Instructions for Copying

Answers are printed in non-reproducible blue. Copy pages on a light setting in order to make multiple copies for classroom use.
## LIFE SCIENCE

### Unit A Literature

**Chapter 1 Cells and Kingdoms**

- **Chapter Concept Map** .................................................. 2
- **Lesson 1**
  - Lesson Outline .......................................................... 3
  - Lesson Vocabulary ..................................................... 5
  - Lesson Cloze Activity .................................................. 6
- **Lesson 2**
  - Lesson Outline .......................................................... 7
  - Lesson Vocabulary ..................................................... 9
  - Lesson Cloze Activity .................................................. 10
  - Reading in Science ..................................................... 11
- **Lesson 3**
  - Lesson Outline .......................................................... 13
  - Lesson Vocabulary ..................................................... 15
  - Lesson Cloze Activity .................................................. 16
  - Writing in Science ..................................................... 17
- **Lesson 4**
  - Lesson Outline .......................................................... 19
  - Lesson Vocabulary ..................................................... 21
  - Lesson Cloze Activity .................................................. 22
  - Writing in Science ..................................................... 23
- **Lesson 5**
  - Lesson Outline .......................................................... 25
  - Lesson Vocabulary ..................................................... 27
  - Lesson Cloze Activity .................................................. 28

**Chapter Vocabulary** .................................................. 29

### Chapter 2 Parents and Offspring

- **Chapter Concept Map** .................................................. 31
- **Lesson 1**
  - Lesson Outline .......................................................... 32
  - Lesson Vocabulary ..................................................... 34
  - Lesson Cloze Activity .................................................. 35
  - Writing in Science ..................................................... 36
- **Lesson 2**
  - Lesson Outline .......................................................... 38
  - Lesson Vocabulary ..................................................... 40
  - Lesson Cloze Activity .................................................. 41
- **Lesson 3**
  - Lesson Outline .......................................................... 42
  - Lesson Vocabulary ..................................................... 44
  - Lesson Cloze Activity .................................................. 45
- **Lesson 4**
  - Lesson Outline .......................................................... 46
  - Lesson Vocabulary ..................................................... 48
  - Lesson Cloze Activity .................................................. 49
  - Reading in Science ..................................................... 50

**Chapter Vocabulary** .................................................. 52
## Unit B Literature .......................................................... 54

### Chapter 3 Interactions in Ecosystems

#### Chapter Concept Map .................................................. 55

**Lesson 1**
- Lesson Outline .......................................................... 56
- Lesson Vocabulary ....................................................... 58
- Lesson Cloze Activity .................................................. 59
- Writing in Science ....................................................... 60

**Lesson 2**
- Lesson Outline .......................................................... 62
- Lesson Vocabulary ....................................................... 64
- Lesson Cloze Activity .................................................. 65

**Lesson 3**
- Lesson Outline .......................................................... 66
- Lesson Vocabulary ....................................................... 68
- Lesson Cloze Activity .................................................. 69
- Reading in Science ..................................................... 70

#### Chapter Vocabulary .................................................... 72

### Chapter 4 Ecosystems and Biomes

#### Chapter Concept Map .................................................. 74

**Lesson 1**
- Lesson Outline .......................................................... 75
- Lesson Vocabulary ....................................................... 77
- Lesson Cloze Activity .................................................. 78

**Lesson 2**
- Lesson Outline .......................................................... 79
- Lesson Vocabulary ....................................................... 81
- Lesson Cloze Activity .................................................. 82

**Lesson 3**
- Lesson Outline .......................................................... 83
- Lesson Vocabulary ....................................................... 85
- Lesson Cloze Activity .................................................. 86
- Reading in Science ..................................................... 87

**Lesson 4**
- Lesson Outline .......................................................... 89
- Lesson Vocabulary ....................................................... 91
- Lesson Cloze Activity .................................................. 92
- Writing in Science ..................................................... 93

#### Chapter Vocabulary .................................................... 95
## Contents

**EARTH SCIENCE**

<table>
<thead>
<tr>
<th>Chapter 5 Our Dynamic Earth</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Concept Map</td>
<td>98</td>
</tr>
<tr>
<td>Lesson 1</td>
<td>99</td>
</tr>
<tr>
<td>Lesson Outline</td>
<td></td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>101</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>102</td>
</tr>
</tbody>
</table>

| Lesson 2                    | 103|
| Lesson Outline              |  |
| Lesson Vocabulary           | 105|
| Lesson Cloze Activity       | 106|
| Writing in Science          | 107|

| Lesson 3                    | 109|
| Lesson Outline              |  |
| Lesson Vocabulary           | 111|
| Lesson Cloze Activity       | 112|

| Lesson 4                    | 113|
| Lesson Outline              |  |
| Lesson Vocabulary           | 115|
| Lesson Cloze Activity       | 116|
| Writing in Science          | 117|

| Lesson 5                    | 119|
| Lesson Outline              |  |
| Lesson Vocabulary           | 121|
| Lesson Cloze Activity       | 122|
| Reading in Science          | 123|

| Chapter Vocabulary          | 125|

**Chapter 6 Protecting Earth’s Resources**

| Chapter Concept Map         | 127 |
| Lesson 1                    | 128 |
| Lesson Outline              |  |
| Lesson Vocabulary           | 130 |
| Lesson Cloze Activity       | 131 |

| Lesson 2                    | 132 |
| Lesson Outline              |  |
| Lesson Vocabulary           | 134 |
| Lesson Cloze Activity       | 135 |

| Lesson 3                    | 136 |
| Lesson Outline              |  |
| Lesson Vocabulary           | 138 |
| Lesson Cloze Activity       | 139 |
| Writing in Science          | 140 |

| Lesson 4                    | 142 |
| Lesson Outline              |  |
| Lesson Vocabulary           | 144 |
| Lesson Cloze Activity       | 145 |
| Reading in Science          | 146 |

| Chapter Vocabulary          | 148 |
Unit D Literature ....................................................... 150

Chapter 7  Weather Patterns
Chapter Concept Map ............................................. 151
Lesson 1  Lesson Outline ........................................... 152
Lesson Vocabulary ................................................. 154
Lesson Cloze Activity ............................................. 155
Lesson 2  Lesson Outline ........................................... 156
Lesson Vocabulary ................................................. 158
Lesson Cloze Activity ............................................. 159
Lesson 3  Lesson Outline ........................................... 160
Lesson Vocabulary ................................................. 162
Lesson Cloze Activity ............................................. 163
Writing in Science .................................................. 164
Lesson 4  Lesson Outline ........................................... 166
Lesson Vocabulary ................................................. 168
Lesson Cloze Activity ............................................. 169
Reading in Science ................................................ 170

Chapter Vocabulary ............................................... 172

Chapter 8  The Universe
Chapter Concept Map ............................................. 174
Lesson 1  Lesson Outline ........................................... 175
Lesson Vocabulary ................................................. 177
Lesson Cloze Activity ............................................. 178
Lesson 2  Lesson Outline ........................................... 179
Lesson Vocabulary ................................................. 181
Lesson Cloze Activity ............................................. 182
Writing in Science .................................................. 183
Lesson 3  Lesson Outline ........................................... 185
Lesson Vocabulary ................................................. 187
Lesson Cloze Activity ............................................. 188
Reading in Science ................................................ 189
Lesson 4  Lesson Outline ........................................... 191
Lesson Vocabulary ................................................. 193
Lesson Cloze Activity ............................................. 194

Chapter Vocabulary ............................................... 195
# PHYSICAL SCIENCE

## Unit E Literature

<table>
<thead>
<tr>
<th>Chapter 9 Comparing Kinds of Matter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Concept Map</td>
<td>198</td>
</tr>
<tr>
<td>Lesson 1 Lesson Outline</td>
<td>199</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>201</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>202</td>
</tr>
<tr>
<td>Lesson 2 Lesson Outline</td>
<td>203</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>205</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>206</td>
</tr>
<tr>
<td>Reading in Science</td>
<td>207</td>
</tr>
<tr>
<td>Lesson 3 Lesson Outline</td>
<td>209</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>211</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>212</td>
</tr>
</tbody>
</table>

## Chapter Vocabulary

<table>
<thead>
<tr>
<th>Chapter 10 Physical and Chemical Changes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Concept Map</td>
<td>215</td>
</tr>
<tr>
<td>Lesson 1 Lesson Outline</td>
<td>216</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>218</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>219</td>
</tr>
<tr>
<td>Lesson 2 Lesson Outline</td>
<td>220</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>222</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>223</td>
</tr>
<tr>
<td>Lesson 3 Lesson Outline</td>
<td>224</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>226</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>227</td>
</tr>
<tr>
<td>Writing in Science</td>
<td>228</td>
</tr>
<tr>
<td>Lesson 4 Lesson Outline</td>
<td>230</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
<td>232</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
<td>233</td>
</tr>
<tr>
<td>Reading in Science</td>
<td>234</td>
</tr>
</tbody>
</table>

## Chapter Vocabulary

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Vocabulary</td>
</tr>
<tr>
<td>Unit F Literature</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Chapter 11 Using Forces</strong></td>
</tr>
<tr>
<td>Chapter Concept Map</td>
</tr>
<tr>
<td><strong>Lesson 1</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td>Reading in Science</td>
</tr>
<tr>
<td><strong>Lesson 2</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td><strong>Lesson 3</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td><strong>Lesson 4</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td>Writing in Science</td>
</tr>
<tr>
<td><strong>Chapter Vocabulary</strong></td>
</tr>
<tr>
<td>Chapter Concept Map</td>
</tr>
<tr>
<td><strong>Lesson 1</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td><strong>Lesson 2</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td><strong>Lesson 3</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td>Writing in Science</td>
</tr>
<tr>
<td><strong>Lesson 4</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td>Reading in Science</td>
</tr>
<tr>
<td><strong>Lesson 5</strong></td>
</tr>
<tr>
<td>Lesson Outline</td>
</tr>
<tr>
<td>Lesson Vocabulary</td>
</tr>
<tr>
<td>Lesson Cloze Activity</td>
</tr>
<tr>
<td><strong>Chapter Vocabulary</strong></td>
</tr>
</tbody>
</table>
Adventures in Eating
Read the Literature feature in your textbook.

Write About It
Response to Literature  This article tells about different adaptations for eating. Research two more animals that have interesting adaptations. Write a report that explains how these adaptations help the animals eat. Compare these adaptations to the ones you read about in the article.

