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SCIENCE EXPLORER

Grade 7

Guided Reading and Study Workbook

- Promotes active reading and enhances students' study skills using innovative questioning strategies and exercises linked to the student text
- Builds a record of students' work to use as a study aid for quizzes and tests
- Provides a wide range of question formats—for every section of the text—to reach a wide variety of learners
- Gives parents a handy resource to help students study and learn

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Science Explorer Guided Reading and Study Workbook Grade 7 Prentice Hall

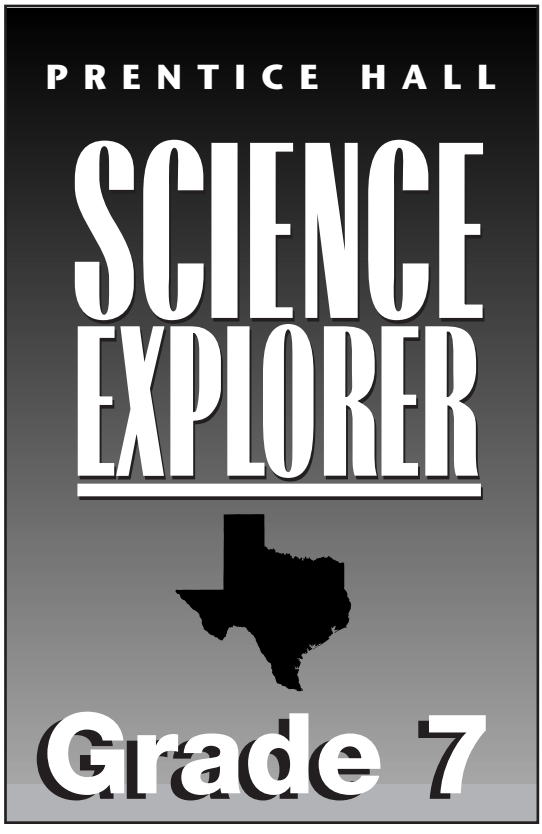

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Table of Contents

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What Is Science?
(pages 10–19)

This section explains the skills that scientists use to solve problems and find answers. It also tells about safety in the laboratory and branches of science.

▶ Introduction (page 10)

1. A way of learning about the natural world is science.
2. What is scientific inquiry? Scientific inquiry is the many ways in which scientists study the natural world.

▶ Thinking Like a Scientist (pages 10–15)

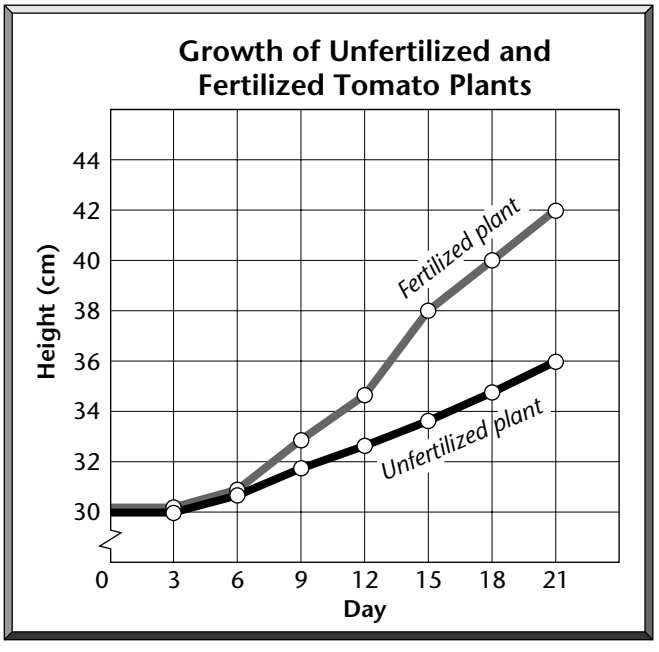
3. Circle the letter of the skill that scientific inquiry usually begins with.
   a. designing an experiment **b.** asking a question
   c. collecting data **d.** communicating
4. Is the following sentence true or false? An inference is a fact.
   false
5. Is the following sentence true or false? A hypothesis is a possible explanation for a set of observations. true
6. What is a controlled experiment? An experiment in which all of the variables except for one remain the same
7. Circle the letter of the manipulated variable in the tomato plant experiment.
   a. sunlight **b.** water **c.** height **d.** fertilizer
8. The facts, figures, and other observations that are gathered through using one or more of your senses are called data.

Name _____ Date _____ Class _____

What Is Science? *(continued)*

9. Why is it important for scientists to use a standard system of measurement? With a standard system of measurement, scientists from all over the world can communicate their findings with one another.

10. Use this graph to answer the questions below.



a. Compare the heights of the two tomato plants after six days.
Both plants are the same height.

b. Compare the heights of the two tomato plants after 21 days.
The fertilized plant is 6 cm taller than the unfertilized plant.

11. What does it mean to draw a conclusion? Drawing a conclusion means to sum up what you have learned from the investigation.

12. How do scientists communicate their conclusions to other scientists?
Scientists write articles in scientific journals, attend scientific meetings, and use the Internet.

Name _____ Date _____ Class _____

▶ Scientific Theories and Laws (page 16)

13. What is a scientific theory? A scientific theory is a well-tested concept that explains a wide range of observations.

14. Is the following sentence true of false? Future testing can prove a scientific theory to be incorrect. true

▶ Laboratory Safety (page 16)

15. Circle the letter of each safe laboratory practice.

(a.) Show respect to your teacher and classmates.

(b.) Wear proper safety equipment.

(c.) Handle lab materials carefully.

(d.) Keep your work area neat and clean.

▶ Branches of Science (pages 18–19)

16. List the four main branches of science.

a. physical science **b.** Earth science

c. life science **d.** environmental science

▶ Technology and the Internet (page 19)

17. Circle the letter of each way that scientists use technology.

(a.) Microscopes to see tiny viruses

b. Telescopes to make models

(c.) Computers to make graphs

(d.) Internet to communicate

Reading Skill Practice

A concept map is a useful tool to organize information. Make a concept map to show the skills that scientists use in an investigation. For more information about concept maps, see page 660 in the Skills Handbook of your textbook.

