Foldable as shown. Foldable B from Section 1 can be attached to the back.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

Section 1

Before You Read (p. 307)

Students’ responses will vary. Sample response: “I think there were five times as many humans in 2000 as there were in 1900. I believe the human population will double in the next 100 years.”

Read to Learn

1. c, about 2.8 billion (p. 308)
2. the largest number of individuals of a particular species that the environment can support (p. 308)
3. to kill insects and weeds (p. 309)

After You Read (p. 310)

1. Accept any reasonable answer, such as “If human populations do not recycle, landfills will overflow.”
2. 

3. Responses will vary. Students may suggest using the Internet or library resources. They may also state that writing questions helped them focus better on what they were reading.
Before You Learn (p. 311)
Student responses will vary. Some students may name farming, construction, etc. Students may answer that the air can be polluted by these activities.

Read to Learn
1. contour plowing, no-till farming, or planting cover crops (p. 312)
2. Fewer trees means less moisture in the air, and therefore less rain. (p. 312)
3. Now that the area is accessible, homes and businesses are built. (p. 313)
4. Students should highlight the cement, clay, or plastic liner. (p. 313)
5. type of soil, the depth to groundwater, and neighborhood concerns (p. 314)
6. using plants that absorb metals and other toxins to clean up soil and groundwater (p. 314)
7. carbon, hydrogen, oxygen, and nitrogen (p. 315)
8. Responses will vary, but may include that the wildlife would not have as much space to live or may become (more) endangered or extinct. (p. 315)

After You Read (p. 316)
1. Accept any reasonable answer, such as “Sometimes people throw hazardous wastes in with the regular garbage.”

2.

<table>
<thead>
<tr>
<th>CAUSE</th>
<th>EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers till soil.</td>
<td>Soil erosion</td>
</tr>
<tr>
<td>Crops harvested or vegetation dug up for construction</td>
<td>Soil erosion</td>
</tr>
<tr>
<td>Sanitary landfills leak.</td>
<td>Hazardous wastes get into soil and groundwater.</td>
</tr>
<tr>
<td>Hazardous wastes are improperly thrown away.</td>
<td>May cause cancers or other illnesses in living things.</td>
</tr>
</tbody>
</table>

3. Student responses will vary. Teachers may want to allow time for volunteers to share their findings.

Section 3

Before You Read (p. 317)
Student responses will vary, but may include recycling, limiting water usage, reusing products, or using nondisposable containers.

Read to Learn
1. 3,100 liters (p. 318)
2. glass, paper, plastic, steel, and tires (p. 318)
3. Answers will vary, but may include that people have reduced, reused, and recycled more materials. (p. 318)
4. Answers will vary. Sample: Recycled materials cost more because more people and special facilities are needed to create them. (p. 319)
5. because our population is still growing and resources might be used up (p. 319)

After You Read (p. 320)
1. Accept any reasonable answer, such as “Composting is good for the environment because it reduces the amount of trash in landfills.”
2. | **BENEFITS OF RECYCLING** | **DISADVANTAGES OF RECYCLING** |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduces trash in landfills</td>
<td>Must be carried separately from trash</td>
</tr>
<tr>
<td>Can save companies money</td>
<td>Requires more trucks and people</td>
</tr>
<tr>
<td>Reduces amount of raw materials used</td>
<td>Not enough demand for recycled items due to high price</td>
</tr>
<tr>
<td>Can get cash back for returning bottles or cans</td>
<td>Costs more to have separate recycling facility</td>
</tr>
</tbody>
</table>

3. Responses will vary, but students may find that highlighting increases their focus on the material they’re reading.

**Chapter 21 Our Impact on Water and Air**

**Dinah Zike’s Foldables™ Teaching Strategies**

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables.*

To help students reinforce the concepts presented in Our Impact on Water and Air, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of paper to make a folded book. Tape or glue each section’s Foldable as shown. Foldable B can be attached to the back of the book.

**Optional Foldable**

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

**Section 1**

**Before You Read (p. 321)**

Students’ answers will vary. Answers might include: I use water to drink, for life processes, to cook with, to clean with, to cool off with, or for leisure activities such as swimming or canoeing.

