Reading Essentials

Answer Key

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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 helping 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).

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Chapter 1 The Nature of Science

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 Nature of Science, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of construction paper or cardstock to create a three-pocket folder. Place each section’s Foldable in the correct pocket.

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. 5)
Students’ responses will vary, but might include that they observe what is happening, ask people around them, or read the newspaper.

Read to Learn
1. Students list decisions they have made in the past 24 hours. (p. 6)
2. a scientific explanation supported by facts (p. 6)
3. to find and analyze data (p. 7)
4. Students’ responses will vary, but might include studying for exams or writing a paper from the notes taken. (p. 7)

After You Read (p. 8)
1. Students write a sentence that describes how scientists use technology in their work. A sample would be: “Scientists use technology when they use computers to find and analyze data.”

Skills Scientists Need

observing measuring classifying interpreting

3. Students explain how asking and answering questions helps them remember what they have learned.

Section 2

Before You Read (p. 9)
Students’ responses will vary, but students should indicate how they would get the information they need from their science book. For example, they may be able to go to a friend’s house to look at the information.

Read to Learn
1. recognize the problem, form a hypothesis, test the hypothesis, and analyze the data (p. 10)
2. when scientists expect certain results or when selecting surveys or groups for investigation (p. 10)
3. to provide the most accurate results possible (p. 11)
4. Answers may include to represent things that happen too slowly or too quickly or are too big or too small to observe. (p. 11)
ANSWER KEY

5. There are three million milligrams in three kilograms. (p. 12)

6. You can give an oral presentation, display the results on a bulletin board, or make a poster. You can share charts, tables, and graphs that show your data. (p. 13)

7. the factor being measured in the experiment (p. 13)

8. a sample that does not have the independent variable applied to it (p. 14)

9. By running it more than once, you can eliminate any unusual results. (p. 14)

After You Read (p. 18)

1. Students write a sentence explaining how they use information technology. A sample would be: “Searching the Internet for information for a history project is a way of using information technology.”

2. Students choose one of the question heads and write an answer to the question. For example, students may choose: “Who practices science?” The answer would be that scientists include men and women, as well as people of all races, cultures, and time periods.

3. Students describe a problem that science can help solve. An example would be new ways to use renewable energy sources that would reduce our dependence on nonrenewable energy sources.

Chapter 2 Traits and How They Change

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 Traits and How They Change, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of construction paper or cardstock to create a three-pocket folder. Insert each section’s Foldables in the correct pocket.

Section 3

Before You Read (p. 16)

Students name three scientific discoveries that affect their lives every day, such as microwaves, video games, computers, and digital technologies.

Read to Learn

1. Answers will vary. Science can help people by finding cures for diseases. Science can harm people if a virus is accidentally released into the air and infects people. (p. 17)
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. 19)
Students should describe how extended exposure to sunlight affects their skin and hair.

Read to Learn
1. A gene is a section of DNA. (p. 20)
2. light and temperature (p. 20)
3. Students circle the threadlike leaves growing under the water and highlight one of the broad leaves growing above water. (p. 21)
4. The environment can affect the growth, appearance, and sex of organisms. (p. 21)

After You Read (p. 22)
1. Students write a sentence that explains the relationship of DNA and genes. An example answer would be: “A gene is part of the DNA code on a chromosome.”
2. light
3. temperature
4. water

3. Students explain how reviewing paragraphs with a partner helps them understand what they read.

Section 2

Before You Read (p. 23)
Students should describe the features that are similar, such as hair or eye color.

Read to Learn
1. a dominant allele (p. 24)
2. Students highlight the capital letters in each possible sex cell. (p. 24)
3. Alleles for one trait are inherited independent of the alleles for another trait. (p. 25)
4. Students highlight the two XY squares. (p. 25)

After You Read (p. 26)
1. Students write a sentence comparing dominant and recessive traits. For example: “A dominant allele will show in the phenotype whenever it is present, while a recessive allele will show only when two of them for the trait are present.”
2. | Principle or Law                  | Explanation                                                                 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Principle of dominance</td>
<td>explains why only one form of a trait is shown even when both alleles are present</td>
</tr>
<tr>
<td>Principle of segregation</td>
<td>explains why there is variation among the offspring of parents</td>
</tr>
<tr>
<td>Law of independent assortment</td>
<td>explains why alleles for one trait have no effect on how alleles for another trait are inherited</td>
</tr>
</tbody>
</table>

Section 3

Before You Read (p. 27)
Students list some kinds of plants or animals that could not live in very cold environments. Examples may include tropical plants, and cold-blooded animals such as reptiles.
ANSWER KEY

Read to Learn

1. Different, long-term environmental influences on populations produced the variety of species. (p. 28)
2. the production of many species from one ancestral species (p. 29)
3. about 38,000 species (p. 29)

After You Read (p. 30)

1. Students write a sentence that explains how evolution and extinction are related. A sample answer would be: “Evolution is the change in genetics of a species over time. Extinction, however, is the end of a species.”

2. Nonliving Living
  temperature
  rainfall
  fire
  height of mountains
  volcanic eruptions
  flooding

Environmental Influences on Species Survival

predators
  competition for food
  competition for territory
  human impact on the environment

Chapter 3 Interactions of Human Systems

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 Interactions of Human Systems, 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 two-pocket folder. Place each section’s Foldables in the correct pocket.

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. 31)

Students should list things they need to keep their bodies healthy, such as food, water, exercise, and sleep.

Read to Learn

1. C + O + O = CO₂ (p. 31)
2. Minerals are involved in chemical processes that keep the body healthy and fight disease. (p. 32)
3. Students highlight calcium, flourine, magnesium, and phosphorus. (p. 32)
4. to help your body digest food, deliver oxygen to cells, and remove wastes from the body (p. 33)
5. Carbohydrates are your main source of energy. (p. 33)
6. Students highlight the nucleus. (p. 34)
7. The two systems work together to help provide oxygen to the body’s cells. (p. 35)
ANSWER KEY

After You Read (p. 36)

1. Students write a sentence that explains the difference between organic and inorganic compounds. A sample answer would be: “Most organic compounds contain carbon, while inorganic compounds lack carbon.”

2. Students explain how highlighting main ideas help them understand what they learned. They may conclude, for example, that identifying main ideas helped them remember the most important ideas about the human organism.

3. Students may say that either eating or an increase in the amount of glucose in the blood causes insulin to be released by the pancreas. (p. 41)

4. Students write a sentence that uses a term and associates it with the related organ system. A sample would be: “The alveoli are the part of the respiratory system where oxygen and carbon dioxide are exchanged.”

Chapter 4 Interactions of Life

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 Interactions of Life, have them combine their section Foldables into the following Foldables chapter project.

Use two 11 × 17 pieces of construction paper to make a bound book. Tape or glue each section’s Foldable to a page. Foldable C and D will be placed on other pages of the book.
ANSWER KEY

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. 43)

Students’ answers will vary, but might include trees, flowers, grass, birds, and squirrels.

Read to Learn

1. The amount of energy that reaches Earth from the Sun helps make the temperature just right for life. (p. 43)

2. deer, rabbits (p. 44)

After You Read (p. 45)

1. Students write a sentence that explains the difference between a community and an ecosystem. A sample sentence could be “A community is made up of all species living in an ecosystem, whereas an ecosystem includes both the living and nonliving parts of an environment.”

2. 1. community; 2. population; 3. ecosystem

Section 2

Before You Read (p. 46)

Students’ answers will vary, but they should indicate what factors—loss of industry, addition of industry—contributed to the human population increase or decrease.

Read to Learn

1. living space, food, and other resources (p. 46)

2. to find out whether or not the population is healthy and growing and to know if a population is in danger of disappearing (p. 47)

3. The species will not have enough resources. They could die, or they could have to move somewhere else. (p. 48)

4. Students highlight Zimbabwe and circle Germany. (p. 48)

5. wind, water, and animals (p. 49)

6. Students’ estimates should indicate that the human population increased by more than 3 billion between 1950 and 2000. (p. 49)

After You Read (p. 50)

1. Students write a sentence that explains how one of the terms can affect the population size of a species. A sample would be “A lack of rain could be a limiting factor for the population of wildflowers in a meadow.”