Students should include the skills described on pages 10–15.

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WordWise

Answer the questions by writing the correct key term in the blanks. Use the circled letter in each term to find the hidden key term. Then write a definition for the hidden key term.

What is a factor that can be changed in an experiment?

v a r (i) a b l e

What includes all of the knowledge gained while exploring the natural world?

s c i e (n) c e

What is a well-tested concept that explains a wide range of observations?

s c i e n t i (f) i c t h e o r y

What is a possible explanation for a set of observations?

h y p o t h (e) s i s

What skill involves using one or more of your senses to gather information and collect data?

o b s e (r) v a t i o n

What is the factor that changes in an experiment because of the manipulated variable?

r (e) s p o n d i n g v a r i a b l e

What is the one variable that is changed in an experiment to test a hypothesis?

m a (n) i p u l a t e d v a r i a b l e

What is an experiment in which all of the variables except for one remain the same?

(c) o n t r o l l e d e x p e r i m e n t

What term describes the many ways in which scientists study the natural world?

s c i (e) n t i f i c i n q u i r y

Key Term: i n f e r e n c e

Definition: An inference is an interpretation of an observation that is based on evidence or prior knowledge.

Name _____ Date _____ Class _____

CHAPTER 1

The Properties of Matter

SECTION 1–1 Matter and Changes in Matter (pages 24–30)

This section describes properties of matter and how matter can be classified. The section also describes ways in which matter can change.

▶ Physical and Chemical Properties of Matter (page 25)

1. Is the following sentence true or false? Physical and chemical properties of matter are characteristics used to classify and describe a particular substance. true

2. What is a physical property? A physical property is a characteristic of a substance that can be observed without changing the substance into something else.

3. What is a chemical property? A chemical property is a characteristic that is observed when a substance changes into a different substance.

▶ Elements, Compounds, and Mixtures (pages 26–27)

4. Complete the following table.

Matter	
Kind of Matter	**Definition**
Element	Substance that cannot be broken down into other substances by chemical or physical means
Compound	Substance made of two or more elements that are chemically bound in a set ratio
Mixture	Two or more substances in the same place that are not chemically combined

5. Oxygen, tin, and argon are examples of elements.

6. Table salt and water are examples of compounds.

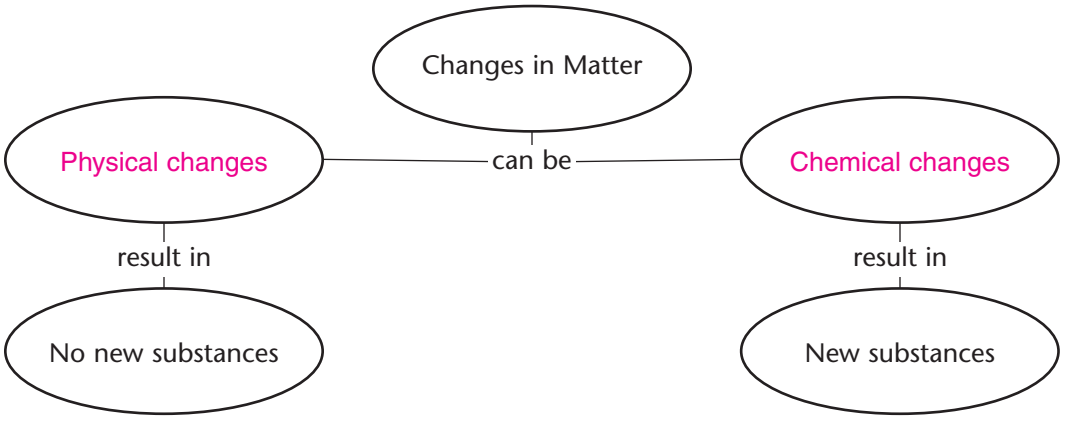
7. The ratio of elements in a compound is shown by the compound's formula.

8. Is the following sentence true or false? The properties of a compound are very similar to its elements. false

9. Is the following sentence true or false? The substances in a mixture keep their original properties. true

▶ Changes in Matter (pages 27–29)

10. Complete the concept map.



11. Complete the table to classify changes as chemical or physical.

Changes	
Kind of Change	**Example**
Physical	Melting of ice
Chemical	Burning of wood
Chemical	Rusting of metal
Physical	Breaking of boulders
Chemical	Tarnishing of metal

Name _____ Date _____ Class _____

▶ Reading Chemical Equations (page 28)

12. What is a chemical equation? A chemical equation is a short, simple way to describe a chemical reaction, using symbols and formulas instead of words.

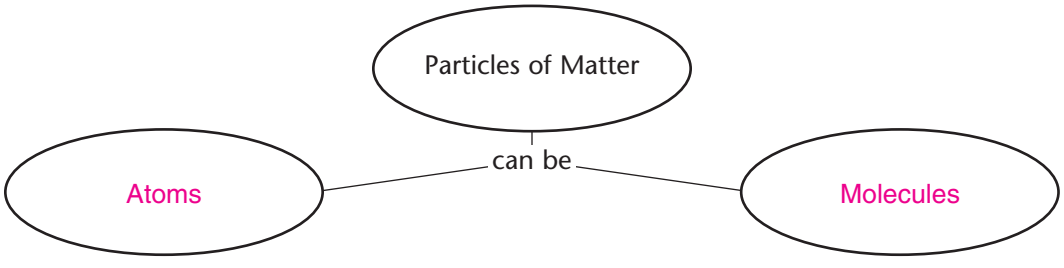
13. Write this equation in words: $C + O_2 \longrightarrow CO_2$ Carbon reacts with oxygen to form carbon dioxide.

14. The substances you start with in a chemical reaction are called the reactants.

15. The substances that are present at the end of a chemical reaction are called the products.

▶ Chemical Reactions on a Small Scale (page 30)

16. Complete the concept map.



17. The smallest particle of an element is a(n) atom.

18. What is a molecule? A molecule is a particle made of two or more atoms.

19. Circle the letter of each sentence that is true of chemical bonds.

a. They can be formed during a chemical reaction.

b. They are found within atoms.

c. They can be broken during a chemical reaction.

d. They hold atoms together.