Paragraphs should have a clear topic sentence that directly identifies the eating adaptations of each animal that they research. The sentences that follow the topic sentence should support the topic sentence by describing how each animal eats and how these adaptations compare to those that students read about in the article. Students should use a closing sentence that wraps up the main idea of the paragraph or restates the topic sentence. Good paragraphs will stay on topic, contain vivid words, include correct grammar and mechanics, and demonstrate a proper transition from one idea to the next.
Cells and Kingdoms

Complete the concept map by filling in answers where blanks appear.

All Living Things

Are Made of

CELLS

Are Classified into

KINGDOMS

Plant cells are different from animal cells.

Plant Cells

Animal Cells

Each type of cell has certain unique parts.

Chloroplasts

Centrioles

Many small vacuoles or no vacuoles

Large Vacuole

Cell Wall

There are six major kingdoms.

True Bacteria

Ancient Bacteria

Protists

Fungi

Plants

Animals
Cells

Use your textbook to help you fill in the blanks.

What are cells?

1. All organisms, or living things, are made of _______ cells _______.

2. Every cell in every living thing comes from another cell that _______ splits or divides _______.

3. A single-celled organism that can carry on all its life processes is called _______ unicellular _______.

4. Organisms made up of more than one cell are called _______ multicellular _______.

5. Scientists estimate that there are more than _______ 100,000 _______ kinds of unicellular organisms.

What is inside an animal cell?

6. Both plant and animal cells perform life processes by using _______ organelles _______.

7. All cells are surrounded by a(n) _______ cell membrane _______ that controls the materials that move in and out of the cell.

8. The region between the cell membrane and the nucleus is filled with _______ cytoplasm _______.

9. The cell’s control center is called the _______ nucleus _______.

© Macmillan/McGraw-Hill
10. The tiny power plants in the cell where food is broken down and energy is released are called **mitochondria**.

11. A structure in a cell used for storage of water, food, and waste is the **vacuole**.

What is inside a plant cell?

12. Plant cells have a(n) **cell wall**; a rigid structure that serves as an outer covering.

13. A green structure, called a(n) **chloroplast**, uses the energy from the Sun to produce food for the plant.

How are cells organized?

14. Cells working together at the same job form a(n) **tissue**.

15. Groups of tissues working together form organs, and groups of organs working together form **organ systems**.

Critical Thinking

16. Compare and contrast the cells of plants, animals, and unicellular organisms.

All cells come from the division of other cells. Cells can carry on basic life processes. Plants and animals are multicellular organisms. They have specialized cells that group together to form tissues, organs, and organ systems. Only by grouping and working together can plant and animal cells carry out all the necessary life processes. Plant and animal cells have cell membranes, nuclei, cytoplasm, and organelles such as mitochondria and vacuoles. Plant cells have structures that animal cells lack, such as cell walls and chloroplasts.
9. The two major groups into which plants are organized are _______ vascular _______ and _______ nonvascular _______.

10. Unlike plants, _______ fungi _______ get food by breaking down dead organisms.

11. A fungus that makes bread rise is called _______ yeast _______.

What are bacteria and protists?

12. Bacteria are unicellular organisms with no _______ nucleus _______ or mitochondria.

13. The two kingdoms used to classify bacteria are the _______ “true” bacteria _______ and _______ “ancient” bacteria _______.

14. Protists can be _______ unicellular _______ or multicellular.

15. Unlike bacteria, protists have large cells, a nucleus, and bound _______ organelles _______.

What are viruses?

16. Viruses are not classified as living organisms because they carry out no life processes except _______ reproduction _______.

Critical Thinking

17. What makes plants and animals different from bacteria?

Plants and animals are multicellular. Bacteria are unicellular. Bacteria cells have no nucleus or membrane-covered organelles such as mitochondria.
Plants

Use your textbook to help you fill in the blanks.

How are plants classified?

1. Small plants such as mosses which survive without a transport system, are called _____nonvascular plants_____.

2. Plants that have a system of hollowed-out tubes to transport water and nutrients are called _____vascular plants_____.

3. A seed plant that does not produce flowers or fruits is called a(n) _____gymnosperm_____.

4. A seed plant that produces flowers and some kind of fruit is called a(n) _____angiosperm_____.

What are roots?

5. Roots absorb minerals and water, store food, and _____anchor plants_____.

6. Root hairs absorb water and minerals, and _____root caps______ protect root tips.

7. The epidermis is on the outside of the root; just beneath it is the _____cortex______ which is used to store food. At the center of the root is the _____vascular system_____.

© Macmillan/McGraw-Hill
What are stems?

8. Stems have two main functions: ________support________ and transport.

9. Grasses have __________soft________ stems that are green and bendable; trees have ________woody________ stems.

10. A series of tubes that move water and minerals up the plant are __________xylem________. __________Phloem________ moves sugar made in the plant’s leaves to other parts of the plant.

What are leaves?

11. The function of leaves is to perform ________photosynthesis______.

12. To perform photosynthesis, chloroplasts need ________carbon dioxide________ from the air, water from the soil, and ________sunlight________.

13. Air enters and exits plants through ________stomata________: pores on the underside of the leaves.

Critical Thinking

14. Why do you think some plants have woody stems and some have soft stems?

   Larger plants need to hold up more weight than smaller plants. This could lead to them having woody stems. Some plants may have woody stems to protect them from being eaten. Their bark protects the stem and therefore the plant. Smaller plants may need more than just their leaves to produce food and so have soft stems that contain chlorophyll. The soft stems help them make more food.
# Plants

Fill in the blank with a term from the box.

<table>
<thead>
<tr>
<th>angiosperm</th>
<th>gymnosperm</th>
<th>transpiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>cambium</td>
<td>phloem</td>
<td>xylem</td>
</tr>
<tr>
<td>cellular respiration</td>
<td>photosynthesis</td>
<td></td>
</tr>
</tbody>
</table>

1. A seed plant that does not produce flowers is called a(n) **gymnosperm**.
2. Cells that move sugars up, down, and all around a plant are called **phloem**.
3. A layer in the plant stem that separates xylem and phloem is called the **cambium**.
4. The break down of sugars in plant and animal cells to produce energy and carbon dioxide is called **cellular respiration**.
5. A seed plant that produces flowers is called a(n) **angiosperm**.
6. Cells that transport water and minerals from roots to shoots in plants are called **xylem**.
7. The process that plants use to produce their food and give off oxygen is called **photosynthesis**.
8. When water moves up the vascular tubes through stomata, **transpiration** occurs.
Now use a separate sheet of paper to write the first draft of your article.

Revising and Proofreading

Here is part of the report that Ray wrote. Help him combine his sentences. Use the transition word in parentheses. Make sure you punctuate the new sentence correctly.

1. In CAM photosynthesis, the stomata open at night. The air is cooler and the humidity is higher. (when)
   In CAM photosynthesis, the stomata open at night when the air is cooler and the humidity is higher.

2. CAM photosynthesis is effective. It results in more efficient water use. (since)
   CAM photosynthesis is effective since it results in more efficient water use.

Now revise and proofread your article. Ask yourself:

- Have I introduced my main idea about photosynthesis in yuccas?
- Have I included facts and details to show how this process works?
- Have I used examples and language appropriate for my audience?
- Have I used transition words and phrases to connect ideas?
- Have I ended with a strong conclusion about why yucca plants are special?
- Have I corrected all grammar errors?
- Have I corrected all problems in spelling, punctuation, and capitalization?
Classifying Animals

Use your textbook to help you fill in the blanks.

What are simple invertebrates?

1. The simplest animals are _________ sponges _______. They are without real tissues or organs and have a(n) _________ asymmetrical _______ body plan.

2. Jellyfish and hydras are _________ cnidarians _______. They possess a mouth and muscle tissue and are _________ radially _______ symmetrical.

3. Worms that have flat bodies with one body opening and simple eyes are called _________ flatworms _______.

4. Worms that have simple digestive and nervous systems are called _________ roundworms _______.

What are complex invertebrates?

5. Clams and squids are _________ mollusks _______. They have _________ bilateral _______ symmetry, a muscular foot, a mantle, and several specialized organs.

6. Sea stars and sea cucumbers are _________ echinoderms _______. They have _________ tubed _______ feet and a water pressure system that helps them feed, breathe, and move.

7. Crabs and insects belong to the largest animal group on Earth, the _________ arthropod _______ phylum.
Name ___________________________ Date ___________

What are vertebrates?

8. There are three kinds of fish: ______ jawless fish______, such as lamprey and hagfish; ______ cartilaginous fish______, such as sharks and skates; and ______ bony fish________.

9. Frogs, toads, and salamanders are ______ amphibians______.  

10. Lizards, snakes, turtles, and alligators are ______ reptiles_________.  
   They are ______ cold-blooded______, which means that their body temperature is not steady.

11. Birds are designed for flying: they are warm-blooded and have ______ bones______ and feathers that are light and strong.

What are mammals?

12. Animals that are warm-blooded and have hair are called ______ mammals________.

13. A duck-billed platypus lays eggs. It is a(n) ______ monotreme________.

14. A kangaroo is a(n) ______ marsupial______. It gives birth to partially developed offspring.

15. Lions, whales, and humans are ______ placental mammals______. Their offspring develop within the mother.

Critical Thinking

16. Compare 4 different vertebrates.

   Answers will vary. Example answer: Mammals are the only vertebrates that produce milk to feed their young. Reptiles are vertebrates that have thick scaly skin. Amphibians can breathe both under water and on land. Birds have hollow bones that help them fly.
Classifying Animals

Read each clue and fill in the blank with the correct answer.

<table>
<thead>
<tr>
<th>asymmetrical</th>
<th>invertebrates</th>
<th>monotreme</th>
<th>radial</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilateral</td>
<td>marsupial</td>
<td>placental</td>
<td>vertebrates</td>
</tr>
</tbody>
</table>

1. _______ marsupial A koala is one. It gives birth to partially developed offspring.

2. _______ bilateral Worms have this kind of symmetry because they can be divided along only one plane.

3. _______ vertebrates Fish, birds, amphibians, reptiles, and mammals.

4. _______ placental A whale is an example of this kind of mammal.

5. _______ radial Cnidarians have this kind of symmetry.

6. _______ monotreme A mammal that lays eggs.

7. _______ asymmetrical A type of body plan that has no definite shape.

8. _______ invertebrates Sponges, cnidarians, echinoderms, mollusks, and arthropods.
Classifying Animals
Fill in the blanks.

amphibians  invertebrates  sponges  vertebrates
hollow       reptiles    tentacles

The animal kingdom contains all the animals. The animal kingdom is separated into two large groups—animals with backbones called **vertebrates** and animals without backbones called **invertebrates**. These two groups are divided into smaller groups called phyla.