2. Causes of Changes in Population Size

Competition for food, living space, or other resources
Limiting factors, both living and nonliving
Reaching carrying capacity in an ecosystem
Changes in birth rate, death rate

3. Answers will vary. Students may indicate that writing quiz questions helps them review the specific facts they have learned.
ANSWER KEY

Section 3

Before You Read (p. 51)
Students’ answers will vary, but students might indicate that they get the energy they need to do things from the food they eat.

Read to Learn
1. People belong to the omnivore group because they eat both plants and animals. (p. 52)
2. shrubs (or plants) → deer → mountain lion (p. 52)
3. the organism’s role in the environment—how it obtains food and shelter, finds a mate, cares for its young, and avoids danger (p. 53)
4. Predators limit the size of the prey population, so food and other resources are less likely to become scarce. This reduces competition among the species. (p. 53)

After You Read (p. 54)
1. Students write a sentence that explains the difference between consumers and producers. A sample would be “Producers use the energy from the Sun to make their own energy-rich molecules, whereas consumers get energy by eating other organisms.”

2. Students choose one of the question headings and write an answer to the question. For example, students may choose: “What are food chains?” The answer would be that food chains are simple models that show the feeding relationships in an ecosystem.

Chapter 5 The Nonliving Environment

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 Nonliving Environment, 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 three-pocket folder. Place each section’s Foldable into the pockets as shown. For Section 1, have students use the chapter Foldable found in the Student Edition on the Start-Up Activities page.

Section 1

Before You Read (p. 55)
Students’ responses will vary, but should include what the temperature and precipitation of the area is like most of the time. Students should also indicate how the climate affects plant and animal life around them. Students should note that the plants and animals native to the area are affected by such things as temperature and rainfall.

Read to Learn
1. CO₂, water, and energy from sunlight (p. 55)
2. Because soil is made up of different combinations of sand, clay, and humus, the type of soil a region has will determine the kinds of plants that grow in that region. (p. 56)
3. light energy and heat energy (p. 56)
4. Students highlight the sunlight hitting Earth at the equator in one color, and hitting the poles in another color. (p. 57)
5. There are fewer air molecules to heat. (p. 57)
6. temperature and precipitation (p. 57)
7. Students’ first label should indicate that moist air is carried to land by the wind. The second label should indicate air moving down the other side of the mountain is drier and warmer. (p. 58)

After You Read (p. 59)
1. Students write a sentence that explains the difference between biotic and abiotic factors. A sample would be: “Biotic factors are living things in the environment, such as plants, whereas abiotic factors are nonliving things, such as sunlight.”

<table>
<thead>
<tr>
<th>Abiotic Factor</th>
<th>Importance to Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>CO₂ in the air is important for photosynthesis.</td>
</tr>
<tr>
<td>Water</td>
<td>Many processes, such as digestion, can happen only in the presence of water.</td>
</tr>
<tr>
<td>Soil</td>
<td>The kind of soil an area has determines the kind of plant life found there.</td>
</tr>
<tr>
<td>Sunlight</td>
<td>Sunlight provides energy to all life on Earth.</td>
</tr>
<tr>
<td>Temperature</td>
<td>Temperature determines where most organisms can live, because organisms have to live in a certain range of temperatures to survive.</td>
</tr>
<tr>
<td>Climate</td>
<td>The climate of a place, which includes temperature and precipitation, determines the plant and animal life the place can support.</td>
</tr>
</tbody>
</table>

3. Students may list bathing, drinking, and washing a car. (p. 62)
4. Answers may include that animals get nitrogen from eating plants, animal wastes return nitrogen to the soil, or decomposing animals release nitrogen into the soil. (p. 62)
5. Answers may include fertilizers, compost, and animal manure. (p. 63)
6. respiration and photosynthesis (p. 63)

After You Read (p. 64)
1. Students write a sentence that explains the difference between condensation and evaporation. A sample sentence would be “In condensation a gas is changed into a liquid, whereas in evaporation a liquid is changed into a gas.”

Steps in the Nitrogen Cycle
1. Nitrogen combines with soil bacteria to form nitrogen compounds.
2. Plants take in compounds through roots.
3. Animals eat plants with nitrogen.
4. Nitrogen from bodies of dead organisms returns to soil or atmosphere.

Before You Read (p. 65)
Students’ responses will vary. Students should indicate that they need energy for all their activities. They might indicate food and rest as their sources of energy.

Read to Learn
1. bacteria that live in the deep ocean (p. 66)
2. Berries should be labeled as producers; the mouse and the black bear as consumers. (p. 66)
ANSWER KEY

3. Answers should include that a reduced amount of energy is available to each higher level so many producers are needed to provide energy to the few consumers at the top of the food chain. (p. 67)

After You Read (p. 68)

1. Students write a sentence explaining how the process of chemosynthesis works. A sample sentence would be: “In chemosynthesis, chemicals are used to produce energy-rich nutrient molecules that bacteria use to make their own food.”

2. Students explain how finding definitions of unfamiliar words helped them understand energy flow.

Chapter 6 Ecosystems

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 Ecosystems, have them combine their section Foldables into the following Foldables chapter project.

Use two 11 × 17 pieces of construction paper or cardstock to make a bound book. Students write Ecosystems on the outside of the book. Tape or glue each section’s Foldable to one of the pages. Foldable C is attached to another page.

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. 69)

Students should include changes such as old buildings have been torn down, new buildings have been built, new roads have been built.

Read to Learn

1. where there is already soil and where organisms once lived (p. 70)

2. Answers may include forest fires, avalanches, tornadoes, or human activities such as cutting down trees. (p. 70)

After You Read (p. 71)

1. Students write sentences that explain the difference between pioneer species and climax communities. A sample would be: “Pioneer species are the first living things, such as lichens, to inhabit an area so they are the beginning of primary succession. Climax communities are the end stage of succession and are made up of trees and other species that do not change.”

2. lichens; 2. soil; 3. moss, ferns; 4. grasses, wildflowers; 5. shrubs, trees
3. Students will reflect how the quiz helped them prepare for a test. They should note that it helps to think of questions that might be on the test and then learn the answers.

2. Students explain how underlining important ideas helped them.

3.

<table>
<thead>
<tr>
<th>Biomes</th>
<th>Climate</th>
<th>Plants and Animals</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tundra</td>
<td>very cold, dry, long winters</td>
<td>mosses, grasses, small shrubs, lichens, insects, migratory birds, hawks, owls, mice, reindeer, and oxen</td>
<td>south of north pole or on high mountains</td>
</tr>
<tr>
<td>Taiga</td>
<td>cold, wetter, and warmer than tundra, 35 cm—100 cm of snow yearly</td>
<td>cone-bearing evergreen trees, lichens, moss, moose, bear, lynx</td>
<td>between latitudes 50°N and 60°N across North America, northern Europe, and Asia</td>
</tr>
<tr>
<td>Temperate deciduous forests</td>
<td>below freezing in winter—30°C or more in summer; precipitation from 75 cm—150 cm</td>
<td>deciduous trees, white-tailed deer, many other species</td>
<td>all continents except Antarctica</td>
</tr>
<tr>
<td>Temperate rain forests</td>
<td>temperatures from 9°C to 12°C; precipitation from 200 cm to 400 cm per year</td>
<td>tall trees with needlelike leaves, lichens, moss, black bear, bobcats, amphibians</td>
<td>New Zealand, southern Chile, Pacific Northwest of the United States</td>
</tr>
<tr>
<td>Tropical rain forests</td>
<td>warm temperatures averaging above 25°C; 200 cm to 600 cm of rain yearly</td>
<td>many kinds of species of plants and animals including giant trees, moss, lichens, birds, reptiles, amphibians, insects, small and large mammals</td>
<td>all continents except Europe and Antarctica, near the equator</td>
</tr>
<tr>
<td>Deserts</td>
<td>dry, extreme hot and cold temperatures; less than 25 cm of rain yearly</td>
<td>cactus, kangaroo rat, small animals</td>
<td>all continents except Europe and Antarctica</td>
</tr>
<tr>
<td>Grasslands</td>
<td>temperate, tropical regions with little rain; 25 cm—75 cm</td>
<td>grasses, kangaroos, zebras</td>
<td>temperate and tropical regions in all continents except Antarctica</td>
</tr>
</tbody>
</table>

Section 2

Before You Read (p. 72)

Students should describe the geographic area where they live including information about the climate, the landforms, and the kind of plants and animals that live in the area.