Reading Skill Practice

Knowing the meanings of key terms in a section will help you to better understand what you are reading. Make a list of key terms in this section. Write the meanings of these terms using your own words. In this way, the key terms become a natural part of your vocabulary. Do your work on a separate sheet of paper.

Definitions of the key terms should be written in the students' own words, but be based on the information on pages 24–30.

SECTION 1-2

Organizing the Elements

(pages 31–37)

This section explains how chemical and physical properties of elements can be used to organize and classify elements.

▶ Organizing Elements by Their Properties (page 32)

1. Information about the elements and their properties is organized in the periodic table.

2. To organize his periodic table, Dmitri Mendeleev studied elements' physical properties , such as melting point, and chemical properties, such as the types of compounds they form.

3. The average mass of one atom of an element is called the atomic mass of that element.

4. Circle the letter of each statement that is true of Mendeleev's periodic table.
   - **a.** Mendeleev arranged elements according to the diameters of their atoms.
   - **b.** Mendeleev left spaces where he expected unknown elements belonged.
   - **c.** Mendeleev found that there were groups of elements with similar properties.
   - **d.** Mendeleev's predictions of new elements were incorrect.

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▶ Today's Periodic Table (pages 33–35)

5. List the three particles that make up atoms.
   a. protons b. neutrons c. electrons

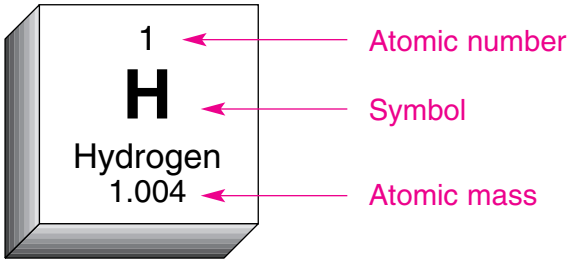
6. What is an element's atomic number? It is the number of protons in the nucleus of its atoms.

7. The modern periodic table is organized by increasing atomic numbers of the elements.

8. Elements in the same column of the periodic table are called a group, or family.

9. A row across the periodic table is called a(n) period.

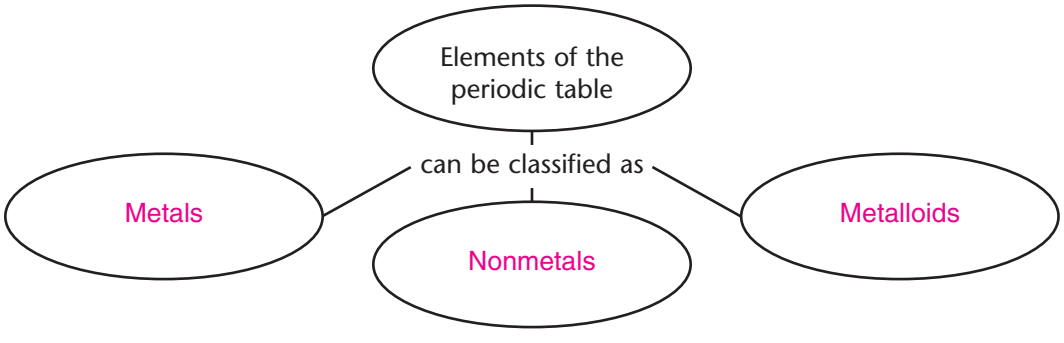
10. Label the symbol, atomic number, and atomic mass in this square from the periodic table.



▶ Identifying Patterns and Properties (pages 36–37)

11. Is the following sentence true or false? You can predict some of an element's physical properties, but none of its chemical properties, based on the element's location in the periodic table. false

12. Complete the concept map.



SECTION 1–3 Metals (pages 39–44)

This section describes the properties of metals and the characteristics of the different groups, or families, of metals.

▶ What Is a Metal? (pages 39–40)

1. Chemists classify an element as a metal based on what physical properties?

   a. hardness b. shininess

   c. malleability d. ductility

2. Is the following sentence true or false? Most metals are solids at room temperatures because they have very low melting points.

   false

Match the term with its definition.

Term	Definition
d 3. malleable	a. The process of reaction and wearing away of a metal element
c 4. ductile	b. A characteristic of those metals that are attracted to magnets or can be made into magnets
b 5. magnetic	c. A term used to describe a material that can be pulled out, or drawn, into a long wire
a 6. corrosion	d. A term used to describe a material that can be pounded or rolled into shapes

7. Why are most metals called good conductors? They transmit heat and electricity easily.

8. Is the following sentence true or false? Metals show a wide range of chemical properties. true

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▶ Alloys (page 41)

9. A mixture of two or more elements that has the properties of a metal is called a(n) alloy.

10. Bronze is a mixture of what two metals? copper and tin

▶ Metals in the Periodic Table (pages 41–44)

11. How do the properties of each family of metals change as you move across the table? Metals tend to become less reactive as you move from left to right across the periodic table.

12. Circle the letter of each sentence that is true about alkali metals.

a. They are never found as elements but only in compounds.

b. As elements, they are soft and shiny.

c. They are often found as pure elements in sea water.

d. They are extremely reactive.

13. What are the two most important alkali metals?

sodium and potassium

14. Circle the letter of each sentence that is true about alkaline earth metals.

a. They are good conductors of electricity.

b. They are never found uncombined in nature.

c. They are bright white and fairly hard.

d. They are much less reactive than most metals.