**Read to Learn**

1. Sample answer: The fertilizer causes algae to grow. The algae uses up the oxygen in the water which can cause fish and other animals to die. (p. 322)

2. in wastewater from factories and from mining (p. 323)

3. by using cooling towers or ponds to cool the water (p. 323)

4. It set goals for reducing point source and nonpoint source pollution. (p. 324)

5. Student responses will vary, but may include planting drought-tolerant plants, etc. (p. 324)

**After You Read (p. 325)**

1. Students’ answers will vary. Sample sentence: Sewage contains harmful organisms that can make people sick.
2. Student responses will vary. Teachers may want to ask students to share their strategies with each other.

Section 2

Before You Read (p. 326)
Students’ answers will vary. Answers may include nose and throat irritation and harm to lungs.

Read to Learn
1. nitrogen compounds in the presence of sunlight (p. 327)
2. below 5.6 (p. 327)
3. Answers may include pneumonia or asthma. (p. 328)
4. moderate (p. 328)
5. the eyes, nose, throat, and lungs (p. 329)
6. The amount of pollutants released is decreasing. (p. 329)
7. Air pollutants go wherever the wind carries them. (p. 330)
8. Answers may vary but may state that cars might be designed to reduce emissions more. (p. 330)
9. sulphur dioxide (p. 331)
10. Possible answer: walk to a friend’s house rather than being driven, set the thermostat in your home lower in the winter (p. 331)

After You Read (p. 332)
1. Answers will vary but should show an understanding of the terms chosen.

Chapter 22 Exploring Space

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in Exploring Space, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of construction paper or cardstock to make a tri-fold pocket project. Tuck each Foldable into the appropriate pocket. Title the Foldable Exploring Space.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.
**Section 1**

**Before You Read (p. 333)**
Answers will vary. Students may discuss telescopes, space probes, and space travel.

**Read to Learn**

1. infrared (p. 334)

2. They all travel at the same speed. (p. 334)

3. Students may say that a refracting telescope uses convex lenses to collect light, and a reflecting telescope uses concave mirrors to collect light. (p. 335)

4. a building that contains a telescope (p. 336)

5. Its views are not distorted by Earth’s atmosphere. (p. 336)

6. Students may say that scientists should continue to try to improve telescopes to learn more about our galaxy and other galaxies. (p. 337)

7. Radio waves pass freely through Earth’s atmosphere. (p. 337)

**After You Read (p. 338)**

1. Students’ answers will vary. Sample sentence: An observatory is a building that can house an optical telescope, and often has a dome-shaped roof that opens for viewing.

3. Answers will vary, for example: “Yes, I could answer most of the questions. This strategy helped me answer questions in my own words.”

**Section 2**

**Before You Read (p. 339)**
Answers will vary, such as: “Humans have sent telescopes, space probes, space stations, and humans into space. These have provided data about Earth’s Moon, about the other planets and their moons, and about the effects of space travel on the human body.”

**Read to Learn**

1. liquid-propellant rocket (p. 340)

2. It can be shut down and restarted. (p. 340)

3. into space (p. 341)

4. both were space probes sent to Venus (p. 342)

5. 6 years (p. 342)

6. to put a spacecraft with an astronaut into orbit around Earth (p. 343)


**After You Read (p. 344)**

1. Students’ answers will vary. Sample sentence: A satellite orbits another object, such as Earth.

2. Students’ answers will vary. Sample question and answer: What are satellites? A satellite is any natural or artificial object that revolves around another object. The Moon is a natural satellite.
**Section 3**

**Before You Read (p. 345)**

Students’ answers will vary. Sample questions:
Could there have been life on Mars at one time? What are Saturn’s rings made of? Do other planets besides Earth have moons?

**Read to Learn**

1. Astronauts can live on the space shuttle for only a short period of time. The living area is small. (p. 346)

2. improving medicines and the treatment of diseases (p. 346)

3. *Pathfinder* (p. 347)

4. Digging might help discover water or ice below the surface. (p. 347)

5. whether Titan’s atmosphere is like that of early Earth (p. 348)

6. Answers will vary. Sample answer: It may help scientists learn how our galaxy evolved and is evolving. (p. 348)

7. Students’ answers will vary. Sample sentence: Space technology is used in medicine. (p. 349)

8. Students’ answers will vary. Students may state that being able to read license plates more clearly will allow the police to identify lawbreakers more accurately. (p. 349)

**After You Read (p. 350)**

1. The space shuttle will take the parts of the space station into orbit where it is being built.

**2.**

<table>
<thead>
<tr>
<th>Who is building it?</th>
<th>When will it be complete?</th>
<th>Where is it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 nations, including the U.S.</td>
<td>2006</td>
<td>In Earth’s orbit</td>
</tr>
</tbody>
</table>