Vertebrates include fish, amphibians, reptiles, birds, and mammals. Fish live in the water and breathe through gills. Vertebrates that spend part of their lives in water and part on land are called **amphibians**. Lizards, snakes, turtles, alligators, and crocodiles are **reptiles**. Birds are designed for flying. Their bones are **hollow** and light. Mammals produce milk to feed their young.

Invertebrates include sponges, mollusks, worms, and arthropods. The most primitive of the animal groups are called **sponges**. Cnidarians have mouths surrounded by stinging **tentacles**. The largest of all the animal groups are called arthropods.
Cells and Kingdoms

Choose the letter of the best answer.

1. The flexible wrapping that surrounds all cells is called the
   a. cytoplasm.
   b. cell wall.
   c. cell membrane.
   d. vacuole.

2. Which of these structures is found in a plant cell, but not in an animal cell?
   a. central vacuole
   b. mitochondria
   c. nucleus
   d. organelles

3. Which of the following is in the correct order, from simplest to most complex?
   a. cells, tissues, organs, organism, organ systems
   b. cells, tissues, organs, organ systems, organism
   c. cells, organs, tissues, organ systems, organism
   d. cells, tissues, organ systems, organs, organism

4. Which phylum has the most species?
   a. echinodermata
   b. molluska
   c. chordata
   d. arthropoda

5. In which kingdom do all of the members obtain energy by breaking down dead organisms?
   a. plants
   b. animals
   c. fungi
   d. protists

6. Which life process do viruses carry out?
   a. reproduction
   b. movement
   c. growth
   d. use of energy

7. Which structure found in vascular plants allows for the transport of water?
   a. flower
   b. xylem
   c. phloem
   d. seed
Parents and Offspring

Complete the concept map with information you have learned about different types of reproduction. Some answers have been written for you.

### All Living Things Reproduce

<table>
<thead>
<tr>
<th>Types of Reproduction</th>
<th>Organisms that use this type of reproduction</th>
<th>Does this type of reproduction enhance genetic variation?</th>
<th>Disadvantages or Advantages to this type of reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEXUAL</td>
<td>animals</td>
<td>yes</td>
<td>Disadvantage: Animals have to find mates.</td>
</tr>
<tr>
<td>ASEXUAL</td>
<td>bacteria</td>
<td>no</td>
<td>Bacteria can reproduce very quickly this way.</td>
</tr>
</tbody>
</table>
Reproduction

Use your textbook to help you fill in the blanks.

**What are sexual and asexual reproduction?**

1. Survival of a(n) ________________ species depends on its ability to produce offspring.

2. Every organism comes from a parent through the process of ________________.

3. The transfer of ________________ genetic material from parents to their offspring is known as reproduction.

4. Genetic material contains the information that controls an organism's ________________.

5. The production of a new organism from two parents is called ________________ sexual reproduction.

6. When an egg cell joins with a sperm cell, ________________ fertilization occurs.

7. A fertilized egg develops into an individual with traits from each ________________ parent.

8. The production of a new organism from a single parent is called ________________ asexual reproduction.

**How do organisms reproduce asexually?**

9. Most bacteria and unicellular protists reproduce by making a copy of their genetic material and ________________ splitting.

10. Cnidarians, sponges, and some fungi can reproduce through ________________ budding.
Reproduction

Fill in the blanks.

<table>
<thead>
<tr>
<th>asexual</th>
<th>reproduce</th>
<th>sperm</th>
<th>variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>mate</td>
<td>sexual</td>
<td>splitting</td>
<td></td>
</tr>
</tbody>
</table>

No organism lives forever. This means all organisms must **reproduce**. There are two types of reproduction: **sexual** and **asexual**. Sexual reproduction requires two parents. A female egg cell unites with a male **sperm** cell to produce a fertilized egg. The fertilized egg grows into a new, unique individual. Asexual reproduction requires only one parent and results in offspring that are genetically identical to the parent.

The main advantage of sexual reproduction is that it promotes **variety** within a species. An advantage of asexual reproduction is that it does not require finding a(n) **mate**. There are several methods of asexual reproduction. Simple, one-celled organisms, such as bacteria and protists, reproduce by **splitting** into two cells. Animals such as cnidarians and sponges undergo a process called budding.
Write About It

Cause and Effect Explain how the bacterium Bt affects corn borers. Tell how genetically modified corn might cause problems for other insects and for the environment in general.

Planning and Organizing
Answer these questions in detail.

1. What does the Bt bacterium produce, and what effect does it have on corn borers?
   The Bt bacterium produces a protein that is toxic to corn borers.
   When the borers eat corn that has been treated with Bt, they die.

2. What enables the Bt bacterium to make a protein that is toxic to corn borers?
   Bt bacterium have a gene that causes them to make the poisonous protein.

3. What was transferred from the Bt bacterium to Bt corn?
   The gene that codes for the toxic protein was transferred from the bacterium to the corn.

4. How does Bt corn affect corn borers?
   Bt corn is toxic to corn borers.

5. How might Bt corn affect other living things, such as monarch butterflies?
   Bt corn might also kill harmless insects that eat it—like the monarch butterfly.
Parents and Offspring

Choose the letter of the best answer.

1. Which of the following organisms reproduces by using budding?
   a. sponge    c. lizard
   b. cat       d. frog

2. Which of the following plants reproduces by using runners?
   a. corn plant
   b. moss
   c. strawberry plant
   d. apple tree

3. Which of the following is an example of sexual reproduction?
   a. cloning
   b. budding
   c. seed production
   d. vegetative propagation

4. Which organisms can develop from an unfertilized egg?
   a. humans    c. some birds
   b. all sheep  d. certain lizards

5. Which of the following is an advantage of asexual reproduction?
   a. It depends on finding another organism.
   b. It promotes variety in a species.
   c. It is convenient.
   d. It gives rise to offspring better suited to environmental change.

6. Where on a flower is pollen made?
   a. stigma
   b. style
   c. anther
   d. pistil

7. Where on a plant are egg cells produced?
   a. ovary
   b. pistil
   c. anther
   d. filament

8. When a new plant sprouts from a seed, it is
   a. fertilizing.
   b. pollinating.
   c. beginning its asexual phase.
   d. germinating.
Meet Caroline Chaboo

Read the Reading in Science feature in your textbook.

Complete the statements in the “Clues” and “What I Know” columns. Use this information to infer something that is not directly stated in the text. Write that statement in the “What I Infer” column.

<table>
<thead>
<tr>
<th>Clues</th>
<th>What I Know</th>
<th>What I Infer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Sabal palm stands up to high winds, drought, and driving rain in the Caribbean region.</td>
<td>The Sabal palm is well adapted for the Caribbean region.</td>
<td>The Sabal palm is a common tree in the Caribbean.</td>
</tr>
<tr>
<td>2. The tortoise beetle harms Sabal palm trees in regions where it lives.</td>
<td>The tortoise beetle lives in the Dominican Republic.</td>
<td>The tortoise beetle is a problem for Sabal palms in the Dominican Republic.</td>
</tr>
<tr>
<td>3. The tortoise beetle weakens the Sabal palm, but does not kill it.</td>
<td>Caroline Chaboo studies plants, such as the Sabal palm, to discover whether they have adapted natural protection against insect pests.</td>
<td>Caroline Chaboo may find something in the Sabal palm one day that helps protect many plants against insect pests.</td>
</tr>
</tbody>
</table>
What are ocean ecosystems?

9. Organisms of the shallow _____ intertidal _____ zone are covered and uncovered each day by the rise and fall of tides.

10. Sunlight allows producers and the animals that depend on them to live in the _____ neritic _____ zone.

11. Large organisms live near the surface in the top part of the _____ oceanic _____ zone, which is called the bathyal zone.

12. Few creatures can live in the cold, dark waters at the bottom of the oceanic zone, which is called the _____ abyssal _____ zone.

Where do salt and fresh water meet?

13. The place where a river empties into the ocean is called a(n) _____ estuary _____ . Estuaries usually contain _____ salt _____ marshes, boggy areas covered with grasses.

14. When the tide comes in, an estuary’s waters are mostly _____ salty _____, but the waters are mostly _____ fresh _____ when the tide goes out.

15. Wetlands protect coastal regions during _____ storms _____ by soaking up excess water.

Critical Thinking

16. How is sunlight a limiting factor in water ecosystems?

Most producers in water ecosystems depend on sunlight and thrive in sunlit waters. Because producers are the base of food chains, more organisms can live in these sunlit areas.
Water Ecosystems

Match the correct letter with the description and fill in the crossword puzzle.

<table>
<thead>
<tr>
<th>benthos</th>
<th>nekton</th>
<th>shore zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>intertidal zone</td>
<td>plankton</td>
<td></td>
</tr>
</tbody>
</table>

Across

4. Place where organisms are covered and uncovered daily by the waters of changing tides
5. The larger, active swimmers in a body of water

Down

1. Creatures that drift freely in the water
2. The shallow water in standing-water ecosystems
3. Organisms that live on the bottom of a body of water
Water Ecosystems

Fill in the blanks.

<table>
<thead>
<tr>
<th>benthos</th>
<th>nekton</th>
<th>oceanic</th>
<th>tides</th>
</tr>
</thead>
<tbody>
<tr>
<td>intertidal</td>
<td>neritic</td>
<td>running-water</td>
<td>upper</td>
</tr>
</tbody>
</table>

Water ecosystems have many forms of life.
Organisms in water ecosystems are classified as plankton that float in the water; ________________ that are large, free swimmers; and ________________ that live on the bottom of a body of water. In general, more organisms live in the ________________ layers of the water.

Organisms such as kelp, fish, and whales live in the ocean’s ________________ zone. Sharks, squid, and octopi live in the upper part of the ocean’s ________________ zone (few animals live in the lower part of this zone).

Freshwater ecosystems are divided into ________________ bodies, standing-water bodies, and wetlands ecosystems.

Organisms of the ocean’s (saltwater) ________________ zone must be adapted to rise and fall of ________________ .

Organisms that live in estuaries are adapted to survive in both fresh and salty waters.
Earth’s Landforms

Use your textbook to help you fill in the blanks.

What are landforms?

1. A physical feature on Earth’s surface is a(n) ______ landform ______.
2. The highest of Earth’s physical features are ______ mountains ______.
3. A low area between mountains or hills is a(n) ______ valley ______.
4. Wide, flat areas of land are called ______ plains ______.
5. A large, flat area higher than the land around it is a(n) ______ plateau ______.
6. Earth’s largest bodies of water are its saltwater ______ oceans ______.
7. Natural streams of flowing water that empty into lakes, oceans, or other bodies of water are ______ rivers ______.
8. A body of water with land all around it is a(n) ______ lake ______.