Read to Learn

1. Few species; many species cannot survive the harsh climate. (p. 73)
2. Students circle North America, South America, Africa, Asia, and Australia. (p. 73)
3. The leaves fall off every autumn. (p. 74)
4. It removes large parts of the temperate rain forest and destroys the habitats of many organisms (p. 74)
5. Students highlight emergents and canopy. Students circle emergents, canopy, understory, and forest floor. (p. 75)
6. The ground is bare because there is not enough water to support plant life. (p. 76)
7. The dry season with little or no rain keeps forests from developing. (p. 76)

After You Read (pp. 77–78)

1. Students should write two sentences that explain the difference between temperate deciduous forests and temperate rain forests. A sample would be: “The trees in a deciduous forest lose their leaves every autumn. The trees in temperate rain forests have needlelike leaves that do not fall off every autumn.”
ANSWER KEY

Section 3

Before You Read (p. 79)
Students’ answers include any four of the following bodies of water classified as freshwater or salt water: Freshwater—rivers, streams, lakes, ponds, wetlands, swamps, bogs, fens; salt water—oceans, estuaries, bays, lagoons, harbors, inlets, sounds.

Read to Learn
1. Lakes are larger and deeper than ponds and have more open water. (p. 80)
2. Students should make a pie graph that shows 95% salt water and 5% freshwater. (p. 80)
3. the lighted zone and the dark zone (p. 81)
4. changes in temperature, moisture, and the amount of salt in the water (p. 81)

After You Read (p. 82)
1. Students write a sentence explaining the difference between a wetland and an estuary. A sample would be: “A wetland is a freshwater region that is wet for all or most of the year. An estuary is an area where a river meets an ocean and contains a mixture of freshwater and salt water.”

Chapter 7 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. 83)
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. 84)
2. Wegener didn’t provide enough evidence. (p. 84)
3. Students will draw leaves on the continents named. (p. 85)
4. glacial deposits and scarring (p. 85)
5. Similar rock structures are found on different continents. (p. 86)
6. Student should label North America on the drawings of the drifting continents. (p. 86)

After You Read (p. 87)
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
   Pangaea broke apart.

Second
   Continents began to drift.

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.

Section 2

Before You Read (p. 88)
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. 89)
2. Older rocks are located farther away. (p. 89)
3. north to south (p. 90)
4. Iron in rocks are magnetized in the same direction as the magnetic field. The direction changes when there is a reversal. (p. 90)
ANSWER KEY

After You Read (p. 91)
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.
3. Student answers will vary as how marking the text with sticky notes for later discussion helped them understand seafloor spreading.

Section 3

Before You Read (p. 92)
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. 93)
2. divergent boundaries (p. 93)
3. getting larger because of volcanic activity (p. 94)
4. They crash and fold into mountain ranges. (p. 95)
5. Students should highlight arrows showing plates moving in the same direction. (p. 95)
6. convection current (p. 96)
7. Students should label uppermost arrow cooling, followed by sinking, heating, and rising. (p. 96)
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. 97)
9. Students should circle arrows showing compression forces on top of the figure. (p. 98)
10. volcanoes and mountains (p. 98)
11. indirect evidence (p. 99)
12. Students should respond that the laser is reflected from the satellite to Earth. (p. 99)

After You Read (p. 100)
1. Student answers should demonstrate they understand that the rigid lithosphere moves and floats on the plasticlike layer called the asthenosphere.
2. Major Plates of the Lithosphere

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 8 Earthquakes and Volcanoes

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 and Volcanoes, have them combine their section Foldables into the following Foldables chapter project.
Use two sheets of 11 × 17 paper to make a bound book. Tape or glue each Foldable to a page. Title the project Earthquakes and 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. 101)
Student may talk about the ground shaking, buildings collapsing, people getting trapped by rubble.

Read to Learn
1. direction of movement (p. 102)
2. seismic waves (p. 103)
3. (1) epicenter, (2) seismic waves (p. 103)
4. primary waves, secondary waves (p. 104)
5. study earthquakes (p. 104)
6. 4,000 km, 5 min (p. 105)
7. Anchorage (p. 105)
8. $32 + 32 = 64$ times stronger (p. 106)
9. tsunamis (p. 106)
10. Answers will vary, but should include one of the following: Put heavy things on lower shelves. Secure gas hot water heater and appliances. Have a sensor installed on gas lines so they shut off during an earthquake. (p. 107)

11. Some possible safety measures include: Reinforcing with spiral rods in concrete structures; putting buildings on rubber supports that bend; making water and gas pipes flexible so they don’t break. (p. 107)

After You Read (p. 108)
1. One example: Seismic waves from an earthquake are recorded on a seismograph. Based on the information, the magnitude of the earthquake is given as a number on the Richter scale.

3. Student answers will vary as to whether or not underlining key terms and main ideas helped them learn the information.

Section 2

Before You Read (p. 109)
Possible answers: lava flows, dust and ash, hot lava, getting buried in rocks

Read to Learn
1. Students should label magma inside Earth and lava outside Earth’s surface. (p. 110)
2. The lava is thicker and doesn’t flow as well. It traps more gas and water. (p. 110)
3. in broad, flat layers (p. 111)
4. Tephra layers may have periodically exploded from the vent and built steep sides up around the cone. (p. 112)
ANSWER KEY

5. Students should circle the Columbia River Basalts on the map. (p. 112)

After You Read (p. 113)

1. Sentences should include information about different volcanic eruptions such as: Lava flows more slowly and quietly out of a shield volcano. Tephra explodes forcefully out of a cinder cone volcano because of the build up of gas in the magma. Composite volcanoes sometimes have quiet eruptions and sometimes have explosive eruptions.

2. Answers will vary. Students may say that flash cards make it easier to memorize new information.

Section 3

Before You Read (p. 114)

They are caused by forces inside Earth. They have to do with things moving inside Earth. They can be dangerous to humans.

Read to Learn

1. Students should trace areas on map where volcanoes are located and should notice they are near plate boundaries. (p. 115)
2. The plate that sinks melts. (p. 116)
3. Circle should be around the island closest to the hot spot. Box should be around the island farthest away. (p. 116)
4. Pressure builds up and the plates bend upward. (p. 117)

5. Magma rises, cools, sinks, then heats in a convection current. (p. 117)

After You Read (p. 118)

1. Volcanoes can occur at a rift where two plates are separating, allowing magma to come to the surface. Volcanoes can occur at a hot spot in the middle of a plate, if magma is allowed to come to the surface.

2. |   |   |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hot spot forms in Earth's mantle.</td>
</tr>
<tr>
<td>2</td>
<td>Breaks through Earth's surface.</td>
</tr>
<tr>
<td>3</td>
<td>Lava cools on the bottom of the ocean.</td>
</tr>
<tr>
<td>4</td>
<td>Over time, lava flows build up into a volcanic mountain.</td>
</tr>
<tr>
<td>5</td>
<td>Volcanic island is formed.</td>
</tr>
</tbody>
</table>

3. Answers will vary as to whether or not they found it helpful to discuss with their partner what they already knew and what they learned from the text.

Chapter 9 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 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. 119)

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. 120)
2. groundwater (p. 120)
3. a cavity, or hole, in a rock (p. 121)
4. The substance of the shell has been replaced by a mineral to form the cast. (p. 121)
5. burrows, trails, footprints, or tracks (p. 122)
6. remains of fossils that lived for a short time, were numerous, and were found in many places (p. 122)
7. 410 to 440 million years ago (p. 123)
8. Seas must have covered the mountains long ago. The tops of mountains must have been the bottom of seas. (p. 123)

After You Read (p. 124)

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. 125)

You need to know their birthdays.