**International Space Station**

<table>
<thead>
<tr>
<th>Why is it being built?</th>
<th>What is it?</th>
<th>How will it be built?</th>
</tr>
</thead>
<tbody>
<tr>
<td>to do long-term space research</td>
<td>a huge, permanent science laboratory in space</td>
<td>In phases; the space shuttle and Russian rockets will carry parts into space</td>
</tr>
</tbody>
</table>

**3.** Students’ answers will vary. Sample answer: Space research has led to medical advancements, such as ways to treat heart disease, detect eye problems, and help deaf people hear. Technology has also helped police and people who drive emergency vehicles.

**Chapter 23 The Sun-Earth-Moon System**

**Dinah Zike’s Foldables™ Teaching Strategies**

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables*.

To help students reinforce the concepts presented in The Sun-Earth-Moon System, have them combine their Foldables into a bound book Foldables project. Students can title their project *The Sun-Earth-Moon System*.

Use two sheets of 11 × 17 or 12 × 18 paper to make a bound book. Tape or glue each Foldable inside.
Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.

**Section 1**

**Before You Read (p. 351)**

Students may say Earth is round, large, and moves in a circle. Accept any reasonable answers.

**Read to Learn**

1. $12,756 \text{ km} - 12,714 \text{ km} = 42 \text{ km}$; Earth is not a perfect sphere. (p. 352)

2. Earth has opposite north and south magnetic poles. (p. 352)

3. Students should draw lines through Earth’s magnetic axis and rotational axis. (p. 353)

4. Earth’s orbit, or path, around the Sun (p. 353)

5. Daylight hours are shorter in winter. (p. 354)

6. the southern hemisphere (p. 354)

7. over the Tropic of Capricorn (p. 355)

8. An equinox occurs when the Sun is directly above Earth’s equator. (p. 355)

**After You Read (p. 356)**

1. Earth’s rotation causes day and night. Earth’s tilted axis causes seasons.

<table>
<thead>
<tr>
<th>Earth’s Properties and Seasons</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth’s shape is a slightly flattened sphere.</td>
<td>true</td>
</tr>
<tr>
<td>Earth’s seasons are caused by its tilt.</td>
<td>true</td>
</tr>
<tr>
<td>The shape of Earth’s orbit is a circle.</td>
<td>false</td>
</tr>
<tr>
<td>The shape of Earth’s orbit is an ellipse.</td>
<td>true</td>
</tr>
<tr>
<td>After the summer solstice, daylight hours increase.</td>
<td>false</td>
</tr>
<tr>
<td>During a solstice the Sun is at its farthest point north or south of the equator.</td>
<td>true</td>
</tr>
</tbody>
</table>

**Section 2**

**Before You Read (p. 357)**

Accept any reasonable statements students make about what they know about the Moon, such as: the phases of the Moon; the movement of the Moon; or its physical characteristics.

**Read to Learn**

1. Students should highlight the right side of each figure of the Moon. (p. 358)

2. more of the lighted half of the Moon can be seen from Earth (p. 358)

3. about twelve and a half times a year (p. 359)

4. Earth (p. 359)

5. Students should label the darker area umbra and the lighter shadow penumbra. (p. 360)

6. Students should correctly label umbra and penumbra. (p. 361)

7. during the full moon phase (p. 362)

8. Maria are dark, flat regions on the Moon resulting from an ancient lava flow. (p. 362)

9. A new theory, the impact theory, was formed. (p. 362)

10. about 90 km (p. 363)
11. core, lower mantle, upper mantle, and crust (p. 363)

After You Read (p. 364)

1. Students’ answers will vary. Sample: It takes one month to see all of the moon phases, and waxing moon is getting larger.

2. Solar eclipses occur at the new moon phase.

An umbra is the darkest portion of the Moon’s or Earth’s shadow.

Eclipses

People are less likely to see a solar eclipse than a lunar eclipse.

Lunar eclipses occur at the full moon phase.

Section 3

Before You Read (p. 365)

Possible responses: What is it made of? How was it formed? How long has it been there?

Read to Learn

1. Apollo 15 (p. 366)
2. iron (p. 367)
3. ice is found in deep craters at both poles (p. 367)

After You Read (p. 368)

1. Students’ answers will vary. Sample: An impact basin is caused by a collision with an object such as a meteorite.

2. 