15. What are the two most common alkaline earth metals?

magnesium and calcium

16. Circle the letter of each element that is a transition metal.

a. gold **b.** iron **c.** copper **d.** lithium

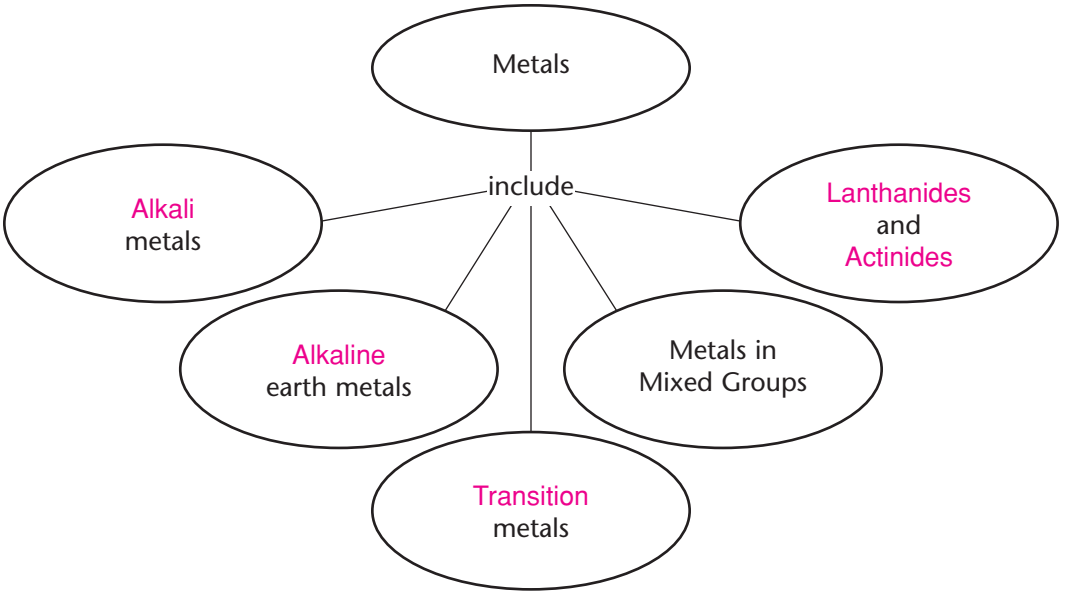
17. Is the following sentence true or false? The transition metals are fairly stable, reacting slowly or not at all with air and water. true

18. Lanthanides and actinides are found in periods 6 and 7 within the transition metals.

19. Where are the lanthanides and actinides placed on the periodic table? They are placed at the bottom of the periodic table.

20. Uranium has an atomic number of 92. How were all the elements with atomic numbers higher than 92 created? They were created artificially in laboratories.

21. Complete the concept map about metals.



SECTION 1–4 Nonmetals and Metalloids (pages 48–54)

This section describes properties of the elements on the periodic table that are not metals.

▶ What Is a Nonmetal? (pages 48–49)

1. The elements that lack most of the properties of metals are called nonmetals.

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2. Where are the nonmetals found on the periodic table? They are found to the right of the zigzag line.

3. Is the following sentence true or false? Many of the nonmetals are gases at room temperature. true

4. Circle the letter of each sentence that is true about the physical properties of nonmetals.

   a. Solid nonmetals are brittle.

   b. They usually have lower densities than metals.

   c. Most are shiny.

   d. They are good conductors of both heat and electricity.

5. Except for the Group 18 elements, most nonmetals readily form compounds.

6. What happens when nonmetals and metals react? When nonmetals and metals react, electrons move from the metal atoms to the nonmetal atoms.

7. A molecule composed of two atoms is called a(n) diatomic molecule.

▶ Families of Nonmetals (pages 50–53)

8. Group 14 is also known as the carbon family.

9. The only nonmetal in Group 14 is carbon.

10. All living things contain what kind of compounds? All living things contain compounds that are made of long chains of carbon atoms.

11. What are the nonmetals in Group 15? nitrogen and phosphorus

12. Air is almost 80 percent nitrogen gas.

13. Circle the letter of each sentence that is true about oxygen.

a. The oxygen you breathe is a diatomic molecule.

b. Oxygen rarely combines with other elements.

c. Oxygen is the most abundant element in Earth's crust.

d. Ozone collects in a layer in the upper atmosphere.

14. Is the following sentence true or false? Most halogens are dangerous to humans. true

15. Circle the letter of each sentence that is true about the noble gases.

a. They exist in large amounts in the atmosphere.

b. They are chemically very stable and unreactive.

c. They were discovered in the early 1700s

d. They are used in glowing electric lights.

16. Complete the table about families of nonmetals.

Nonmetals		
Family	**Group**	**Nonmetals in Family**
Carbon family	Group 14	Carbon
Nitrogen family	Group 15	Nitrogen, phosphorus
Oxygen family	Group 16	Oxygen, sulfur, selenium
Halogen family	Group 17	Fluorine, chlorine, bromine, iodine
Noble gases	Group 18	Helium, neon, argon, krypton, xenon, radon

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17. Where on the periodic table is hydrogen found? In the upper left-hand corner

18. How many protons and electrons does a hydrogen atom usually contain? A hydrogen atom contains only one proton and one electron.

19. Why can't hydrogen be grouped in a family? The chemical properties of hydrogen differ very much from those of the other elements.

20. Is the following question true or false? Most of the hydrogen found on Earth is combined with oxygen in water. true

▶ The Metalloids (page 54)

21. What are metalloids? They are elements that have some of the characteristics of metals and some of the characteristics of nonmetals.

22. How many metalloids are shown in the periodic table? seven

23. What is the most common metalloid? silicon

24. What is the most useful property of the metalloids? Their most useful property is their varying ability to conduct electricity.

25. What are semiconductors? They are substances that under some conditions can carry electricity, like a metal, while under other conditions cannot carry electricity, like a nonmetal.

26. Where are semiconductors used? In computer chips, transistors, and lasers

Name _____ Date _____ Class _____

WordWise

Use the clues to help you unscramble the key terms from Chapter 1. Then put the numbered letters in order to find the answer to the riddle.

Clues	Key Terms	
A substance made of two or more elements that are chemically combined in a set ratio	doncumop	c o m p(1) o u n d
A term used to describe a material that can be pounded or rolled into shape	llbeealam	m a l l e(2) a b l e
The gradual wearing away of a metal element	rsoooincr	c o r(3) r o s i(4) o n
A particle outside the nucleus of an atom	nocleetr	e l e c t r(5) o n
A horizontal row across the periodic table	roiedp	p e r i o d(6)
An element that has some characteristics of a metal and some characteristics of a nonmetal	ldmtioael	m e t a l l o i(7) d
A term used to describe a material that can be drawn into a long wire	lecuitd	d u c(8) t(9) i l e
The number of protons in the nucleus of an atom	mtoica meunrb	a(10) t o m i c n u m b e r
The elements in Group 18 of the periodic table	beoln ssgea	n o b(11) l e g a s e s
Elements in the first row of the rare earth elements of the periodic table	sletahnaidn	l(12) a n t h a n i d e(13) s

Riddle: What chart shows the repeating properties of elements?