Read to Learn

1. relative age (p. 126)
2. Students should highlight the limestone. Oldest fossils are probably found in the layer of sandstone. (p. 126)
3. unconformities (p. 127)
4. Students should highlight the angular unconformity. (p. 127)
5. Students should highlight rock surfaces where erosion took place before new sediments were deposited. (p. 128)
6. Students should color rock being uplifted red and sedimentary rock blue. (p. 128)
7. Two ways to correlate rock layers are walking the layers and using fossil evidence. (p. 128)
**ANSWER KEY**

**After You Read (p. 129)**

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>Type</th>
<th>Description</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<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. 130)**

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. 131)

2. Students should circle the beta particle and alpha particle being released. (p. 131)

3. The parent isotope has to break down or decay. (p. 132)

4. Students should circle the remains of the parent material after four half-lives and write 1/16 on the line. (p. 132)

5. Sedimentary rocks are eroded from older rocks. Radiometric dating would give the age of the original rocks. (p. 133)

6. slow, everyday changes; sudden, violent events (p. 133)

**After You Read (p. 134)**

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. | Percent Carbon-14 | Years Passed |
---|-------------------|-------------|
| 100  | 0                |
| 50   | 5,730           |
| 25   | 11,460          |
| 12.5 | 17,190          |
| 6.25 | 22,920          |
| 3.125| 28,650          |

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 10 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.
**ANSWER KEY**

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. 135)

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. 136)
2. mass extinction (p. 136)
3. a species (p. 137)
4. Charles Darwin (p. 137)
5. The animals might have died out as a species. (p. 138)
6. by moving (p. 138)
7. Students should outline the long lobes in red, and circle the head, middle, and tail in blue. (p. 139)
8. became extinct; evolved (p. 139)
9. eye location (p. 140)
10. Students should highlight the body segments on each trilobite. (p. 140)
11. how different species of trilobites adapted to new conditions (p. 141)
12. Students should outline the continents they recognize. (p. 141)

**After You Read** (p. 142)

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.

**Section 2**

**Before You Read** (p. 143)

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, so no oxygen-breathing animals, including people (p. 144)
2. The Paleozoic Era had more organisms with hard body parts that preserved well in fossils. (p. 144)
3. fishlike creatures without jaws (p. 145)
4. Students should circle the leglike fins. (p. 145)
5. protective coating around eggs or scales (p. 146)
6. island chains (p. 146)
ANSWER KEY

After You Read (p. 147)
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; amphibians

   blue-green algae, called cyanobacteria

   animals without backbones, called invertebrates

   when animals with backbones, called vertebrates evolved, amphibians also evolved.

3. Student responses will vary.

Section 3

Before You Read (p. 148)
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. 149)
2. Answers will vary but may include: bones don’t have rings; circular; hollow core. (p. 149)
3. Student responses will vary, but may compare fur, legs, body shape with a mouse or other rodent. (p. 150)
4. They’re both plants; produce seeds. (p. 150)
5. Cenozoic Era (p. 151)
6. Homo sapiens (p. 151)

After You Read (p. 152)
1. Student sentences will vary, but should describe one of the eras.

2. Student responses may vary.

   MESOZOIC ERA
   Plants
   gymnosperms
   Changes in Earth
   Pangaea breakup
   Animals
   dinosaurs

   CENOZOIC ERA
   Plants
   angiosperms
   Changes in Earth
   mountain building
   Animals
   mammals

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

Chapter 11 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. 153)

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

Read to Learn

1. 12,756 km — 12,714 km = 42 km; Earth is not a perfect sphere. (p. 154)
2. Earth has opposite north and south magnetic poles. (p. 154)
3. Students should draw lines through Earth’s magnetic axis and rotational axis. (p. 155)
4. Earth’s orbit, or path, around the Sun (p. 155)
5. Daylight hours are shorter in winter. (p. 156)
6. the southern hemisphere (p. 156)
7. over the Tropic of Capricorn (p. 157)
8. An equinox occurs when the Sun is directly above Earth’s equator. (p. 157)

After You Read (p. 158)

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

Section 2

Before You Read (p. 159)

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. 160)
2. more of the lighted half of the moon can be seen from Earth (p. 160)
3. about twelve and a half times a year (p. 161)
4. Earth (p. 161)
5. Students should label the darker area umbra and the lighter shadow penumbra. (p. 162)
6. Students should correctly label umbra and penumbra. (p. 163)
7. during the full moon phase (p. 164)
8. Maria are dark, flat regions on the Moon resulting from an ancient lava flow. (p. 164)
9. A new theory, the impact theory, was formed. (p. 164)
10. about 90 km (p. 165)
ANSWER KEY

11. core, lower mantle, upper mantle, and crust (p. 165)

After You Read (p. 166)
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.
   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. 167)
Possible responses: What is it made of? How was it formed? How long has it been there?

Read to Learn
1. Apollo 15 (p. 168)
2. iron (p. 169)
3. ice is found in deep craters at both poles (p. 169)

After You Read (p. 170)
1. Students’ answers will vary. Sample: An impact basin is caused by a collision with an object such as a meteorite.

<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>

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 12 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.

Section 1

Before You Read (p. 171)
Accept any or all: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

Read to Learn
1. the Sun’s gravity (p. 172)
2. Mercury, Pluto, Earth (p. 172)
3. Mercury, Venus, Earth, and Mars (p. 173)
4. Neptune (p. 173)

After You Read (p. 174)
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 Sun formed first. It was at the center of the new solar system.
4. The other material in the solar system collided and formed nine planets.
5. 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. 175)
Accept any reasonable answers.

Read to Learn
1. from 425°C to −170°C (p. 176)
2. Students’ answers will vary. Sample: like Earth in mass and size; carbon dioxide atmosphere (p. 176)
3. protects life forms from the Sun's harmful rays, causes meteors to burn before they reach the surface (p. 177)
4. No (p. 178)
5. evidence of life (p. 178)
6. alcove, channel, and apron (p. 178)
7. strong winds, which cause dust storms (p. 179)
8. It is tilted on its axis. (p. 179)

After You Read (p. 180)
1. Possible answer: Mars has two moons.
2.

<table>
<thead>
<tr>
<th>THE INNER PLANETS</th>
<th>ORDER FROM SUN</th>
<th>ATMOSPHERE</th>
<th>TEMPERATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERCURY</td>
<td>Closest</td>
<td>No true atmosphere</td>
<td>Highs: 425°C Lows: −170°C</td>
</tr>
<tr>
<td>VENUS</td>
<td>2nd</td>
<td>Heavy clouds Carbon dioxide gas</td>
<td>Highs: 475°C Lows: 450°C</td>
</tr>
<tr>
<td>EARTH</td>
<td>3rd</td>
<td>protects life-forms from harmful effects of the Sun</td>
<td>Not given</td>
</tr>
<tr>
<td>MARS</td>
<td>4th</td>
<td>Mostly carbon dioxide, some nitrogen and argon</td>
<td>Highs: 75°C Lows: −125°C</td>
</tr>
</tbody>
</table>

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

### Section 3

**Before You Read (p. 181)**
Accept any reasonable responses.

**Read to Learn**

1. moons of Jupiter (p. 182)
2. Possible answers: largest planet, faint rings, hydrogen and helium atmosphere, continual storms, at least 61 moons in all (p. 182)
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. 183)
4. a collision (p. 183)
5. b. Methane (p. 184)
6. Answers will vary, but students should see that no life could exist on Pluto because the planet has a thin atmosphere. (p. 184)

**After You Read (p. 185)**

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

### Section 4

**Before You Read (p. 186)**
Accept all possible responses.

**Read to Learn**

1. an event in which Earth passes through the old orbit of a comet, and small pieces of rock and dust enter Earth’s atmosphere (p. 187)
2. Mars and Jupiter (p. 187)
3. to learn what the solar system might have been like long ago, and possible better understand how Earth formed (p. 187)

**After You Read (p. 188)**

1. The Oort cloud is a giant area of comets out beyond the orbit of Pluto.
2. **Meteor**: meteoroid that burns up in Earth’s atmosphere  
**Asteroid Belt**: lies between the orbits of Mars and Jupiter  
**Comet**: space object made of dust and rock particles mixed with frozen water, methane, and ammonia  
**Meteorite**: rock from space that strikes Earth’s surface

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

### Chapter 13 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. 189)**

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. 190)
2. the circumpolar constellations (p. 190)
3. the close object (p. 191)
4. elements in a star’s atmosphere (p. 191)

**After You Read (p. 192)**

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. 

#### Constellations are a group of stars arranged in a pattern.  
**Polaris** is often called the North Star.

Stars seem to move in the night sky because Earth rotates.

#### Absolute magnitude describes a star’s brightness.

The hottest stars are blue-white. Cooler stars are orange or red.

The distance between stars is measured in light-years.