What are the features of the ocean floor?

9. A(n) ______ ocean basin ______ is a large underwater area between continents.

10. Shallow waters cover the ______ continental shelf ______, the gently sloping part of the ocean floor along the coast.

11. The sharp drop from the continental shelf to the continental rise is the ______ continental slope ______.
LESSON 12. A wide, flat area covering about 40 percent of the ocean floor is the ________ abyssal plain ________.

13. The deepest areas of the ocean floor are ________ trenches ________.

How are Earth’s features mapped?

14. Measurements taken by a(n) ________ surveyor ________ are used to make maps.

15. Elevations are shown with shading on a(n) ________ relief ________ map.

16. Lines are used to show elevation and steepness of slopes on a(n) ________ topographical ________ map.

What are Earth’s layers?

17. The layer of air around Earth is the ________ atmosphere ________.

18. Earth’s waters make up Earth’s ________ hydrosphere ________.

19. Earth is made of three main layers: the crust, the ________ mantle ________, and the core.

20. The part of Earth that is home for living things is the ________ biosphere ________.

Critical Thinking

21. Compare the mantle and core of the Earth.

   Answers will vary. Example: The mantle and core both have layers. The core has a liquid layer while the mantle is made up of hard and soft layers of rock.
Earth’s Landforms

Fill in the blanks.

- crust
- elevation
- hydrosphere
- inner core
- landforms
- mantle
- oceans
- outer core
- surveyor

The physical features of Earth are part of Earth’s surface. Earth’s surface has many types of \_
\_
\_landforms\_\_, from high mountains to deep valleys. There are also physical features under Earth’s largest bodies of water, the \_
\_
oceans\_
\_. These undersea features look like the mountains, valleys, and cliffs on land.

Landforms are measured by a(n) \_
\_surveyor\_
\_. One important measurement is \_
\_elevation\_
\_, or the height of land above sea level.

Earth has several layers. Earth’s waters are its \_
\_hydrosphere\_
\_. The planet itself is divided into the surface \_
\_crust\_
\_, the \_
\_mantle\_
\_ beneath it, and the core at the center. The crust and mantle are rock. Earth’s core is made of metal. The \_
\_outer core\_
\_ is liquid, and the \_
\_inner core\_
\_ is solid. The core makes up the central part of Earth.
10. The hot rock cools at the surface forming the mid-ocean ridge and the ______ rift valley ______ along its top.

How does the movement of Earth's plates affect the land?

11. When plates push toward each other, a force called ______ compression ______ results.

12. Because of this force, the ground at the edges of plates is pushed upward to form ______ folded ______ mountains.

13. A mountain range in Asia, the ______ Himalayas ______, began to form in this way millions of years ago.

14. In places where one plate rubs past another, a twisting or tearing force called ______ shear ______ results.

15. This force can cause blocks of crust to break apart along deep cracks in Earth's crust called ______ faults ______.

16. When rock on one side of a fault moves down and rock on the other side moves up, a ______ fault-block ______ mountain is formed.

17. A California mountain range, the ______ Sierra Nevada ______, is this type of landform.

Critical Thinking

18. Compare how two types of mountains are formed.

Fault-block mountains form when one side of a fault moves down and one side moves up. Folded mountains, on the other hand, are formed when two plates push against each other and both sides of the ground are pushed upward.
Plate Tectonics

Use the terms in the box below to fill in the blanks.

- continental drift
- fault-block mountains
- folded mountains
- geologist
- mid-ocean ridge
- plate tectonics
- rift valley

1. As hardened magma builds up on both sides of a plate boundary, a(n) _______ forms at the center of a mid-ocean ridge.

2. The force of compression can form _______ at the point where two plates push together.

3. The theory that states that the continents were once one landmass and that they drifted to their present positions over many years is called _______.

4. A highland in the middle of the oceans that runs parallel to the continents is called a(n) _______.

5. A scientist who studies Earth's structure and history is called a(n) _______.

6. Shear forces at a fault can form _______.

7. The scientific theory that states Earth's crust is made of moving plates is called _______.

© Macmillan/McGraw-Hill
Drafting
Write a sentence to begin your essay. This sentence should tell your main idea about Rodinia and Pannotia.

Students’ sentences will vary.

Review the evidence you found and your summary. Now write the first draft of your essay. Use a separate piece of paper. Include facts and details that back up your main idea. Draw a conclusion at the end.

Revising and Proofreading
Help Mai revise her writing. Use the word but to combine each pair of sentences. Put a comma before this word. Write the new sentence on the lines.

1. Pangea was a supercontinent. It was not the earliest supercontinent.
   Pangea was a supercontinent, but it was not the earliest supercontinent.

2. Rodinia and Pannotia were both supercontinents. They were formed at different times.
   Rodinia and Pannotia were both supercontinents, but they were formed at different times.

Now revise and proofread your writing. Ask yourself:

► Did I clearly state my main idea?
► Did I include facts and details to back up my idea?
► Did I reach a sound conclusion at the end?
► Did I correct all mistakes?
11. A volcano that is ______active______ can erupt with lava, ash, gas, or rock.

12. When a volcano stays quiet for a time, it is ______dormant______.

13. A volcano that no longer erupts is ______extinct______, or dead.

**How do volcanoes build islands?**

14. The Hawaiian Islands formed over a stationary pool of magma below Earth's crust called a(n) ______hot spot______.

15. When the mountains grew high enough to break the ocean's surface, they became volcanic ______islands______.

16. As the plate moved away from the hot spot a new ______island______ formed.

17. Where two ocean plates meet and one is pushed under the other, an island ______arc______ may form.

18. Magma from edge of the lower plate rises and builds volcanic islands along the plate ______boundary______.

19. An example of an island arc is the ______Aleutian Islands______ in Alaska.

**Critical Thinking**

20. Why do volcanoes form when one plate dives under another?

*When one plate dives under another and reaches the mantle, the rock melts and forms magma. Magma can rise through cracks in the crust and form volcanoes.*
Volcanoes

Fill in the blanks.

<table>
<thead>
<tr>
<th>cinder-cone</th>
<th>lava</th>
<th>plates</th>
<th>volcano</th>
</tr>
</thead>
<tbody>
<tr>
<td>composite</td>
<td>mantle</td>
<td>shield</td>
<td></td>
</tr>
</tbody>
</table>

Openings on Earth’s surface appear on the edges of the crust’s plates. An opening in Earth’s crust from which magma flows is a(n) _______ volcano. Most volcanoes form in places where _______ plates push toward each other, and one dives under the other. The lower edge of the diving plate melts in the _______ mantle, producing hot magma that rises in the crust. Magma that breaks through to Earth’s surface is ______ lava ______.

There are three types of volcanic mountains. A large, broad mountain composed of hardened lava is a(n) _______ shield volcano. A narrow, steep mountain formed from cinders is a(n) _______ cinder-cone volcano. A large, cone-shaped mountain formed by layers of ash and cinders sandwiched between layers of hardened lava is a(n) _______ composite volcano. Volcanoes are built up over time as more material is deposited.
Earthquakes

Use your textbook to help you fill in the blanks.

What is an earthquake?

1. Earthquakes happen when the layers of rock on both sides of a(n) _______ fault suddenly slip.

2. Waves of energy spread out from the _______ focus, the place where the slipping began.

3. When they reach the surface, waves spread out from the _______ epicenter of the earthquake (the point directly above the focus).

4. Most earthquakes happen at faults that are near the boundaries of _______ tectonic plates.

What waves do earthquakes make?

5. Scientists use a(n) _______ seismometer to detect and measure earthquake waves.

6. The fastest earthquake waves, _______ primary or P _______ waves, pass through solids and liquids and move back and forth.

7. An earthquake's _______ secondary or S _______ waves travel slower than primary waves and move only through Earth's solid layers.

8. The slowest-moving waves, _______ surface or L _______ waves, move across Earth's surface causing the most damage.

How is an earthquake's energy measured?

9. A measure of the amount of _______ energy that an earthquake releases is magnitude.

10. Scientists use the _______ Richter Scale to measure earthquake magnitude.
11. Scientists use the __________ Mercalli Scale to measure an earthquake’s effects.

12. An underwater earthquake can produce a large wave called a(n) __________ tsunami.

13. Underwater earthquakes with a magnitude of __________ 6.5 or greater on the Richter scale are most likely to cause tsunamis.

How can people prepare?

14. Layers of rubber and steel between a building and its foundation allow the building to __________ sway, reducing the damage caused by up-and-down motions.

15. Before an earthquake, people should __________ secure objects to prevent them from falling and causing injury.

16. In their attempt to tell when earthquakes might happen, scientists look for possible warning signs such as changes in the angle of the __________ ground.

17. Earthquakes are hard to __________ predict, but the ability to do so would allow early warnings that could save lives.

Critical Thinking

18. Which scale do you think would better explain an earthquake to you, the Richter Scale or the Mercalli Scale? Why?

   Answers will vary. Example: The Mercalli scale would better explain an earthquake to me. It’s based on how people see the damage from the earthquake around them. I would see what was damaged and then look up the appropriate number on the scale.
Earthquakes

Use the clues below to find the words hidden in the puzzle.

1. A sudden movement of Earth’s crust is a(n) ___________.
2. The point on the surface directly above an earthquake’s focus is its _____________.
3. A crack in Earth’s crust is a(n) ___________.
4. The place along a fault where the slipping that causes an earthquake begins is the earthquake’s _____________.
5. A measure of the energy that an earthquake releases is its _____________.
6. A large ocean wave caused by an underwater earthquake is a(n) ___________.
7. The scale that measures the magnitude of an earthquake is called the _____________.
Earthquakes

Fill in the blanks.

earthquake  primary or P
energy  Richter
fault  secondary or S
Mercalli

The plates of the Earth are in motion. A sudden movement of Earth’s crust is a(n) _______earthquake_____. Most earthquakes occur near plate boundaries, when layers of rock that usually adhere to each other suddenly slip at a(n) _______fault_____. The scale that measures the magnitude of an earthquake is called the _______Richter_____. Scale. The scale that measures how severe an earthquake feels and the amount of damage the quake does to objects is called the _______Mercalli_____. Scale.

The movement of plates during an earthquake sends out waves of _______energy_____. that shake the ground. When an earthquake occurs, _______primary or P______ waves move back and forth very rapidly. An earthquake’s _______secondary or S______ waves move up and down. The slowest waves are surface or L waves. They cause the most damage.
Shaping Earth’s Surface

Use your textbook to help you fill in the blanks.

What is weathering?

1. The process that breaks down rock into small pieces is called _______ weathering _______.

2. Impacts, temperature changes, and ice expanding in cracks break down rock in the process of _______ physical weathering _______.