Answer: p(1) e(2) r(3) i(4) o(5) d(6) i(7) c(8) t(9) a(10) b(11) l(12) e(13)

Name _____ Date _____ Class _____

CHAPTER 2

Elements Forming Compounds

SECTION 2–1 Atoms and Ionic Bonds (pages 60–67)

This section describes the structure of an atom and explains how an atom becomes electrically charged. It also describes how bonds are formed between charged atoms.

▶ Inside an Atom (pages 60–61)

1. Electrons that are farther away from the nucleus or most loosely held by the nucleus are called valence electrons.

2. The symbol of an element surrounded by dots is called a(n) electron dot diagram.

▶ Valence Electrons and the Periodic Table (page 62)

3. Is the following sentence true or false? All atoms in the same period have the same number of valence electrons. false

4. A neutral atom never has more than eight valence electrons.

▶ Electron Transfer and Bonding (pages 62–63)

5. An atom or group of atoms that has become electrically charged is a(n) ion.

6. What happens to an atom when it loses an electron? It loses a negative charge and becomes a positive ion.

7. What happens to an atom when it gains an electron? It gains a negative charge and becomes a negative ion.

▶ Forming an Ionic Bond (pages 63–64)

8. What is an ionic bond? An ionic bond is the attraction between two oppositely charged ions.

9. What kind of ions do a sodium atom and a chlorine atom become when a valence electron is transferred from one to the other? The sodium atom becomes a positive ion, and the chlorine atom becomes a negative ion.

10. Use Figure 5 on page 63 to complete the table.

Ions and Their Charges		
Name	**Charge**	**Symbol or Formula**
Sodium	1+	Na^+
Magnesium	2+	Mg^{2+}
Chloride	1–	Cl^-
Sulfate	2–	SO_4^{2-}

11. What does the formula for the compound magnesium chloride, $MgCl_2$, tell you about how many chloride ions are needed to cancel out the charge of a magnesium ion? The formula shows that two chloride ions are needed to cancel out the charge of one magnesium ion.

▶ Polyatomic Ions (page 65)

12. Ions that are made of more than one atom are called polyatomic ions.

13. How many atoms make up the carbonate ion (CO_3^{2-}), and what is its charge? It is made up of four atoms, including one carbon atom and three oxygen atoms. It has a charge of 2–.

Name _____ Date _____ Class _____

▶ Naming Ionic Compounds (page 65)

14. Is the following sentence true or false? In an ionic compound, the name of the negative ion comes first. false

15. When does the end of a name of a negative ion become *-ide*? The end becomes *-ide* when the negative ion is an element.

▶ Physical Properties of Ionic Compounds (pages 66–67)

16. What are three characteristic properties of ionic compounds?

a. crystal shape

b. high melting points

c. electrical conductivity

17. An orderly, three-dimensional arrangement formed by ions is called a(n) crystal.

18. In an ionic compound, every ion is attracted to what other ions? They are attracted to ions nearby that have an opposite charge.

19. At room temperature, ionic bonds are strong enough to cause all ionic compounds to be solids.

20. When do ionic compounds conduct electricity well? They conduct electricity well when they are dissolved in water.

Reading Skill Practice

A flowchart can help you remember the order in which events occur. On a separate sheet of paper, create a flowchart that describes the steps that take place when sodium and chlorine atoms form an ionic bond. This process is explained in *Exploring Ionic Bonds* on page 64. For more information about flowcharts, see page 661 in the Skills Handbook of your textbook.

Students' flowcharts should begin with the transfer of one electron from the sodium atom to the chlorine atom.

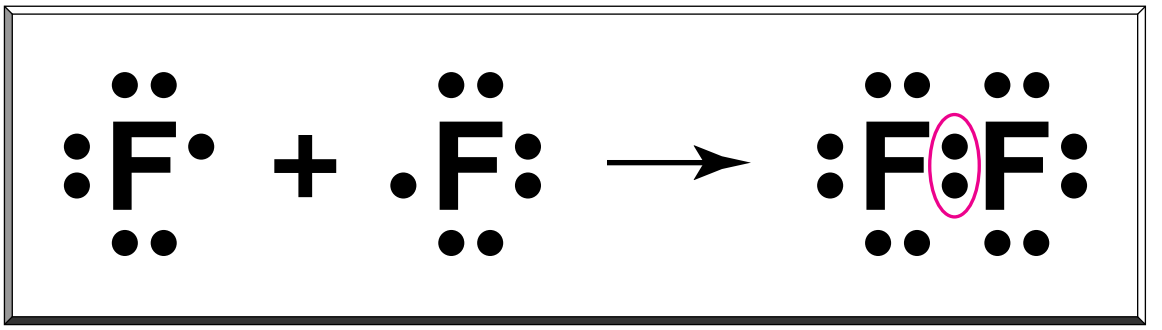
SECTION 2–2 Atoms and Covalent Bonds (pages 69–73)

This section describes how a chemical bond forms when two atoms share electrons. It also describes how electrons are shared unequally in some chemical bonds.

▶ Electron Sharing (page 69)

1. What is a covalent bond? A covalent bond is a chemical bond formed when two atoms share electrons.

2. On the dot diagram below, draw a circle around the shared electrons that form a covalent bond between two fluorine atoms.



3. Circle the letter of the sentence that is true about a covalent bond in a molecule of fluorine.

   a. Only the right atom attracts the two electrons in the middle.

   b. Both atoms lose electrons.

   c. Both atoms attract the two shared electrons at the same time.

   d. Only the left atom attracts the two electrons in the middle.

▶ How Many Bonds? (page 70)

4. In the dot diagram of an oxygen molecule in Figure 10 on page 70, how many covalent bonds are in the molecule? two

5. A chemical bond formed when atoms share two pairs of electrons is called a(n) double bond.

Name _____ Date _____ Class _____

▶ Physical Properties of Molecular Compounds (pages 70–71)

6. What do molecular compounds consist of? They consist of molecules having covalently bonded atoms.

7. Circle the letter of each sentence that is true about molecular compounds.

a. More heat is needed to separate molecules from one another than is needed to separate ions.

b. They melt at much lower temperatures than do ionic compounds.

c. They boil at much lower temperatures than do ionic compounds.

d. They are poor conductors of electricity.