3. 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.”
ANSWER KEY

Section 2

Before You Read (p. 193)
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. 194)
2. Gases near a sunspot brighten and shoot outward. (p. 194)
3. Answers will vary. Sample answer: It occurs near Earth’s northern pole. (p. 195)
4. about eight minutes (p. 195)

After You Read (p. 196)
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.”

Section 3

Before You Read (p. 197)
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. 198)
2. white dwarfs (p. 198)
3. fusion (p. 199)
4. about 5 billion years (p. 199)
5. As hydrogen levels go down, the star’s temperature goes up. (p. 200)
6. a neutron star (p. 201)

After You Read (p. 202)
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. 203)
Answers will vary, but students might note that 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. 204)
2. The universe expands. (p. 204)
3. It’s getting closer. (p. 205)
4. It began with a huge explosion. (p. 205)

After You Read (p. 206)
1. Answers will vary, such as: “The big bang theory explains why galaxies are moving apart.”

2. (Diagram showing the universe, local group, Milky Way, solar system, and Earth)

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.”

Chapter 14 Inside the Atom

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 Inside the Atom, have them combine their section Foldables into the following Foldables chapter project.

Use one 11 × 17 or 12 × 18 piece of construction paper as a base to create a chapter project. Tape or glue each section’s Foldable inside the panels as shown. Have students tape or glue Foldable B from Section 1 onto the back of the project. Title the project The Story of the Atom and The Nucleus.

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. 207)
Students should provide reasonable answers, such as: The smallest thing I ever saw was a plant cell under a microscope. The cell was made up of smaller parts.
ANSWER KEY

Read to Learn

1. Early scientists did not know much about chemistry. They didn’t have the equipment. (p. 207)

2. Students should draw a circle around the anode and a square around the cathode. (p. 208)

3. Light cannot be bent by a magnet. (p. 209)

4. All materials produced electrons. (p. 209)

5. Dalton’s model is the same throughout. Thompson’s has electrons. (p. 210)

6. Alpha particles are positively charged. Two positive charges will repel. (p. 210)

7. No, some bounce back. (p. 210)

8. Electrons (p. 211)

9. They were repelled by the positive charge, or protons, in the nucleus. (p. 211)

10. 6; 6 (p. 212)

11. Empty space (p. 212)

12. There is no clear boundary. (p. 213)

13. Students should shade the area of the electron cloud closest to the nucleus. (p. 213)

After You Read (p. 214)

1. The atoms of the element gold are all the same.

2. Students should include reasonable responses, such as the following:

3. Students reflect on learning strategies that worked for them in this section, such as: I used my outline to help me remember the different models of an atom.

Section 2

Before You Read (p. 215)

Students should provide reasonable answers, such as: the shape of the body, face, hair color, eye color, skin color.

Read to Learn

1. \[238 - 92 = 146\] neutrons (p. 216)

2. Strong nuclear force (p. 216)

3. It becomes another element. (p. 217)

4. Two protons and two neutrons (p. 217)

5. 3 (p. 217)

6. Students should circle the electron, labeled \(e^–\). (p. 218)

7. 0.5 g (p. 218)

8. Elements made by humans (p. 219)
9. We need to know if the pesticides are getting into water supplies. (p. 219)

After You Read (p. 220)

1. The atomic number is the number of only the protons in an element. The mass number is the number of protons and neutrons.

2.

<table>
<thead>
<tr>
<th>Radioactive Decay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Particle Released</strong></td>
</tr>
<tr>
<td>Alpha particle</td>
</tr>
<tr>
<td>Beta particle</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. 221)

Students should give reasonable answers, such as:
An element is matter. Elements make up everything on Earth.

Read to Learn

1. transition elements (p. 222)

2. Students should number the groups of representative and transition elements 1 through 18. (p. 222)

3. copper (p. 223)

4. one or two (p. 224)

5. The symbol for gold is Au because it is comes from the Latin word aurum. (p. 224)

After You Read (p. 225)

1. Possible answer: A period is a row of elements going across the periodic table and a group is a column of elements going up and down on the period table.
ANSWER KEY

2. Metals
   - have luster
   - conduct heat and electricity
   - malleable
   - ductile
   - solids at room temperature

Nonmetals
   - gases or breakable solids at room temperature
   - poor conductors of heat and electricity

metalloids

3. Accept all reasonable responses, such as: The periodic table shows all the elements. Elements that are alike are close to each other in the table.

Section 2

Before You Read (p. 226)
Students should provide reasonable answers, such as: Aluminum is used in buildings. It is also used to make soda cans.

Read to Learn
1. six (p. 227)
2. false (p. 227)
3. Boron is the first element in the group. (p. 227)
4. lead (p. 228)
5. Sb (p. 228)
6. They would burst into flames when exposed to air. (p. 229)
7. tellurium (p. 229)
8. 18 (p. 230)
9. radon (p. 230)

After You Read (p. 231)
1. Possible answer: An alkali metal has a lower density. It is softer and has a lower melting point.

Section 3

Before You Read (p. 232)
Students should provide reasonable answers, such as: I use spoons and forks, paper clips, and scissors.

Read to Learn
1. four periods (p. 233)
2. the platinum group (p. 233)
3. 28 (p. 234)
4. because they are so alike (p. 234)
5. They become other elements. (p. 235)
6. Dentists can make the wires in the shape they want the teeth to be and they will try to return to that shape, straightening the teeth as they do. (p. 235)

After You Read (p. 236)
1. Possible answer: You would add a catalyst to something to make it happen faster.
ANSWER KEY

2. Possible uses given.

<table>
<thead>
<tr>
<th>Element</th>
<th>Element Group</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plutonium</td>
<td>actinide</td>
<td>nuclear power plant</td>
</tr>
<tr>
<td>Cerium</td>
<td>lanthanide</td>
<td>lighter</td>
</tr>
<tr>
<td>Tungsten</td>
<td>transition element</td>
<td>light bulb filament</td>
</tr>
<tr>
<td>Iron</td>
<td>transition element</td>
<td>building material</td>
</tr>
</tbody>
</table>

3. Students should provide reasonable answers, such as: I can make a table and list the transition elements, lanthanides, and actinides. I can use the table to study the elements.

Chapter 16 Atomic Structure and Chemical Bonds

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 Atomic Structure and Chemical Bonds, have them combine their section Foldables into the following Foldables chapter project.

Use one 11 × 17 piece of construction paper or cardstock to make a book-type project. Place the optional Foldable on the left side of the inside of the project book. Place Foldable [A] from Section 1 on the right side of the inside of the project book. Place Foldable [B] from Section 2 on the back of the project. Title the project Atomic Structure and Chemical Bonds.

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. 237)

Students should provide reasonable answers, such as: A rock is solid and heavy. A balloon is hollow and light.

Read to Learn

1. Students should circle the electrons. (p. 238)
2. different areas for electrons to be in an atom (p. 238)
3. Students should label the energy level that is closest to the nucleus. (p. 239)
4. energy level three (p. 239)
5. 50 electrons; \(2(5^2) = 2(25) = 50\) (p. 240)
6. the number of protons in an atom of an element (p. 240)
7. Students should circle boron and aluminum. (p. 241)
8. They have the same number of electrons in their outer energy levels. (p. 241)
9. eight electrons (p. 242)
10. Halogens need to gain one electron to be stable. Alkali metals need to lose one electron to be stable. (p. 242)
11. how an element can react (p. 243)
12. six electrons (p. 243)

After You Read (p. 244)

1. The energy levels in an atom are located in the electron cloud.
ANSWER KEY

2. Students should draw five dots around the letter P so that the electron dot diagram looks like the diagram for nitrogen.

3. Nitrogen and phosphorus have the same number of electrons in their outer energy levels.

4. Accept all reasonable answers. Students reflect on how highlighting helped them understand more about electrons in an atom.

Section 2

Before You Read (p. 245)

Students should provide reasonable answers, such as: When things are bonded, they are stuck together. You can use tape or glue to bond things.