3. When rock’s composition is broken down and changed, _______ chemical weathering _______ occurs.

What is erosion?

4. Pieces of weathered rock are moved from place to place by _______ erosion _______.

5. When rock and soil on a slope become loose, gravity can move them downhill in a _______ landslide _______.

6. A large mass of flowing ice, called a _______ glacier _______, can erode the rock and soil beneath it.

What is deposition?

7. The process of _______ deposition _______ picks up eroded material and leaves it in a different place.

8. The running water of _______ rivers _______ erodes rock and soil and washes it downstream.

9. Slow-moving rivers can flow in gentle loops called _______ meanders _______.

© Macmillan/McGraw-Hill
10. Waves wash away at the sides of a headland forming an arch.

11. Waves can move sand along beaches or deposit it offshore to build strips of sand called sandbars.

How are shorelines changed?

12. During floods, rivers deposit sediment on floodplains along their banks.

13. Deposits of sand along the shore can form barrier islands that protect the beaches behind them from storm waves.

14. Wind deposits sand along the shoreline in hills of sand called dunes.

How can shorelines be protected?

15. People build walls called levees along rivers to prevent floods.

16. To slow erosion barricades can be built in the water along the beach.

17. Fences and plants protect dunes by preventing sand from blowing away.

Critical Thinking

18. How can people help stop erosion on a beach?

People can plant grasses or other plants to help keep the sand in place. People can also put up fences near dunes to slow down the wind near the sand.
8. A volcano is
   a. an opening in Earth’s crust through which magma flows.
   b. any mountain near a plate boundary.
   c. a group of faults near a hot spot.
   d. movement at a fault.

9. The low area between mountains is called a
   a. plateau.
   b. trench.
   c. valley.
   d. landform.

10. The wide, flat area of the ocean floor is known as the
    a. mantle.
    b. abyssal plain.
    c. trench stretch.
    d. aquatic plateau.

11. What is the term used for melted rock that reaches the Earth’s surface?
    a. lava
    b. mantle
    c. magma
    d. boundary rock

12. A device used to detect and measure earthquake waves is called a
    a. wavometer.
    b. richtometer.
    c. barometer.
    d. seismometer.

13. A mass of large flowing ice that can erode rock is called a(n)
    a. glacier.
    b. landslide.
    c. iceberg.
    d. delta.

14. Underwater earthquakes of a great magnitude can create
    a. continental divides.
    b. trenches.
    c. tsunamis.
    d. aquatic drift.
11. When magma and lava cool and harden, they become ________  ____ igneous _______ rock.

12. If they become buried deep beneath Earth’s surface, sedimentary and igneous rocks can become ________  ____ metamorphic _______ rock.

What are igneous and sedimentary rocks?

13. Igneous rocks that form inside Earth are called ________ intrusive _______ , and have ________ large _______ crystals.

14. Igneous rocks that form from lava that cools on Earth’s surface are ________ extrusive _______ , and have ________ small/tiny _______ crystals.

What are metamorphic rocks?

15. When metamorphic rocks form, the shape and ________ size _______ of crystals can change, or the crystals can change position to form ________ layers _______ .

Critical Thinking

16. What are the different ways that rocks are produced, and what are the different properties of minerals?

Properties of minerals include color, streak, luster, hardness, cleavage, fracture, and crystal shape. Minerals form three types of rocks. Igneous rocks form from cooled and hardened lava or magma; Sedimentary rocks form from compacted and cemented layers of sediment; Metamorphic rock forms when heat and pressure change existing rock into other types.
Soil

Use your textbook to help you fill in the blanks.

What is soil?

1. Soil is a mixture of bits of \underline{\text{rocks}} and once-living parts of plants and \underline{\text{animals}}.

2. The formation of soil starts with the \underline{\text{weathering}} of rock.

3. Soil forms in layers that are called soil \underline{\text{horizons}}.

4. The A horizon contains \underline{\text{humus}} which is made up of decayed organic materials.

5. The soil in the A horizon is also called \underline{\text{topsoil}} and is the soil in which most \underline{\text{plants}} grow.

6. The A horizon also contains the decayed organic materials, or \underline{\text{humus}}, that makes soil fertile.

7. The B horizon, called the \underline{\text{subsoil}}, has lots of fine rock particles but little humus.

8. The C horizon, which rests on \underline{\text{bedrock}}, is mostly large pieces of weathered rock.

How is soil used?

9. Soil in forests has a thin layer of \underline{\text{topsoil}}, and has little \underline{\text{humus}}.
Fossils and Energy

Use your textbook to help you fill in the blanks.

What are fossils?

1. The remnants or traces of organisms from long ago that are preserved in soil or rock are __________ fossils.

2. Many fossils formed when organisms died and were covered with layers of __________ sediment.

3. Over millions of years, sediment covered and compressed dead plants to form soft or __________ bituminous coal.

4. Sometimes increased heat and pressure turned soft coal into harder __________ anthracite coal.

5. Heat and pressure on buried ocean plants and animals helped to form __________ oil and __________ natural gas.

6. Coal, oil, and natural gas are __________ fossil fuels.

How old are fossil and fossil fuels?

7. Scientists can tell how old a fossil is by testing the age of the __________ rock around it.

8. The law of superposition says that each layer of rock is __________ younger than the layer below it.

9. The comparison that tells whether one fossil is older than another fossil is __________ relative age.
How can wind, water, and the Sun provide energy?

10. Sources of energy other than fossil fuels are called alternative energy sources.

11. Running or falling water spins generators to make electricity in a(n) hydroelectric plant.

12. Energy from the Sun is called solar energy. This energy does not pollute.

What are other sources of alternative energy?

13. Changes in the centers of atoms can release heat that produces nuclear power.

14. Heat from deep inside the Earth is geothermal energy that can produce electricity and provide hot water.

How can we conserve energy?

15. You use energy when you ride in a(n) car/vehicle or use anything at home that runs on electricity.

16. When you do not waste energy, you conserve it.

Critical Thinking

17. How did ancient organisms become fossil fuels?

Coal is formed from ancient plants that were covered by sediment and compressed over millions of years. Oil and natural gas are formed when decayed plants and animals buried deep under the ocean are changed by heat, pressure, and the action of bacteria.
Fossil fuels are formed from the decay of ancient organisms. Examples of fossil fuels are ______ coal, _______ oil, and _______ natural gas. These fossil fuels are _______ nonrenewable resources. We also use _______ alternative energy sources, which are energy sources that are not fossil fuels. Renewable energy sources include wind, falling _______ water, and the _______ Sun. These forms of energy do not produce _______ pollution that dirties the air and water. Another energy source is _______ geothermal energy, which comes from heat inside Earth. People also burn materials such as wood, a type of biomass. Changes in the nucleus of atoms release energy that runs _______ nuclear power plants.

To save energy, people do things to conserve it.
Air and Water

Use your textbook to help you fill in the blanks.

What are sources of fresh water?

1. About 70 percent of Earth’s surface is covered with water, with most of it in the oceans.
2. Salt enters much of Earth’s water as rain and ocean waves wash over dirt and rocks.
3. Running water includes sources such as streams and rivers.
4. Standing water includes sources such as lakes and reservoirs that fill holes in the ground.
5. Water beneath Earth’s surface is groundwater.
6. Groundwater collects underground in layers of rock or soil called aquifers.

How do we use water?

7. Water can pick up substances that pollute or contaminate it as it falls through the sky or runs along the ground.
8. Wastes from mines and factories can also pollute water.

How do we clean, conserve, and protect water?

9. The following steps clean drinking water in water treatment plants: coagulation, sedimentation, filtration, and disinfection.
LESSON

Outline

10. People can reduce their use of water through conservation.

How do we use and pollute air?

11. Particles produced by cars and trucks can create a yellow haze in the air called smog.

12. Chemicals in old aerosol cans and old air conditioners can escape high into the atmosphere and destroy ozone.

13. In some areas, pollution caused by smoke and gases from factories combines with rain to form acid rain.

How do we protect our air?

14. Many pollutants are now banned or disposed of before they get into the air because of the Clean Air Act.

15. For example, vehicles have devices that limit the amount of pollutants that come out of exhaust pipes.

Critical Thinking

16. Why are water and air important resources?

Most of the organisms that live on land (including people) cannot survive without fresh water. Water is used for drinking, to irrigate crops, and to fight fires. Air contains gases necessary for life. Plants take in carbon dioxide to make their food. Both plants and animals use oxygen to produce energy.
Choose the letter of the best answer.

8. Harmful chemicals added to air, water, or soil are
   a. luster.
   b. pollution.
   c. runoff.
   d. smog.

9. The remnants, or traces, of ancient organisms preserved in soil or rock are known as
   a. fossils.
   b. minerals.
   c. horizons.
   d. fuels.

10. Which of these is a nonrenewable energy resource?
    a. wind
    b. falling water
    c. oil
    d. biomass

11. Which of these is an alternative energy resource?
    a. coal
    b. natural gas
    c. the Sun
    d. oil

12. Which of these statements is true of a nonrenewable energy resource?
    a. Its supply will never run out.
    b. It is used up faster than it is made.
    c. It cannot be burned as fuel.
    d. It can be replaced faster than it is used.

13. An underground layer of rock or soil that can absorb water is a(n)
    a. aquifer.
    b. reservoir.
    c. soil horizon.
    d. well.

14. Which of these is a source of drinking water for people?
    a. acid rain
    b. ozone holes
    c. groundwater
    d. pools of magma

15. A yellow haze in the air caused by particles from cars and factories is
    a. oxygen.
    b. acid rain.
    c. carbon dioxide.
    d. smog.
Weather Patterns

Complete the concept map about weather.

<table>
<thead>
<tr>
<th>Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>The average weather in a given region is called <strong><strong>climate</strong></strong>.</td>
</tr>
<tr>
<td>Weather is predicted by measuring <strong><strong>variables</strong></strong> and making <strong><strong>maps</strong></strong>.</td>
</tr>
<tr>
<td>The variables that contribute to weather are air pressure, <strong><strong>temperature</strong></strong>, cloud cover, <strong><strong>precipitation</strong></strong>, and wind speed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of Cloud Cover</th>
<th>Types of Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Definition</td>
</tr>
<tr>
<td>Cirrus clouds</td>
<td>Clouds composed of ice crystals high in the sky.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulus clouds</td>
<td>Puffy clouds at middle altitudes.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clouds and Precipitation

Fill in the blanks.