▶ Unequal Sharing of Electrons (pages 71–72)

8. How do molecules come to have a slight electrical charge?

Some atoms pull more strongly on the shared electrons than other atoms do. As a result, the electrons move closer to one atom, causing the atoms within a molecule to have slight electrical charges.

9. In a polar covalent bond, electrons are shared unequally.

10. How are electrons shared in a nonpolar covalent bond? The electrons are shared equally.

11. How can a molecule be nonpolar even when it has polar bonds? A molecule is nonpolar if it contains polar bonds that cancel each other.

12. Is the following sentence true or false? Water molecules are polar.

true

▶ Attractions Between Molecules (pages 72–73)

13. Why do polar and nonpolar molecules have different properties? The differences in attractions between molecules lead to the different properties.

14. Why don't water and vegetable oil mix? Oil is nonpolar, and nonpolar compounds do not dissolve well in water. The polar water molecules are attracted more strongly to one another than to the molecules of oil.

15. When you do laundry, what causes nonpolar dirt to mix with the polar water? Detergent or soap causes the dirt and water to mix because detergents and soaps are made of molecules that are polar at one end and nonpolar at the other.

SECTION 2–3 Crystal Chemistry (pages 76–78)

This section explains how chemical bonds are related to the properties of minerals.

▶ The Physical Properties of Minerals (pages 76–77)

1. A naturally occurring solid that has a crystal structure and a definite chemical composition is called a(n) mineral.

2. What properties do mineralogists use to identify minerals? Color, shininess, density, crystal shape, hardness, magnetism and the way the mineral breaks apart

3. What do all the properties of a mineral depend on? They all depend on its chemical composition.

Name _____ Date _____ Class _____

▶ Bonding in Mineral Crystals (pages 77–78)

4. Is the following sentence true or false? All mineral crystals are made of ions. false

5. What determines mineral properties such as crystal shape, hardness, and the way the crystal breaks apart? These properties are determined by the arrangement of particles in a mineral and the kind of bonds holding them together.

6. Complete the table about mineral crystals.

Characteristics of Two Minerals		
Mineral	**How It Breaks**	**Type of Crystal**
Halite	Splits along face of like charges	Ionic crystal
Quartz	Breaks apart into irregular shapes	Molecular crystal

▶ Comparing Crystals (page 78)

7. Is the following sentence true or false? The stronger bonds of quartz make it harder than halite. true

8. If a mineralogist is in doubt about the identity of a mineral, what can he or she do? The mineralogist can test the sample for characteristics such as hardness and the way the crystals break.

WordWise

Answer the questions by writing the correct key terms in the blanks. Use the numbered letters in the terms to find the hidden key term. Then write a definition for the hidden key term.

Clues	Key Terms
_____ ions are made of more than one atom.	p o l y a t o m i c 1
What is a covalent bond called in which electrons are shared unequally?	p o l a r 2
Molecular _____ are made of molecules having covalently bonded atoms.	c o m p o u n d s 3
What is a naturally occuring solid with a crystal structure?	m i n e r a l 4
What is an orderly, three-dimensional arrangement formed by ions called?	c r y s t a l 5
What is a chemical bond formed when two atoms share electrons?	c o v a l e n t b o n d 6
What is a bond in which electrons are shared equally?	n o n p o l a r 7
What is an atom or group of atoms that has become electrically charged?	i o n 8
What is a bond in which two pairs of electrons are shared between atoms?	d o u b l e b o n d 9

Key Term: i o n i c b o n d
1 2 3 4 5 6 7 8 9

Definition: The attraction between two oppositely charged ions

Name _____ Date _____ Class _____

CHAPTER 3

EVERYDAY CHANGES IN SUBSTANCES

SECTION 3–1 Understanding Solutions (pages 84–91)

This section explains what happens to particles of substances in solution. It also describes properties of solutions, including how well a solute can dissolve in a solvent.

▶ Solutions and Suspensions (pages 84–85)

1. What is a suspension? A suspension is a mixture in which particles can be seen and easily separated by settling or filtration.

2. A well-mixed mixture is called a(n) solution.

3. Circle the letter of the mixture that is evenly mixed throughout.
   a. mixture **b.** solution
   c. suspension **d.** compound

4. Circle the letter of each method you could use to separate salt from water.
   a. filtering **b.** boiling
   c. evaporation **d.** settling

▶ Solvents and Solutes (pages 85–86)

5. Complete the table about solvents and solutes.

Parts of a Solution		
Part	**Definition**	**Which Part of Salt Water Solution?**
Solvent	The part of a solution present in the largest amount	Water
Solute	A substance present in a solution in a smaller amount	Salt

6. In a solution, the solute is dissolved by the solvent.

7. Why is water called the "universal solvent"? Water is called that because it dissolves so many substances.

8. According to the table in Figure 3 on page 86, what is the solute and what is the solvent in the solution called air? Oxygen and other gases are the solute; nitrogen is the solvent.

▶ Particles in a Solution (pages 86–87)

9. What happens to the solute's particles whenever a solution forms? The particles of the solute leave one another and become surrounded by particles of the solvent.

10. Circle the letter of each sentence that is true about particles in a solution.
    - **a.** When an ionic solid mixes with water, its ions repel water molecules.
    - **b.** When a molecular solid mixes with water, the covalent bonds are not broken.
    - **c.** When an ionic solid mixes with water, water molecules surround each ion.
    - **d.** When a molecular solid mixes with water, the solute's individual molecules break up.

11. How could you use electrical conductivity to distinguish between a salt solution and a sugar solution? If the solution conducts electricity, it contains ions, which come from ionic compounds. Salt is an ionic compound. Sugar is not ionic, and it does not conduct electricity in solution.