Read to Learn

1. neutral (p. 246)

2. Students should circle the single electron in the third energy level of the sodium atom. Then, they should circle the added electron to the right of the Cl symbol in the third energy level. (p. 246)

3. Students should draw an arrow from the single dot in the sodium electron dot diagram to the empty place at the left in the chlorine electron dot diagram. (p. 247)

4. two negative charges of the two chlorine ions (p. 247)

5. free (p. 248)

6. nonmetal (p. 248)

7. two electrons (p. 249)

8. three pairs (p. 249)

9. uneven (p. 250)

10. Partial positive charges are attracted to partial negative charges. Partial negative charges are attracted to partial positive charges. (p. 250)

11. modern (p. 251)

12. It tells you which elements are in a compound and how many atoms of an element are present. (p. 251)

After You Read (p. 252)

1. Students should write accurate sentences contrasting two kinds of chemical bonds, such as: In a covalent bond, atoms share electrons but in a metallic bond, atoms pool electrons.

2.  

<table>
<thead>
<tr>
<th>Type of Bond</th>
<th>Reaction</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ionic bond</td>
<td>A negative ion and a positive ion come together.</td>
<td>sodium chloride or table salt</td>
</tr>
<tr>
<td>Metallic bond</td>
<td>Metal atoms share their pooled electrons.</td>
<td>silver</td>
</tr>
<tr>
<td>Covalent bond</td>
<td>Atoms come together to share electrons.</td>
<td>hydrogen, water</td>
</tr>
<tr>
<td>Polar bond</td>
<td>A covalent bond in which the electrons are shared unevenly.</td>
<td>water</td>
</tr>
</tbody>
</table>

Chapter 17 Chemical Reactions

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 Chemical Reactions, have them combine their section Foldables into the following Foldables chapter project.

Use one sheet of 11 × 17 or 12 × 18 construction paper or cardstock to create a chapter project. Tape or glue each section’s Foldable inside the book. Foldable B from Section 2 may be glued to the back of the project. Title the project *Chemical Reactions*.
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. 253)
Students should give reasonable answers, such as: The wood turns to ashes and smoke is made.

Read to Learn
1. sight, hearing, smell, taste, and touch (p. 254)
2. bubbles and foam (p. 254)
3. reactants, products, physical states, and amounts of each substance (p. 255)
4. banana + oxygen → banana turns brown (p. 255)
5. 3; 2 (p. 256)
6. 5; 5 (p. 256)
7. law of conservation of mass (p. 257)
8. 2HCl + Cu → CuCl₂ + H₂ (p. 257)
9. Possible answers: gas burning to heat stove, wood burning (p. 258)
10. water (p. 258)
11. a battery (p. 258)
12. heat (p. 259)

13. endothermic (p. 259)

After You Read (p. 260)
1. Possible answer: Reactants and products are both part of chemical reactions and equations. The reactants combine to make the products.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Balanced Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂ + O₂ → H₂O</td>
<td>2H₂ + O₂ → 2H₂O</td>
</tr>
<tr>
<td>H₂ + Cl₂ → HCl</td>
<td>H₂ + Cl₂ → 2HCl</td>
</tr>
<tr>
<td>2Al + 3CuCl₂ → 2AlCl₃ + 3Cu</td>
<td></td>
</tr>
</tbody>
</table>

3. Student answers should reflect on how highlighting helped them, such as: Highlighting the chemical equations helped me to study the equations to make sure I understood them.

Section 2

Before You Read (p. 261)
Students should provide reasonable answers, such as: Wood or newspaper burning happens fast.

Read to Learn
1. It does not cost as much to pay the workers since they work for less time. (p. 262)
2. 0°C (p. 262)
3. It slows down molecules so they crash into each other less often and with less energy. (p. 263)
4. the bottom circle (p. 263)
5. More of its molecules are out in the open. (p. 263)
6. Possible answer: You can get rid of the harmful substance faster. (p. 264)
ANSWER KEY

7. Possible examples: build bones and tissue, change food to fuel, make other enzymes, change extra energy to fat (p. 265)

8. bring them together (p. 265)

After You Read (p. 266)

1. Possible answer: You add a catalyst to a reaction to make it go faster. You add an inhibitor to a reaction to make it go slower.

2. Cause
   - an increase in temperature
   - a decrease in concentration
   - a decrease in surface area
   - adding a catalyst
   - a decrease in temperature

   Effect on Reaction Rate
   - speeds up
   - slows down

3. Accept all reasonable answers. Student answers should reflect on how making flash cards with possible quiz questions helped them learn about rates of chemical reactions.

Chapter 18 Motion and Momentum

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 Motion and Momentum, have them combine their section Foldables into the following Foldables chapter project.

Use one 11 × 17 piece of paper to make an accordion fold project as shown below. Glue or tape each section’s Foldables as shown. Title the project Motion and Momentum.

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. 267)

Students should provide reasonable answers, such as when you move, you can see the things around you going by. When you get to your new place, the things around you look different.

Read to Learn

1. a reference point (p. 267)
2. because your ending point is the same as your starting point (p. 268)
3. instantaneous speed (p. 269)
4. Students should show their work.
   \[3 \text{ m}/4 \text{ s} = 0.75 \text{ m/s}\] (p. 269)
5. 1 m (p. 270)
6. the direction it was moving (p. 270)

After You Read (p. 271)

1. Ramona found her average speed because average speed is a distance divided by the time it takes to travel that distance.
ANSWER KEY

2. a. 25 km/h  
b. Her speed decreased.  
c. The line of the graph becomes less steep.  
d. 20 km/h

Section 2

Before You Read (p. 272)
Students should provide reasonable answers, such as my coach measures the time it takes me to run 100 meters.

Read to Learn
1. A change in direction is a change in velocity. (p. 273)
2. 7 m/s² (p. 273)
3. negative (p. 274)
4. 2 seconds (p. 274)

After You Read (p. 275)
1. Possible answer: Acceleration measures an object changing speed, direction, or both in a certain amount of time.

Read to Learn
2. Students should show their work.  
3. c (p. 277)
4. slower (p. 278)
5. Students should show their work. (p. 278)
   (3 kg × 4 m/s) + (57 kg × 0 m/s) = 12 kg · m/s
   12 kg · m/s = (3 kg + 57 kg) × velocity
   12 kg · m/s = (60 kg) × velocity
   0.2 m/s = velocity
6. from the marble with the smaller mass to the marble with the larger mass (p. 279)
7. No (p. 279)

After You Read (p. 280)
1. Mass affects inertia. The more mass an object has, the more inertia it has.
2. Students should draw arrows that show the two marbles will move in the direction of the larger marble.
3. Students should provide reasonable answers, such as: It is hard to tackle a large football player who is running because of inertia and when two football players collide, momentum is moved.
**Chapter 19 Force and Newton’s Laws**

**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 Force and Newton’s Laws, have them combine their section Foldables into the following Foldables chapter project.

Use one $11 \times 17$ or $12 \times 18$ piece of construction paper or cardstock to make a book project as shown below. Glue or tape Foldable B on the back of the project. Title the project *Force and Newton’s Laws*.

**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. 281)**

Students should provide reasonable answers, such as: You have to push a shopping cart to make it move. Motion is caused by some kind of push.

**Read to Learn**

1. The door will not move. (p. 282)

2. to the right; to the right (p. 282)

3. The object would keep moving in a straight line with the same speed. (p. 283)

4. Students should draw an arrow pointing to the right. (p. 284)

5. rolling (p. 284)

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

1. Possible answer: The skateboard stops because friction acts on it and it slows down.

2. 

<table>
<thead>
<tr>
<th>Object at rest</th>
<th>How is it affected by Newton’s first law?</th>
<th>Which type or types of friction could affect it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>An object remains at rest if the net force acting on it is zero.</td>
<td>static friction</td>
<td></td>
</tr>
</tbody>
</table>

3. Accept all reasonable answers. Students should reflect on how the flash cards helped them learn about Newton’s first law.

### Section 2

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

Students should provide reasonable answers, such as: It means that the car is going faster and faster.

**Read to Learn**

1. newtons (p. 287)

2. $343 \text{ N}; 35 \text{ kg} \times 9.8 \text{ m/s}^2 = 343 \text{ N}$ (p. 287)

3. weight (p. 288)

4. 0.007 (p. 288)
ANSWER KEY

5. Students should label the arrow on the left as *Force due to friction* and label the arrow on the right as *Direction of motion.* (p. 289)

6. 7 m/s²; 14 N ÷ 2 kg = 7 m/s² (p. 289)

7. Students should draw the curved path of a ball. (p. 290)

8. toward the center of the circle; The centripetal force is always toward the center of the circle. (p. 290)

9. It would go around Earth and never hit the ground. (p. 291)

10. the center of the ball (p. 291)

After You Read (p. 292)

1. An object can accelerate by speeding up, slowing down, or changing direction.

2. Possible answer: Reviewing what I underlined made me read over the main ideas of the section again. This will help me remember the main ideas.