<table>
<thead>
<tr>
<th>air mass</th>
<th>fog</th>
<th>snow</th>
<th>weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>clouds</td>
<td>front</td>
<td>stratus</td>
<td></td>
</tr>
<tr>
<td>cumulus</td>
<td>sleet</td>
<td>warm front</td>
<td></td>
</tr>
</tbody>
</table>

The formation of precipitation begins when water vapor condenses on dust particles, forming _______ clouds _______.

Clouds form in different places and have different shapes—_______ fog _______ forms close to the ground, layered _______ stratus _______ clouds form at low altitudes, and puffy _______ cumulus _______ clouds form at middle altitudes.

Cirrus clouds form at the highest altitudes. Water droplets grow larger until they become heavy enough to fall as rain, _______ snow _______, or _______ sleet _______.

A large region of air that has similar temperatures and humidity throughout is called a(n) _______ air mass _______. As air masses move, they cause changes in the _______ weather _______.

A place where two different air masses meet is called a(n) _______ front _______. Warm air moving toward cold air is called a(n) _______ warm front _______. Cold air moving toward warm air is called a cold front.
Severe Storms

Match the correct letter with the description.

| a. blizzard          | e. storm surge       |
| b. cyclone           | f. thunderstorm      |
| c. ground blizzard   | g. tornado           |
| d. hurricane         | h. whiteout          |

1. _____ c  blizzard that occurs when snow is no longer falling
2. _____ f  rainstorm with thunder and lightning
3. _____ a  snowstorm with winds of 35 miles per hour and visibility of a 1/4 mile
4. _____ d  tropical storm with wind speeds reaching more than 74 miles per hour
5. _____ h  zero visibility caused by heavy snowfall combined with strong updrafts and downdrafts
6. _____ e  bulge of water in the ocean, caused by hurricane winds
7. _____ b  any storm with a low pressure closure that causes the formation of a circular pattern of winds
8. _____ g  rotating funnel-shaped cloud with winds that blow up to 300 miles per hour
Climate

Use your textbook to help you fill in the blanks.

What is climate?

1. Two variables that are important in determining climate are _______ temperature _______ and _______ rainfall _______.

2. The global variable that has the strongest effect on climate is _______ latitude _______.

3. Areas along the equator are located in the _______ tropical _______ zone.

4. A way to categorize an area’s climate is to describe the _______ plants _______ that grow there.

5. Many scientists are concerned that the global climate is _______ warming _______.

6. Radiated heat from Earth’s surface is _______ absorbed _______ by a layer of greenhouse gases. Some of the heat then radiates back and warms Earth.

7. Greenhouse gases include _______ water vapor _______, _______ carbon dioxide _______, and _______ ozone _______.

8. Burning _______ fossil fuels _______ increases the amount of greenhouse gases in the atmosphere, a factor in _______ global warming _______.

© Macmillan/McGraw-Hill
Climate

Choose a word from the word box below to complete the puzzle.

clim ate  Gulfstream  polar  tropical

ENSO  La Niña  temperate  windward

Across

2. Climate zone located along the equator
3. Average weather of a place
5. Climate zone located at the North and South poles
7. Wetter side of a mountain
8. Comings and goings of El Niño

Down

1. Ocean current that warms Europe
4. Climate with warm summers and cold winters
6. The dryer weather that occurs when the current along the Peruvian coast sinks
The type of weather that exists in a place over the long term is its climate. The two most important variables that determine climate are ___temperature___ and ___precipitation___. It is possible to predict the climate of an area if you know its ___latitude___.

Areas near the equator have ___tropical___ climates and the highest temperatures. They also have heavy precipitation during at least part of the year. Areas near the poles have polar climates. Areas between the tropical and polar zones have ___temperate___ climates. Other factors that affect climate are distance from a(n) ___body of water___, ___ocean currents___, and ___altitude___. All of these factors can give you a general idea of the climate of an area.
**Compare and Contrast**

Fill in the Venn diagram below with the facts that you underlined in each of the letters on the previous page.

![Venn Diagram]

<table>
<thead>
<tr>
<th>Mekong River</th>
<th>Both</th>
<th>Palmdale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes more rain than expected</td>
<td>Very hot</td>
<td>Dry season from May to November</td>
</tr>
<tr>
<td>Monsoon season from May to October</td>
<td>Storms last for an hour each day</td>
<td>Water does not rain</td>
</tr>
<tr>
<td>Storms last for an hour each day</td>
<td>Swampy ground</td>
<td>Water piped in from other areas</td>
</tr>
<tr>
<td>Swampy ground</td>
<td></td>
<td>Water plants in the evening</td>
</tr>
</tbody>
</table>

**Write About It**

**Compare and Contrast** How does the weather in Palmdale compare with the weather near the Mekong River? What activity do both Carlos and Vang do?

**Compare and Contrast**

Answer the following questions, using the information you have about both Palmdale and the Mekong River.

1. How does the weather in Palmdale compare with the weather near the Mekong River?

   During the summer, weather in Palmdale is hot and dry, and weather near the Mekong River is hot and wet.

2. What activity do both Carlos and Vang do?

   Both Carlos and Vang garden, but Carlos grows peppers and Vang grows rice.
7. Which of the following best describes how snow forms?
   a. Water vapor freezes directly into a solid.
   b. Water droplets freeze and then fall as precipitation.
   c. Water droplets collide with bits of ice and freeze.
   d. Water droplets fall through a layer of cold air close to the ground.

8. An air mass that forms over northern Canada will be
   a. cold and humid.
   b. cold and dry.
   c. warm and humid.
   d. warm and dry.

9. Which of the following best describes how the weather will change when a cold front moves into an area?
   a. The weather will become drier.
   b. The weather will become clear and cool.
   c. The weather will become stormy, but when the front passes, the weather will become cool and dry.
   d. The weather will become stormy and warmer.

10. Which of the following is a cyclone?
    a. thunderstorm
    b. blizzard
    c. ice storm
    d. hurricane

11. When do storm surges occur?
    a. during a blizzard
    b. during a hurricane
    c. during a thunderstorm
    d. during a tornado

12. A storm that has an eye and rotating winds that reach 74 miles per hour is called a
    a. tropical storm.
    b. cyclone.
    c. tornado.
    d. hurricane.

13. A sudden discharge of static electricity during a thunderstorm is called
    a. thunder.
    b. lightning.
    c. a low pressure closure.
    d. a downdraft.
What Would Happen if Gravity Went Away?
Read the Writing in Science feature in your textbook.

Write About It
Explanatory Writing You know that gravity keeps everything on Earth from floating off into space. Look at the picture on page 438 of your textbook. Explain what would change if gravity suddenly stopped working.

Planning and Organizing
Explanatory writing requires you to organize your ideas in chronological or time order. When Luis planned to make a mobile to represent the solar system, he needed to list the steps in sequence. Here are some steps that he wrote, number them from 1 to 5 with 1 being the first step.

1. _____ 3. Next, cut out the circles. Punch a hole at the top.

2. _____ 5. Then, thread the string through the hole in each circle. Attach it to a coat hanger. Finally, paste a cutout of the Sun onto the coat hanger.

3. _____ 1. First, look at the sizes of the planets in comparison to each other.

4. _____ 4. After that, use string to represent how far each planet is from the Sun.

5. _____ 2. Then, use a compass to draw circles on cardboard to represent each planet. Make sure each circle represents the relative size of each planet. Color each planet and write its name.
The Solar System

Use your textbook to help you fill in the blanks.

How do we observe objects in space?

1. An optical telescope uses __________ lenses or mirrors to make distant objects seem larger and nearer.

2. The orbiting Hubble Space Telescope “sees” objects more clearly than Earth-based telescopes because Earth’s __________ does not change Hubble’s view.

3. Radio telescopes are giant dishes on Earth’s surface that gather __________ waves from objects in space.

What are planets?

4. The solar system includes eight __________ planets that orbit the Sun.

5. The planet closest to the Sun is __________ Mercury, and the planet farthest away from the Sun is __________ Neptune.

6. Mercury, Venus, Earth, and Mars are terrestrial planets with surfaces made of __________ rock.

7. Jupiter, Saturn, Uranus, and Neptune have surfaces made of __________ gases.

How do the planets compare?

8. The most noticeable feature about __________ Saturn is its large set of rings that are made of ice and rock.
The Solar System

Fill in the blanks.

<table>
<thead>
<tr>
<th>asteroids</th>
<th>gases</th>
<th>none</th>
<th>telescopes</th>
</tr>
</thead>
<tbody>
<tr>
<td>comets</td>
<td>Jupiter</td>
<td>tail</td>
<td>terrestrial</td>
</tr>
</tbody>
</table>

The major objects of the solar system are eight planets that orbit the Sun and their moons. Earth is one of the terrestrial planets, which have rocky surfaces. Jupiter, Saturn, Uranus, and Neptune have surfaces made of gases. Earth has one moon, some planets (such as Mercury and Venus) have none, and other planets (such as Jupiter and Saturn) have many.

Other objects in the solar system include the asteroids that orbit the Sun between Mars and Jupiter. Balls of ice, dust, and rock in elongated elliptical orbits around the Sun are comets. When far away from the Sun, comets remain frozen, but they form a glowing tail of gas and dust as they get close to the Sun. Astronomers study the solar system with many types of telescopes.
Stars and the Universe

Use your textbook to help you fill in the blanks.

How do stars form?

1. Stars form from a huge cloud of gases and dust called a(n) __________ nebula.

2. When the cloud contracts and powerful reactions start to turn hydrogen atoms into helium atoms to produce energy, a(n) __________ protostar forms.

3. A __________ white dwarf is a small very dense star that shines with cool white light.

What happens to larger stars?

4. A star that begins life with much more hydrogen than a medium-size star such as our Sun ends its life as an exploding star called a(n) __________ supernova.

5. Very massive stars end their lives as __________ black holes, which are objects with gravity so powerful that even light cannot escape from them.

6. Stars are classified by their size, __________ color, and temperature.

7. The Sun is a medium-size __________ yellow star with a surface temperature of about 6,000°C.

8. By studying the motion of distant stars, scientists have discovered about 160 __________ planets outside our solar system.
8. What causes tides?
   a. earthquakes beneath the ocean  
   b. the gravity of the Moon and Sun  
   c. Earth’s inertia in space  
   d. high winds on the ocean’s surface  

9. A natural object that orbits a planet is a(n)  
   a. asteroid.  
   b. comet.  
   c. moon.  
   d. star.  

10. In the solar system, most asteroids are  
    a. beyond Neptune.  
    b. orbiting Saturn.  
    c. between Mars and Jupiter.  
    d. next to the Sun.  

11. When a meteor lands on the surface of Earth, it is called a(n)  
    a. asteroid.  
    b. meteorite.  
    c. comet.  
    d. satellite.  