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▶ Concentration (page 87)

12. The amount of solute dissolved in a certain amount of solvent is the concentration of a solution.

13. Complete the table about concentrations.

Concentrations	
Type of Solution	**Definition**
Dilute solution	A solution that has only a little solute dissolved in it
Concentrated solution	A solution that has a lot of solute dissolved in it

▶ Solubility (page 88)

14. What is solubility? Solubility is a measure of how well a solute can dissolve in a solvent at a given temperature.

15. Complete the table about solutions.

Solutions	
Type of Solution	**Definition**
Saturated solution	A solution that contains as much dissolved solute as possible
Unsaturated solution	A solution that does not hold as much of a solute as possible

▶ Changing Solubility (pages 88–89)

16. What are two factors that affect the solubility of a substance?

a. temperature **b.** type of solvent

17. What can you do to make a saturated solution hold more solid solute?

You can heat the solution, which increases the solubility of most solid solutes.

18. Circle the letter of each sentence that is true about temperature and solubility.

a. Most solids become more soluble as the temperature goes up.

b. Most gases become less soluble as the temperature goes up.

c. Sugar dissolves better in cold water than in hot water.

d. Carbon dioxide dissolves better in cold water than in hot water.

19. Is the following sentence true or false? Ionic and polar compounds usually dissolve in polar solvents. true

▶ Effects of Solutes on Solutions (pages 90–91)

20. Circle the letter of each sentence that is true about the effects of solutes on solutions.

a. Solutes raise the boiling point of a solvent.

b. The temperature must drop lower than 0°C for water to freeze when a solute is dissolved in the water.

c. Solutes raise the freezing point of a solvent.

d. Antifreeze causes water to boil at a lower temperature than water alone does.

SECTION 3–2 Describing Acids and Bases (pages 94–99)

This section describes properties of compounds called acids and bases.

▶ Properties of Acids (pages 94–97)

1. What three properties are characteristic of an acid?

a. It tastes sour.

b. It reacts with metals and carbonates.

c. It turns blue litmus paper red.

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2. If you were a scientist, why wouldn't you use "sour taste" to identify a compound as acidic? Scientists never identify chemicals by tasting them. Many acids are not safe to eat.

3. Why are acids often identified as corrosive? Acids eat away at other materials.

4. Circle the letter of the kind of rock that is made of calcium carbonate.
a. granite **b.** sandstone **c.** limestone **d.** coal

5. What happens when a dilute solution of hydrochloric acid is poured on a limestone rock? Bubbles of carbon dioxide appear.

6. A compound that changes color in the presence of an acid or a base is called a(n) indicator.

7. Why does lemon juice turn blue litmus paper red? It turns blue litmus paper red because lemon juice is acidic.

8. Is the following sentence true or false? Many of the vitamins in the foods you eat are acids. true

9. Complete the table using information in Figure 12 on page 95 and in *Exploring Uses of Acids* on page 97.

Common Acids		
Acid	**Formula**	**Use**
Hydrochloric acid	HCl	To clean bricks and metals
Nitric acid	HNO_3	To make fertilizers
Sulfuric acid	H_2SO_4	Used in batteries, to refine oil, and to treat iron and steel
Phosphoric acid	H_3PO_4	To make fertilizers

▶ Properties of Bases (pages 98–99)

10. What three properties are characteristic of a base?

a. It tastes bitter.

b. It feels slippery.

c. It turns red litmus paper blue.

11. Why do your hands feel slippery when you rub soap on them under water?

Soap is a base, and bases feel slippery.

12. Is the following sentence true or false? Even a strong base can't hurt you if you touch it. false

13. Is the following sentence true or false? A safe way to identify a base is to feel it. false

14. Remembering the letter *b* will help you remember that b ases turn litmus paper b lue.

15. Potassium hydroxide (KOH) and magnesium hydroxide ($Mg(OH)_2$) are examples of bases.

16. Complete the table using information in *Exploring Uses of Bases* on page 98 and in Figure 15 on page 99.

Common Bases		
Base	**Formula**	**Use**
Sodium hydroxide	NaOH	In drain cleaners
Calcium hydroxide	$Ca(OH)_2$	In mortar and cement
Magnesium hydroxide	$Mg(OH)_2$	In medicines for stomach relief
Ammonia	NH_3	In household cleaning products
Calcium oxide	CaO	In mortar and cement and in soil additives

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SECTION 3–3 Acids and Bases in Solution
(pages 100-105)

This section explains what kinds of ions acids and bases form in water. It also describes what happens when acids and bases react.

▶ Acids in Solution (pages 100–101)

1. What is a hydrogen ion (H^+)? A hydrogen ion is an atom of hydrogen that has lost its electron.

2. What forms when hydrochloric acid reacts with water? Hydrogen ions and chloride ions form.

3. Any substance that forms hydrogen ions (H^+) in water can be called a(n) acid.

▶ Bases in Solution (page 101)

4. What is a hydroxide ion (OH^-)? A hydroxide ion is a negatively charged, polyatomic ion made of oxygen and hydrogen.

5. Any substance that forms hydroxide ions (OH^-) in water can be called a(n) base.

▶ Strengths of Acids and Bases (page 102)

6. Circle the letter of each sentence that is true about the strength of acids and bases.

   a. Strong bases produce more OH^- ions than weak bases.

   b. Weak acids produce more OH^- ions than strong acids.

   c. Strong acids produce more H^+ ions than weak acids.

   d. Weak bases produce more H^+ ions than strong bases.