3. Even in free fall, gravity is still pulling down on an object. (p. 295)

4. gravity (p. 295)

After You Read (p. 296)

1. The wall of the rocket engine puts an action force on the hot gases. This force pushes them out of the engine. The gas molecules put a reaction force on the engine. This pushes the rocket forward.

2. Students should provide reasonable answers, such as: You could stand on the skateboard and jump off of it. The action force would push the skateboard backward. The reaction force would push you forward.

Chapter 20 Work and Simple Machines

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 Work and Simple Machines have them combine their section Foldables into the following Foldables chapter project.
Use one sheet of 11 × 17 or 12 × 18 paper or cardstock to create a shutterfold project. Glue each Foldable to the project. Title the project *Work and Simple Machines*.

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. 297)**

Students should give reasonable answers, such as: I did homework; I washed dishes; I took out the garbage.

**Read to Learn**

1. Students should circle the forward force. (p. 298)
2. 50 N × 2 m = 100 J (p. 298)
3. It decreases. (p. 298)
4. 7 watts (p. 299)
5. kinetic and potential (p. 299)

**After You Read (p. 300)**

1. Possible answer: You do work when you push on something and it moves in the direction you are pushing.

**Reading Essentials**

- Was work done? In which direction was work done? How did the action change the energy of the object?
- Lifting your books from the bottom of your locker: yes, up, The books now have potential energy.
- Carrying your books from your locker to class: no, no direction, no energy.
- Pushing your book across your desk for a friend to see: yes, across the desk, The book had kinetic energy while it was moving.

**Section 2**

**Before You Read (p. 301)**

Students should provide reasonable answers, such as: I used a car; I used a dishwasher.

**Read to Learn**

1. c (p. 302)
2. a. force, b. distance (p. 302)
3. 80 percent (p. 303)
4. High spots touch and stick. (p. 303)
5. sandpaper (p. 303)

**After You Read (p. 304)**

1. Possible answer: The input force makes the machine work. The machine makes the output force that makes work easier.
ANSWER KEY

2. Students should provide reasonable answers, such as: I knew I understood the material when I could answer the questions.

3. Students should provide reasonable answers, such as: It would be good to show examples of the simple machines for students to use.

Chapter 21 Thermal Energy

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 Thermal Energy, have them combine their section Foldables into the following Foldables chapter project.

Use an 11 × 17 piece of paper as the base of the project. Fold the paper into thirds as shown below. Tape or glue each section’s Foldable as shown. Have students fold the Foldable from Sections 1 and 2 as shown and label it Thermal Energy. Title the project Thermal Energy.

Before You Read (p. 305)

Students should provide reasonable answers, such as: I would use the ramp because it is easier.

Read to Learn

1. Students should circle Force = 300 N and Force = 1,500 N; 1,200 N (p. 306)
2. 500 N (p. 306)
3. friction between the screw threads and the object (p. 307)
4. 3 (p. 307)
5. the axle (p. 308)
6. 5 (p. 308)
7. It changes the direction of the force. (p. 309)
8. It multiplies the input force. (p. 309)

After You Read (p. 310)

1. A screw and a wedge are both inclined planes.
ANSWER KEY

Section 1

Before You Read (p. 311)
Students should give reasonable examples of how they used temperature, such as checking an outside thermometer to see if they should wear a jacket, or setting the oven to a specific temperature to bake something.

Read to Learn
1. the average kinetic energy of all the molecules (p. 312)
2. Students write 32 before °F and 0 before °C (p. 312)
3. Students should show all steps. \(80 - 32 = 48; 48 \times 5 = 240; 240 \div 9 = 26.7°C\) (p. 313)
4. Students should show all steps.
   \[30 + 273 = 303 \text{ K}\] (p. 313)
5. potential energy (p. 313)

After You Read (p. 314)
1. Students should write an accurate sentence, such as: If two objects are the same temperature and made of the same material, but are different sizes, the larger object has more thermal energy.
2. 1. b; 2. d; 3. f; 4. a; 5. c; 6. e
3. Students should provide a reasonable answer, such as: I can use the flash cards to quiz myself on questions that might be on the test.

Section 2

Before You Read (p. 315)
Students should give reasonable answers, such as build a fire or wear many layers of clothing.

Read to Learn
1. Sample answers: an egg cooking in a hot pan; an ice cube melting on a warm sidewalk (p. 316)
2. electromagnetic waves (p. 316)
3. The particles in a warm fluid are farther apart than the particles in a cool fluid. (p. 317)
4. Students use a highlighter to trace the arrows. The air flows in over the land from the water, and then rises as it heats. (p. 317)
5. insulator (p. 318)
6. high specific heat (p. 319)
7. Sample answer: Fish can die because there is less oxygen in warmer water for them to breathe. (p. 319)

After You Read (p. 320)
1. Students should write an accurate sentence using either conduction, radiation, or convection, such as “The Sun heats Earth by radiation.”
2. Students’ concept web should be filled in similar to the one below.

3. Students provide a reasonable answer, such as: I could do an experiment where I could observe radiation, conduction, and convection.
**ANSWER KEY**

**Section 3**

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

Students should list at least two machines that have an engine such as: car—the engine makes it move; washing machine—the engine makes the machine wash clothes.

**Read to Learn**

1. Students list any four of the following: kinetic, potential, thermal, mechanical, chemical, radiant, nuclear, or electrical. (p. 321)
2. thermal energy (p. 322)
3. Students should highlight the expansion valve. (p. 323)
4. It must become warmer than the air. (p. 323)
5. outside the building (p. 324)
6. Students use a highlighter to trace a path that shows the heat moving from the outside coils, through the compressor, and into the building in the inside coils. (p. 324)

**After You Read (p. 325 and 326)**

1. Students should write an accurate sentence using both terms, such as: An internal combustion engine is a type of heat engine.
2. Students’ flow charts should be similar to the one shown below.

3. Students’ flow charts should be similar to the one shown below.

4. Students should give a reasonable response, such as: Underlining the answers helped make the main ideas stand out.

**Chapter 22 Electricity**

**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 Electricity, have them combine their section Foldables into the following Foldables chapter project.

Use two 11 × 17 pieces of paper to make a bound book project. Tape or glue Foldables A and B from Section 1 on the second page as shown. Place Foldables C, D, and E from Sections 2 and 3 on the next two pages. Title the project *Electricity*. 

---

**Diagram:**

- **Gain Electrons**
- **Lose Electrons**
- **Like Charges**
- **Unlike Charges**

**Text:**

- **A**
- **B**

---

**Diagram:**

- **Electrical Power**
- **Electricity**

---

**Text:**

- **A**
- **B**
ANSWER KEY

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. It is shown folded and taped to the first page of the project.

Section 1

Before You Read (p. 327)

Students should provide reasonable answers, such as: I wouldn't be able to watch TV or play video games.

Read to Learn

1. Students should mark each proton, neutron, and electron in a different color. (p. 327)
2. fewer electrons (p. 328)
3. c (p. 328)
4. Students should circle the two negative objects labeled “Like charges repel.” (p. 329)
5. The attraction gets stronger. (p. 329)
6. Conductor: copper
   Insulator: plastic (p. 330)
7. The electrons spread from your shoes to your skin. (p. 330)
8. b (p. 331)
9. conductor (p. 331)

After You Read (p. 332)

1. The electric force between two objects would increase if the objects moved closer to each other. The electric force would also increase if the amount of charge on one object increases.
2. Students should include reasonable responses, such as the following:

<table>
<thead>
<tr>
<th>Charges of Two Objects</th>
<th>Electric Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>positive and positive</td>
<td>repel</td>
</tr>
<tr>
<td>positive and negative</td>
<td>attract</td>
</tr>
<tr>
<td>negative and negative</td>
<td>repel</td>
</tr>
</tbody>
</table>

3. Accept all reasonable answers. Student answers should reflect on how highlighting helped them understand electric charge.

Section 2

Before You Read (p. 333)

Students should provide reasonable answers, such as: Electricity comes from wires in wall sockets in my house.