12. What does a telescope do?  
    a. makes objects in space appear larger and nearer  
    b. brings objects closer to Earth  
    c. makes Earth seem brighter  
    d. allows us to see black holes  

13. Stars form from a cloud of gas called a  
    a. galaxy.  
    b. nebula.  
    c. universe.  
    d. neutron star.  

14. What object is so dense and has such strong gravity that no light can escape it?  
    a. black hole  
    b. neutron star  
    c. white dwarf  
    d. red giant  

15. What is the name of the theory that explains the way the universe began?  
    a. The Gravitational Microlensing Theory  
    b. The Stellar Life Cycle Theory  
    c. The Big Bang Theory  
    d. The Expanding Universe Theory
Metals, Nonmetals, and Metalloids

Who am I? What am I?

Choose a word from the word box below that answers each question.

| a. corrosion | d. metal | g. nonmetal |
| b. ductility | e. metalloid | h. semiconductor |
| c. malleability | f. noble gas |

1. _____ d. I am a shiny solid that conducts electricity very well. What am I?
2. _____ f. I am very particular. I am an element that does not like to mix with others. What am I?
3. _____ e. Look for me in the middle of columns in the periodic table. I am located between the metals and the nonmetals. Who am I?
4. _____ b. I am a property of metals. Because of me, people can make copper into thin wires. What am I?
5. _____ g. I am a poor conductor of electricity. Try to bend or flatten me, and I will break or crumble instead. Who am I?
6. _____ a. I happen when metals are left outdoors and combine with nonmetals. I create rust in iron. Who am I?
7. _____ c. I am the property that lets you bend and shape a metal. What am I?
8. _____ h. I am a metalloid used in computer chips. I conduct electricity better than a nonmetal, but not as well as a metal. Who am I?
Choose the letter of the best answer.

8. The pull of gravity on an object determines that object's
   a. mass.
   b. volume.
   c. weight.  
   d. electrical charge.

9. The amount of space being taken up by matter is known as its
   a. volume.
   b. weight.
   c. mass.
   d. density.

10. Anything that has mass and volume is
    a. metallic.
    b. matter.
    c. gaseous.
    d. atomic.

11. The amount of mass for each milliliter of a substance determines the substance’s
    a. weight.
    b. buoyancy.
    c. density.  
    d. volume.

12. An object’s resistance to sinking is called
    a. weight.
    b. buoyancy.
    c. volume.
    d. surface tension.

13. The property that allows matter to be bent, flattened, or hammered without breaking is
    a. malleability.
    b. surface tension.
    c. ductility.
    d. buoyancy.

14. What happens to a metal that is left exposed to the environment and combines chemically with a nonmetal?
    a. It shrinks.
    b. It becomes a metalloid.
    c. It corrodes.
    d. It becomes a nonmetal.
Physical and Chemical Changes

Use your textbook to help you fill in the blanks.

A physical change may involve a change in shape, size, or state of matter. The three states of matter are solid, liquid, and gas.

<table>
<thead>
<tr>
<th>Name of Process</th>
<th>Speed of Process</th>
<th>Initial Phase</th>
<th>Final Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporation</td>
<td>Slow</td>
<td>Liquid</td>
<td>Gas</td>
</tr>
<tr>
<td>Boiling</td>
<td>Fast</td>
<td>Liquid</td>
<td>Gas</td>
</tr>
<tr>
<td>Sublimation</td>
<td>Fast</td>
<td>Solid</td>
<td>Gas</td>
</tr>
<tr>
<td>Melting</td>
<td>Slow/Fast</td>
<td>Solid</td>
<td>Liquid</td>
</tr>
<tr>
<td>Condensation</td>
<td>Slow/Fast</td>
<td>Gas</td>
<td>Liquid</td>
</tr>
</tbody>
</table>
When does matter change states?

10. When a substance melts or boils, it absorbs _______ heat energy _______.

11. The temperature at which a substance changes from a solid to a liquid is its _______ melting point _______.

12. The temperature at which a substance changes from a liquid to a gas is its _______ boiling point _______.

13. The temperature at which a substance changes from a liquid to a solid is its _______ freezing point _______.

14. Nonmetals are weakly attracted to one another, so they have _______ low _______ melting and boiling points.

15. The slow change from a liquid to a gas at temperatures below the boiling point is called _______ evaporation _______.

What are expansion and contraction?

16. An increase in an object’s volume when it is heated is called _______ thermal expansion _______; a decrease in its volume when it is cooled is called _______ thermal contraction _______.

Critical Thinking

17. How does water change when heat is added or removed?

When liquid water is heated to 100°C, it boils and changes into a gas. If the gas is cooled, it condenses and becomes a liquid. If the liquid is cooled to 0°C, it freezes and becomes a solid. If ice is heated, it melts to become water or sublimes to become a gas. Liquid water expands when heated and when it turns into ice.
10. A solution of two or more solids is a(n) ___________ alloy.

11. Because it can dissolve many things, water is called the ___________ universal solvent.

How can you take mixtures apart?

12. To separate one part of a mixture from another, you can use a(n) ___________ physical property.

13. When two liquids in a mixture have different boiling points, they can be separated by ___________ distillation.

14. Because liquids travel at different speeds through an absorbent paper, they can be separated by ___________ chromatography.

How are mixtures used?

15. Cheese, gelatin, marshmallows, and paint are all examples of useful ___________ colloids.

16. Copper is alloyed with zinc to make ___________ brass.

Critical Thinking

17. Suppose you were to mix together salt, water, and mud. Identify the type of mixture you have made. Describe how you could separate the parts of the mixture from one another.

The mixture is a heterogeneous suspension because it is not the same throughout. The specks of mud could be seen with a microscope, and the mud would eventually settle. The mixture could be poured through a filter, or it could be allowed to settle to separate out the mud. Then, the water could be boiled away, leaving behind the dissolved salt.
Acids, Bases, and Salts

Use your textbook to help you fill in the blanks.

What are acids and bases?

1. A substance that tastes \textit{sour}, turns blue litmus to red, and reacts with metals to make \textit{hydrogen gas} is a(n) \textit{acid}.

2. When acids dissolve in water, they release \textit{hydrogen ions or H}^+ \textit{ions}.

3. An atom or a molecule that has lost or gained one or more electrons is a(n) \textit{ion}.

4. Hydrogen ions have a positive charge because they have lost an \textit{electron}.

5. Our stomachs produce \textit{HCl}, which helps digest food.

6. A substance that tastes \textit{bitter}, is slippery to the touch, and turns red litmus to blue is a(n) \textit{base}.

7. When bases dissolve in water, they release \textit{hydroxide ions or OH}^- \textit{ions}, which have a(n) \textit{negative} charge.

8. \textit{Ammonia} is used to make fertilizers.

9. Sodium hydroxide (NaOH), also called \textit{lye or caustic soda}, is used to make textiles, detergents, and some plastics.
How can indicators identify acids and bases?

10. A dye that reacts chemically with acids and bases to produce one color in acids and another color in bases is called an \textbf{acid-base indicator}.

11. A low number on the pH scale indicates \textbf{strong acidity}; a high number indicates \textbf{strong alkalinity}.

12. A pH of 7 means that the solution is \textbf{neutral}.

What are salts?

13. Mixing an acid with a base produces \textbf{a salt} and water.

14. Acids and bases combine to form pH neutral solutions, a process called \textbf{neutralization}.

15. A compound that has positive and negative ions in a regular pattern or crystal is a(n) \textbf{salt}.

16. Acids, bases, and salts dissolve in water to form a(n) \textbf{electrolyte}.

Critical Thinking

17. Compare and contrast acids and bases. Tell what happens when they are mixed together.

\textbf{An acid forms hydrogen ions in water, so it has a low pH. It tastes sour, stings at the touch, and turns litmus red. A base forms hydroxide ions in water, so it has a high pH. It tastes bitter, feels slippery, and turns litmus red. When mixed together, an acid and base can neutralize each other and form salt and water.}
Physical and Chemical Changes

Choose the letter of the best answer.

1. Which of the following is a physical change?
   a. paper burning
   b. egg frying
   c. water boiling
   d. baking soda and vinegar fizzing

2. Snow changing to water vapor is an example of
   a. sublimation.
   b. boiling.
   c. melting.
   d. thermal contraction.

3. When most liquids freeze, they undergo
   a. thermal expansion.
   b. thermal contraction.
   c. condensation.
   d. sublimation.

4. When a gas loses heat, it
   a. evaporates.
   b. boils.
   c. sublimes.
   d. condenses.

5. The temperature at which alcohol changes to a gas is its
   a. sublimation point.
   b. freezing point.
   c. boiling point.
   d. melting point.

6. Steel is an example of a(n)
   a. alloy.
   b. colloid.
   c. heterogeneous mixture.
   d. suspension.

7. Which of the following can form a solution most easily?
   a. two liquids
   b. two gases
   c. two solids
   d. a gas and a liquid

8. In a saltwater solution, the salt is a(n)
   a. alloy.
   b. colloid.
   c. solvent.
   d. solute.
9. Which of the following is an example of a colloid?
   a. gelatin  
   b. brass  
   c. sugar water  
   d. orange juice

10. Which of the following is a compound?
    a. brass  
    c. iron  
    b. rust  
    d. steel

11. In the chemical reaction called photosynthesis, which of the following is a reactant?
    a. sunlight  
    b. oxygen  
    c. carbon dioxide  
    d. sugar

12. Which of the following indicates that a chemical change has taken place?
    a. a change from a liquid to a gas  
    b. an increase in the volume of a substance  
    c. a change from a solid to a liquid  
    d. a change in the color of a substance

13. Which of the following is a property of bases?
    a. tastes bitter  
    b. tastes sour  
    c. stings the skin  
    d. reacts with metal to make hydrogen gas

14. Which of the following releases hydrogen ions when dissolved in water?
    a. sodium hydroxide  
    b. hydrochloric acid  
    c. sodium chloride  
    d. baking soda

15. What happens when an acid and a base are mixed?
    a. A gas is given off.  
    b. A salt forms.  
    c. A color change occurs.  
    d. Heat is given off.
Using Forces

Fill in the concept map below using the information you know about forces.

1. Motion is a change in an object’s ________ over time.

2. Speed is a measure of how fast an object’s position changes. A measurement of an object’s speed and its direction is ________.
   A change in an object’s velocity is ________.

3. A force is a push or a ________ exerted on an object.

4. Newton’s laws describe how forces affect _________. These laws include the ________, second, and ________.

5. A force multiplied by the distance over which the force is applied is _________. The ability to do work is ________.

6. Machines can make doing work easier by changing the ________ of a force or the ________ over which the force is applied.
Motion

Use your textbook to help you fill in the blanks.