<table>
<thead>
<tr>
<th>Spacecraft</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranger and Lunar Orbiters</td>
<td>To photograph the Moon</td>
</tr>
<tr>
<td>Surveyor</td>
<td>To photograph the Moon; to analyze lunar soil samples</td>
</tr>
<tr>
<td>Clementine</td>
<td>To survey the surface of the Moon</td>
</tr>
<tr>
<td>Lunar Prospector</td>
<td>To orbit the Moon; to map the Moon</td>
</tr>
</tbody>
</table>

Section 1

Before You Read (p. 369)

Accept any or all: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

3. Students may say that highlighting the text helped them put the section’s main ideas in order; they may say that they would have chosen different sentences.

Chapter 24 The Solar System

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to Dinah Zike’s Teaching Science with Foldables.

To help students reinforce the concepts presented in The Solar System, have them combine their section Foldables into the following Foldables chapter project.

Fold a sheet of 11 × 17 or 12 × 18 paper into a shutterfold. Tape or glue each section’s Foldable as shown.

Optional Foldable

You may want to have students make the chapter Foldable found in the Student Edition on the Start-Up Activities page. This Foldable can be included in the chapter project.
Read to Learn
1. the Sun’s gravity (p. 370)
2. Mercury, Pluto, Earth (p. 370)
3. Mercury, Venus, Earth, and Mars (p. 371)
4. Neptune (p. 371)

After You Read (p. 372)
1. Possible answers: The solar system formed from a cloud of gas, ice, and dust. Is there life in the solar system anywhere but on Earth?
2. The solar system formed from a cloud of gas, ice, and dust.
3. The cloud condensed to form a(n) spinning disk.
4. The Sun formed first. It was at the center of the new solar system.
5. The other material in the solar system collided and formed nine planets.
6. The inner planets are Mercury, Venus, Earth, and Mars. The outer planets are Jupiter, Saturn, Uranus, Neptune, and Pluto.

3. Students’ responses might include: ask their teachers, use the library, watch science videos or documentaries on television, use the Internet

Section 2

Before You Read (p. 373)
Accept any reasonable answers.

Read to Learn
1. from 425°C to –170°C (p. 374)
2. Students’ answers will vary. Sample: like Earth in mass and size, carbon dioxide atmosphere (p. 374)
3. protects life forms from Sun’s harmful rays, causes meteors to burn before they reach the surface (p. 375)
4. Mars (p. 376)
5. evidence of life (p. 376)
6. alcove, channel, and apron (p. 376)
7. strong winds, which cause dust storms (p. 377)
8. It is tilted on its axis. (p. 377)

After You Read (p. 378)
1. Possible answer: Mars has two moons.
2.

<table>
<thead>
<tr>
<th>ORDER FROM SUN</th>
<th>ATMOSPHERE</th>
<th>TEMPERATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERCURY</td>
<td>Closest planet to the Sun</td>
<td>No true atmosphere</td>
</tr>
<tr>
<td>VENUS</td>
<td>2nd</td>
<td>Heavy clouds Carbon dioxide gas</td>
</tr>
<tr>
<td>EARTH</td>
<td>3rd</td>
<td>Protects life-forms from harmful effects of the Sun</td>
</tr>
<tr>
<td>MARS</td>
<td>4th</td>
<td>Mostly carbon dioxide, some nitrogen and argon</td>
</tr>
</tbody>
</table>

3. Possible response: Use flash cards to quiz a classmate about the inner planets

Section 3

Before You Read (p. 379)
Accept any reasonable responses.

Read to Learn
1. moons of Jupiter (p. 380)
2. Possible answers: largest planet, faint rings, hydrogen and helium atmosphere, continual storms, at least 61 moons in all (p. 380)
3. Saturn has clear complex ring system and Uranus has thin rings, Saturn has at least 31 moons and Uranus has at least 21 moons. (p. 381)
4. a collision (p. 381)

5. B. Methane (p. 382)

6. Answers will vary, but students should see that no life could exist on Pluto because the planet has a thin atmosphere. (p. 382)

After You Read (p. 383)

1. Possible answer: Pluto may be part of the Kuiper Belt.

2.