Read to Learn

1. Students should highlight the flow of water in the figure to reinforce the concept of a circuit. (p. 333)
2. Students should circle the battery. (p. 334)
3. the battery (p. 334)
4. Electrons from the positive end move to the negative end. (p. 335)
5. Chemicals in the battery get used up. (p. 335)
6. resistance (p. 336)
7. high resistance and high melting point (p. 336)

After You Read (p. 337)

1. Possible answer: A good conductor has little resistance. An insulator as high resistance.
2. Students’ answers may include:

- **Copper Wire**
  1. Low resistance
  2. Makes little heat
- **Tungsten Wire**
  1. High resistance
  2. Makes heat and light
- **Both Good conductor**

3. Students should reflect on how creating an outline helped them learn the material in this section.

### Section 3

#### Before You Read (p. 338)

Students should provide reasonable answers, such as: A string of lights is a circuit. There are circuits in my computer.

#### Read to Learn

1. Students should circle the bucket and hose that are lower to the ground. (p. 338)
2. $5 \times 20 \Omega = 100 \text{ V}$. (p. 339)
3. The current would stop flowing. Neither lightbulb would light up. (p. 339)
4. Resistance increases. (p. 340)
5. Nothing would happen to the lightbulb on the right. It would still be lit up. (p. 340)
6. They limit the current so wires won’t get too hot. (p. 341)
7. $10 \times 110 \text{ V} = 1,100 \text{ W}$. (p. 341)
8. $800 \text{ W}$ more (p. 341)
9. Because water is a good conductor of electricity. (p. 342)
10. an insulator (p. 342)
11. It would be hard to breathe. (p. 343)
12. Metal is a good conductor of electricity. You could get hurt. (p. 343)

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

1. Possible answer: A parallel circuit is better because it has more than one path. You can have you lots of things plugged in and they will all work.

2. Ohm’s Law

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage increases</td>
<td>Electric current increases</td>
</tr>
<tr>
<td>Resistance increases</td>
<td>Electric current decreases</td>
</tr>
</tbody>
</table>

3. Students should write about how they chose the main idea for each paragraph.

### Chapter 23 Magnetism

**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 Magnetism have them combine their section Foldables into the following Foldables chapter project.

Use one sheet of 11 × 17 or 12 × 18 paper or cardstock to create a chapter project. Place each Foldable in the correct pocket of the project. Title the project *Magnetism*.
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. It can be used with Section 1.

Section 1

Before You Read (p. 345)
Students should give reasonable answers, such as: The magnets stick because the refrigerator has metal in it.

Read to Learn
1. repel (p. 345)
2. Students should circle north poles repelling and south poles repelling in one color, and north and south poles attracting in another color. (p. 346)
3. Students should trace the magnetic field lines as they leave the north pole; north pole. (p. 346)
4. in the same direction (p. 347)
5. The magnetic domains are pointing in all directions. (p. 347)
6. Students should label the pole N. (p. 347)
7. It repels charged particles from the Sun. (p. 348)
8. near Earth’s south pole (p. 348)

After You Read (p. 349)
1. Students circle two of the terms and tell how they are related. Possible answer: A magnetic domain is made up of the magnetic fields of atoms pointing in the same direction.

Section 2

Before You Read (p. 350)
Students should provide reasonable answers, such as: Electricity comes from power plants.

Read to Learn
1. Students should draw a horizontal line through the coils. (p. 350)
2. Students should circle the U-shaped electromagnet. (p. 351)
3. It would stop spinning. (p. 352)
4. No; there would not be any particles from the Sun to crash into other atoms and give off light. (p. 353)
5. Students should highlight the arrows showing current flow. (p. 353)
6. off (p. 354)
7. from different sources, such as coal, gas, and water (p. 354)
8. The voltage has to be decreased so it will be safe to use in homes and businesses. (p. 355)
9. increasing (p. 355)
10. A superconductor makes no heat. (p. 356)
11. power lines, very fast computers (p. 356)
12. energy given off by protons (p. 357)
13. a brain (p. 357)

After You Read (p. 358)
1. A generator turns a magnetic field into electricity. A motor can turn the electricity from the generator into kinetic energy.
ANSWER KEY

2. 1. b
   2. d
   3. f
   4. a
   5. e
   6. c

3. Students should provide reasonable answers, such as: The main ideas are the sentences that tell what the paragraph is about.

Chapter 24 Waves, Sound, and Light

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 Waves, Sound, and Light, have them combine their section Foldables into the following Foldables three-pocket chapter project.

Use an 11 × 17 or 12 × 18 piece of construction paper as the base. Place each Foldable in the correct pocket as shown. Title the project Waves, Sound, and Light.

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. 359)

Students should give a reasonable explanation of a wave people make at a sporting event. Explanation could include, “As people on one end of the wave sat down, people on the other end of the wave stood up.”

Read to Learn

1. energy (p. 360)

2. Students should draw a 90 degree angle on the figure with one ray showing the direction of movement of the rope and the other ray showing the direction of movement of the wave. They should label the angle 90 degrees. (p. 360)

3. Students should highlight the rarefaction in the compressional wave one color and the compression in the wave using a different color. (p. 361)

4. a transverse wave (p. 361)

5. Students should highlight one wavelength of the transverse wave one color and one wavelength of the compressional wave using a different color. (p. 362)

6. 20 Hz (p. 362)

7. Student drawings should be similar to those below. (p. 363)
ANSWER KEY

8. Students should show their work. (p. 364)

\[ v = \lambda f = (10 \text{ m})/(34 \text{ Hz}) \]

\[ v = 340 \text{ m/s} \]

9. Yes, 45 degrees. (p. 364)

10. the air (p. 365)

11. It bends around the object. (p. 365)

After You Read (p. 366)

1. Students should write an accurate sentence, such as: A transverse wave makes the particles in matter move back and forth at right angles to the direction that the wave is traveling. or A compressional wave makes the particles in matter move back and forth in the same direction the wave is traveling.

<table>
<thead>
<tr>
<th>Transverse Waves</th>
<th>Compressional Waves</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motion of Particles</strong></td>
<td>particles move at right angles to the direction the wave travels</td>
</tr>
<tr>
<td><strong>Wavelength</strong></td>
<td>the distance between two crests or two troughs that are next to each other</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>the number of crests or troughs that pass a point in one second</td>
</tr>
<tr>
<td><strong>Amplitude</strong></td>
<td>half the distance between a crest and a trough</td>
</tr>
</tbody>
</table>

4. Possible answer: Sound travels faster through liquid than through air. (p. 369)

5. Students should highlight a path that starts at the outer ear, goes through the ear canal, eardrum, hammer, anvil, stirrup, and cochlea. (p. 370)

6. They use reflected sound waves. (p. 370)

After You Read (p. 371)

1. Students’ sentences should show they understand the term they have chosen. Possible answer: An opera singer sings at a very high pitch.

2. Students should highlight a path that starts at the outer ear, goes through the ear canal, eardrum, hammer, anvil, stirrup, and cochlea.

3. Students should provide reasonable answers such as, I will ask myself the quiz questions over and over until I know all of the answers.

Section 3

Before You Read (p. 372)

Students should give reasonable answers such as, you need light to read, plants need light to make food.

Read to Learn

1. Particles in matter slow down light. (p. 372)

2. Students should highlight another wavelength starting at one crest and ending at the next crest or starting at one trough and ending at the next trough. (p. 373)
3. because its waves carry a greater amount of energy (p. 373)

4. Possible answers: radio waves, microwaves, infrared waves, visible light, ultraviolet waves, gamma rays, X rays. (p. 374)

5. Possible answer: Ultraviolet light is helpful because it helps your body make vitamin D. It is harmful because it can give you a sunburn, it can damage your skin, or it can cause skin cancer. (p. 375)

6. Earth’s atmosphere (p. 375)

7. The light bends because it is slowing down. When light waves slow down, they bend. (p. 376)

8. yellow (p. 376)

9. It becomes flatter. (p. 377)

10. cone cells (p. 377)

After You Read (p. 378)

1. Students’ sentence should explain that the electromagnetic spectrum contains electromagnetic waves of all frequencies and wavelengths.

2. Students should give reasonable answers, such as the main idea is the sentence that describes what the paragraph is about.