What is motion?

1. The location of an object is its __________ position. 
   A change in the position of an object over time is motion.
   Motion has two parts: __________ direction and __________ distance.

2. Distance can be measured in __________ meters, __________ kilometers, __________ feet, __________, or __________ miles.

3. To measure direction, you can use a(n) __________ compass or protractor and units of __________ degrees.

4. You need a(n) __________ frame of reference from which to measure position or motion.

What is speed?

5. To calculate speed, divide the __________ distance traveled by the __________ time spent traveling.

6. Units of speed can be __________ meters per second or __________ miles per hour.

7. To state the velocity of an object, you need to know the object’s __________ speed and its __________ direction.
What is acceleration?

9. Any change in the velocity of an object is a(n) ______ acceleration ______.

10. If the speed of a car traveling south is increasing 5 m/s every second, its acceleration is ______ 5 (m/s)/s south ______.

11. An acceleration can be a change in speed or a change in ______ direction ______. Negative acceleration is called ______ deceleration ______.

What is momentum?

12. An object’s mass multiplied by its velocity is its ______ momentum ______.

13. An object with a mass of 1 kg and a velocity of 10 m/s has a momentum of ______ 10 kg m/s ______.

14. The more mass an object has, the ______ greater ______ its inertia.

Critical Thinking

15. Would it be more difficult to stop a truck carrying a heavy load or stop the same truck empty? Explain your answer, using the concepts of inertia and momentum.

The truck carrying a heavy load has more inertia than an empty truck. It would be harder to change its momentum.
The Position of Earth and the Sun

Read the Reading in Science feature in your textbook.

Main Idea and Details

Use the table below to record the main idea and details described in the timeline portion of the reading passage in your textbook.

<table>
<thead>
<tr>
<th>Main Idea</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many throughout history have made discoveries that help us determine how the planets and stars move.</td>
<td>Aristotle developed a model showing the movement of stars and planets around Earth.</td>
</tr>
<tr>
<td></td>
<td>Ptolemy used Aristotle’s model and geometry to predict the way the Sun, the Moon, and planets would appear in the sky.</td>
</tr>
<tr>
<td></td>
<td>Copernicus first proposed that the Sun is at the center of the Solar System.</td>
</tr>
<tr>
<td></td>
<td>Galileo’s discovery of moons circling Jupiter supported Copernicus’s theory.</td>
</tr>
<tr>
<td></td>
<td>Einstein explained how gravity works, helping us understand the movement of planets and stars.</td>
</tr>
<tr>
<td></td>
<td>Margaret Geller worked on the first 3-D map of the universe.</td>
</tr>
</tbody>
</table>
Write About It

Main Idea and Details  Read the “Write About It” question. Use the text of “The Position of Earth and the Sun” feature to write your answers.

Identifying the Main Idea
The main idea is the central point of the passage. It tells you what the passage is about. Review the graphic organizer to find the main idea of the passage. Write that idea on the lines below.
People throughout history made discoveries that help us determine how the planets and stars move.

Identifying Supporting Details
Details are important parts of the passage that support the main idea. Look for the supporting details within the list of scientists that follows the opening paragraphs. Give one detail from the article that supports the main idea. You can choose one supporting detail from your table. Students may respond with any of the details listed in the table on the opposite page.
Forces and Motion

Use your textbook to help you fill in the blanks.

What are forces?

1. Units of force are the _______ Newton _______ and the _______ pound _______.

2. An arrow can be used to represent the _______ strength _______ and _______ direction _______ of a force.

3. Three forces that act on an airplane: _______ thrust _______, lift, and _______ drag _______.

What are gravity and friction?

4. The force that pulls all objects together is called _______ gravity _______.

5. The amount of friction depends on two factors: the roughness of the _______ surfaces _______ of the objects and how much force is required to _______ push _______ the two objects together.

6. _______ Heat _______ is created whenever there is friction.

What is Newton’s first law?

7. According to the law of inertia, an object at rest tends to _______ stay at rest _______, and an object in motion tends to _______ stay in motion _______, unless acted upon by an _______ unbalanced force _______.

© Macmillan/McGraw-Hill
9. A material that conducts heat poorly is a good ________ thermal insulator.  

10. Thermal conductivity increases as ________ density increases, so ________ solids are the best conductors of heat and ________ gases are the worst conductors.  

11. Objects with a low heat capacity change temperature ________ quickly when heated.  

When is heat waste?  

12. Heat energy caused by friction is usually a waste product that results when energy ________ changes form or ________ performs work.  

Critical Thinking  

13. Describe how heat is used in a kitchen. What appliances produce heat, and how do they produce it? What objects are used as insulators, and what objects are used as conductors?  

Stoves produce heat by burning fossil fuel or by sending electricity through heating coils. Crock pots and toasters also use heating coils to produce heat. Pots and pans are metal, so they conduct heat well.  

Pot holders and pot handles are insulators.  

© Macmillan/McGraw-Hill
9. If you move in the direction from which a sound wave is coming, you hear a higher pitch as a result of the **Doppler effect**.

**What is volume?**

10. Amplitude of sound depends on how **dense** the air in compressions is compared to normal air.

11. Volume is measured in **decibels**.

12. A 30 dB noise has **100 times** more energy than a 10 dB noise, but a 30 dB noise sounds about **4 times** as loud as a 10 dB noise.

13. To make a sound louder, you need to use more energy, which increases the **density** of the particles in the compressions.

14. The volume of a sound decreases with **distance** because the same amount of sound energy is spread over a larger and larger area.

**What is echolocation?**

15. Bats make sound and listen to the **echo** to locate prey.

16. Sound navigation and ranging, or **sonar**, is used to find the depth of a body of water and locate objects beneath water.

**Critical Thinking**

17. Why is the pitch of a train’s whistle higher as the train approaches and lower as it moves away?

   Because the train is moving, the sound waves from the whistle are **compressed in front of the train. The sound waves are expanded behind the train.**
Light

Use your textbook to help you fill in the blanks.

What is light?

1. Light is vibrating electric and magnetic energy.
2. Light waves vibrate in directions perpendicular to the direction of their motion.
3. Light travels fastest in a vacuum.
4. The wavelength of a wave times its frequency is the speed of the wave.
5. Light has properties of both waves and particles.

How does light make shadows?

6. Light rays bouncing off a surface at random angles is called scattering.
7. If most light goes through an object, the object is transparent; if some light goes through, the object is translucent; if no light goes through, the object is opaque.
8. Objects that do not allow light to pass through cause shadows.
Electricity

Use your textbook to help you fill in the blanks.

What is static electricity?

1. When two objects rub against each other, electrons can move from one object to the other and cause a buildup of static electricity.

2. Electrons jumping through the air to an area that has a positive charge form a(n) spark.

3. Charges move easily on a good conductor.

4. Objects can be protected from the buildup of static electricity by grounding them to the Earth.

How can electricity flow?

5. Circuits must have an unbroken path of conductors and a(n) voltage that causes the electrons to move along the path.

6. A device that can open or close a circuit is called a(n) switch.

7. Resistance is measured in ohms, and electric current is measured in amperes or amps.

8. The amount of electric charge moving in a circuit is measured in units called amperes or amps (A).
Electricity

Fill in the blanks.

amperes  resistor  voltage source

circuit  static electricity

conductors  switch

When objects rub against each other, electrons sometimes move from one object onto the other. The resulting buildup of charged particles is called static electricity. A circuit is formed when an electric current passes through an unbroken path of conductors. A voltage source is needed to move electrons along the circuit. The amount of electric charge moving in a circuit is measured in amperes or amps (A).

A device that opens or closes a circuit is called a(n) switch. Any device, such as a light bulb, that resists the flow of electrons is a(n) resistor. Circuits that have only one path for electrons are series circuits, and circuits that have more than one path are parallel circuits.
### Building a Better Battery

Read the Reading in Science feature in your textbook. Try to draw conclusions from text clues.

**Draw Conclusions**

Fill in the Drawing Conclusions Chart using text clues you find in the article.

<table>
<thead>
<tr>
<th>Text Clues</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Batteries are devices that store chemical energy and make it available in electric form.</td>
<td>Batteries convert chemical energy to electrical energy.</td>
</tr>
<tr>
<td><strong>2.</strong> All batteries have positive and negative electrodes and an electrolyte through which a(n) current can flow.</td>
<td>Wires can be attached to electrodes; electrolyte is a solution through which electrons move.</td>
</tr>
<tr>
<td><strong>3.</strong> A(n) lead-acid battery has two electrodes in a(n) sulfuric acid solution; cars today still use them.</td>
<td>This type of battery uses lead electrodes, and sulfuric acid solution is the electrolyte; this type of battery can be recharged.</td>
</tr>
<tr>
<td><strong>4.</strong> Laptop computers use lithium-ion batteries; they are lightweight and powerful.</td>
<td>Lithium-ion batteries allow laptop computers to run longer without needing to be recharged.</td>
</tr>
</tbody>
</table>
Write About It

Draw Conclusions
1. What makes batteries useful?
2. What is the electrolyte in a lead-acid battery?

Planning and Organizing

Answer these questions in more detail.

What things do you use that require batteries?

Answers will vary. Students may mention: calculators, remote controls, MP3 players.

Explain what an electrolyte is.

An electrolyte is a substance through which current can flow.

Explain how a voltaic pile is constructed and what is used as the electrolyte.

A voltaic pile is built with alternating copper and zinc discs, separated by cloth soaked in salt water.

What kinds of batteries do cars have and why do they have them?

Cars run on lead-acid batteries. They are used in cars because they are rechargeable.

What are the benefits of using rechargeable batteries?

Answers will vary. Students may state that not as many batteries are thrown into landfills and people may save money by not having to buy as many batteries.
Magnetism

Use your textbook to help you fill in the blanks.

What is magnetism?

1. When a magnet is cut in half, each of the two pieces has a(n) _______ north pole and a(n) _______ south pole.

2. Like poles of a magnet _______ repel each other, and unlike poles _______ attract each other.

3. The Earth is a giant permanent _______ magnet.

4. Whenever an electric charge moves, it creates _______ magnetic forces.

5. The _______ closer together the lines of a magnetic field, the stronger the magnetic force.

What are electromagnets?

6. An electric current that produces a magnetic field is called a(n) _______ electromagnet.

7. A magnetic field _______ circles around a straight wire when current is flowing through it.

8. Wrapping many loops of wire together _______ increases the magnetism of the coil.

9. You can increase the strength of an electromagnet in three ways: _______ add more coils, place an iron rod inside the coils, or _______ increase the current.