<table>
<thead>
<tr>
<th>THE OUTER PLANETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER FROM THE SUN</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Jupiter 5th</td>
</tr>
<tr>
<td>Saturn 6th</td>
</tr>
<tr>
<td>Uranus 7th</td>
</tr>
<tr>
<td>Neptune Usually 8th</td>
</tr>
<tr>
<td>Pluto Usually, 9th</td>
</tr>
</tbody>
</table>

3. Monitor pairs as they describe comets, meteors, and asteroids.

Chapter 25 Stars and Galaxies

Dinah Zike’s Foldables™ Teaching Strategies

Have students create the Foldables suggested for each section. For additional help making these organizers, refer to *Dinah Zike’s Teaching Science with Foldables*.

To help students reinforce the concepts presented in Stars and Galaxies, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of paper to make an accordion fold. Tape or glue each section’s Foldable as shown.
Section 1

Before You Read (p. 387)
Answers will vary. Students may describe stars, the Milky Way, and constellations. Familiar constellations and shapes could include Cassiopeia and the Big Dipper.

Read to Learn
1. counter-clockwise (p. 388)
2. the circumpolar constellations (p. 388)
3. the close object (p. 389)
4. elements in a star’s atmosphere (p. 389)

After You Read (p. 390)
1. Answers will vary, but may include, “Two stars might have the same absolute magnitude but different apparent magnitudes if one is farther from Earth.”
2. Answers will vary, but may include: “Yes, I learned that stars are different colors. I wanted to learn if stars ever burn out, and I did. The chart helped me think about things I already knew.”

Section 2

Before You Read (p. 391)
Answers will vary. Words might include: hot, bright, powerful, fire, solar system, sunburn.

Read to Learn
1. 1: core; 2: photosphere; 3: chromosphere; 4: corona (p. 392)
2. Gases near a sunspot brighten and shoot outward. (p. 392)
3. Answers will vary. Sample answer: It occurs near Earth’s northern pole. (p. 393)
4. about eight minutes (p. 393)

After You Read (p. 394)
1. Students should use the terms chromosphere, corona, and photosphere, such as: The photosphere is the lowest layer of the Sun’s atmosphere, the chromosphere is the middle layer, and the corona is the top layer.
2. THE SUN vs. Other Stars

<table>
<thead>
<tr>
<th>Similarities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is a huge ball of gas.</td>
<td>Its light reaches Earth in about eight minutes.</td>
</tr>
<tr>
<td>It produces energy in its core.</td>
<td>Life on Earth depends on it.</td>
</tr>
<tr>
<td>It has an atmosphere that has different layers. One is the corona.</td>
<td>It is not close to other stars.</td>
</tr>
</tbody>
</table>

3. Students might add words and phrases such as: “star,” “close to Earth,” “has layers,” “has a center core,” “gives off energy,” “has sunspots,” “rotating,” “yellow light.” Answers might also include: “I was surprised that the Sun was an average star.”
ANSWER KEY

Section 3

Before You Read (p. 395)
Answers will vary, but students might note that some stars are larger or brighter than others. They may also think the Sun is unlike any other star.

Read to Learn

1. Stars in the upper left part of the main sequence should be blue, those in the middle yellow, and those in the lower right red. White dwarfs are blue and giants are red. (p. 396)
2. white dwarfs (p. 396)
3. fusion (p. 397)
4. about 5 billion years (p. 397)
5. As hydrogen levels go down, the star’s temperature goes up. (p. 398)
6. a neutron star (p. 399)

After You Read (p. 400)
1. A giant is larger, brighter, and cooler than a white dwarf.
2. A massive star forms in a nebula. The star burns hydrogen fuel as a main sequence star. The core heats up. The star expands and cools into a supergiant (or red supergiant). The star then explodes as a supernova. Depending on its mass, it will then become either a neutron star or a black hole.
3. Students’ answers will vary. For example: “I can organize the flash cards to show how the Sun formed from a nebula, will become a giant, and end its life as a white dwarf.”

Section 4

Before You Read (p. 401)
Answers will vary, but students might note that the Earth is part of the solar system and that the solar system is part of the Milky Way galaxy.

Read to Learn

1. because our solar system is in one of its spiral arms (p. 402)
2. The universe expands. (p. 402)
3. It’s getting closer. (p. 403)
4. It began with a huge explosion. (p. 403)

After You Read (p. 404)
1. Answers will vary, such as: “The big bang theory explains why galaxies are moving apart.”
2. 
3. Answers will vary, such as: “The Milky Way is a rotating spiral galaxy that may contain one trillion stars. It is about 100,000 light-years across, and our solar system is located about 26,000 light-years from the center. The center of the Milky Way is a black hole.”