7. Circle the letter of each strong acid or strong base.

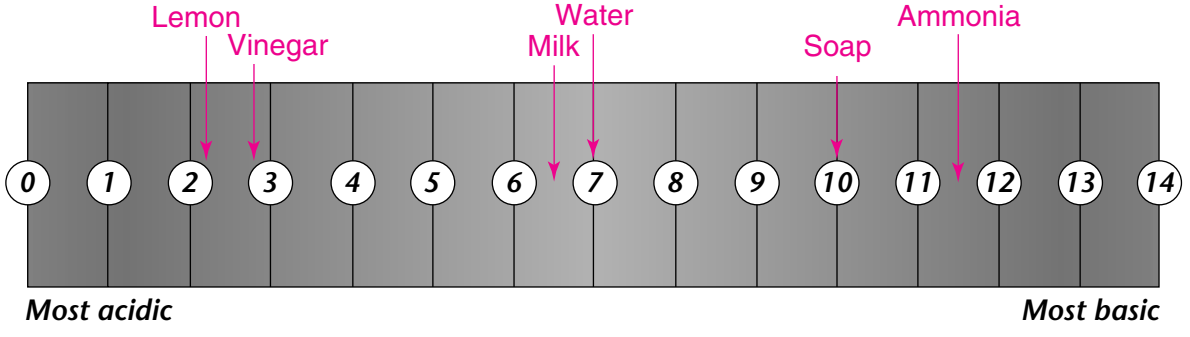
a. ammonia **b.** sulfuric acid **c.** lye **d.** citric acid

8. Is the following sentence true or false? A strong acid is safe as long as it's in a dilute solution. false

▶ Measuring pH (pages 102–103)

9. What is the pH scale? The pH scale is a range of values from 0 to 14. It expresses the concentration of hydrogen ions in a solution.

10. On the scale below, add labels to show the pH of these substances: milk, soap, water, vinegar, lemon, and ammonia.



11. When the pH of a solution is low, is the concentration of hydrogen ions high or low? high

12. Circle the letter of each sentence that is true about pH.

a. A pH lower than 7 is acidic.

b. A pH of 7 is neutral.

c. A pH lower than 7 is basic.

d. A pH higher than 7 is acidic.

▶ Acid Rain—A Chemical Phenomenon (page 104)

13. Rain that is more acidic than normal rainwater is called acid rain.

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14. Why is acid rain a problem? It has a lower pH and is more corrosive than normal rainwater. Acid rain can damage statues and buildings, destroy forests, and kill fishes in lakes.

▶ Acid-Base Reactions (page 104)

15. A reaction between an acid and a base is called a(n) neutralization.

16. Is the following sentence true or false? An acid-base mixture is always more acidic than the starting solutions were. false

▶ Products of Acid-Base Reactions (page 105)

17. What is a salt? A salt is any ionic compound made from the neutralization of an acid with a base.

18. What two substances does a neutralization reaction produce?

a. water

b. a salt

19. Circle the letter of the salt that is used as a de-icer for roads and walkways.

a. KCl **b.** ammonium nitrate **c.** $CaCO_3$ **(d.)** calcium chloride

Reading Skill Practice

When you read about complex topics, writing an outline can help you organize and understand the material. Outline Section 3–3 by using the headings and subheadings as topics and subtopics of your outline and then writing the most important details under each topic. Do your work on a separate sheet of paper.

Students' outlines should have seven major topics, matching the seven headings of the section. Details should include all the highlighted key terms as well as the important concepts discussed under each heading.

SECTION 3–4 Digestion and pH (pages 108–110)

This section explains why it is necessary for your body to digest food. It also explains how pH affects digestion.

▶ The Function of Your Digestive System (pages 108–109)

1. The process that breaks down the complex molecules of food into smaller molecules is called digestion.

2. Why must foods be broken down in your body? Your body can't use foods in the forms in which you eat them. Foods must be broken down into simpler substances that your body can use for raw materials and energy.

3. Complete the table about the two processes of digestion.

Digestion	
Digestive Process	**Description**
Mechanical digestion	Tears and grinds large food particles into smaller ones
Chemical digestion	Changes large molecules into smaller molecules

4. Substances that speed up chemical reactions in living things are called enzymes.

5. Circle the letter of each sentence that is true about digestive enzymes.

(a.) Enzymes require just the right temperature and pH to work.

b. The pH must be neutral for enzymes to work.

(c.) Some enzymes require the pH to be high.

(d.) Some enzymes require the pH to be low.

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▶ pH in the Digestive System (pages 109–110)

6. Is the following sentence true or false? The pH is not the same in all parts of the digestive system. true

7. What is amylase? Amylase is an enzyme in saliva that helps break down the carbohydrate starch into smaller sugar molecules.

8. Amylase works best when the pH is near 7.

9. The stomach starts digestion of which kind of foods? It starts digestion of foods that contain protein, such as meat, fish, and beans.

10. What occurs in your stomach that drops the pH to a very acidic level of about 2? Cells in the lining of the stomach release enzymes and hydrochloric acid.

11. What does pepsin do? It breaks down proteins into small molecules called amino acids.

12. Pepsin works most effectively when the pH is low.

13. Where does food go when it leaves the stomach? It moves into the small intestine.

14. What causes the pH in the small intestine to rise to about 8? One digestive fluid in the small intestine contains the bicarbonate ion (HCO_3^-), which acts as a base.

15. Is the following sentence true or false? Enzymes in the small intestine work best in a slightly basic solution. true

16. Most chemical digestion ends in the small intestine.

WordWise

Match each definition in the left column with the correct term in the right column. Then write the number of each term in the appropriate box below. Next, add up the numbers in each column, row, and two diagonals. All the sums should be the same.

A. A very well-mixed mixture

B. The part of a solution that is present in the smaller amount

C. A compound that changes color in the presence of an acid or a base

D. A substance that turns blue litmus paper red

E. A mixture that has a lot of solute dissolved in it

F. A negatively charged, polyatomic ion

G. A process that breaks down the complex molecules of food into smaller molecules

H. The part of a solution that is present in the larger amount

I. Any ionic compound that can form from the neutralization of an acid with a base

1. solute

2. digestion

3. hydroxide ion (OH^-)

4. salt

5. concentrated solution

6. solution

7. acid

8. indicator

9. solvent

A 6	B 1	C 8	= 15
D 7	E 5	F 3	= 15
G 2	H 9	I 4	= 15
= 15	= 15	= 15	= 15

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CHAPTER 4

Motion and Forces

SECTION 4–1 The Nature of Force and Motion (pages 116–121)

This section explains how balanced and unbalanced forces are related to the motion of an object. It also explains Newton's first law of motion.

▶ What Is a Force? (pages 116–117)

1. In science, a force is a push or a pull.

2. When one object pushes or pulls another object, the first object is exerting a force on the second object.

3. Circle the letters of the two ways that forces are described.

(a.) direction **b.** velocity (c.) strength **d.** acceleration

▶ Unbalanced Forces and Motion (pages 117–118)

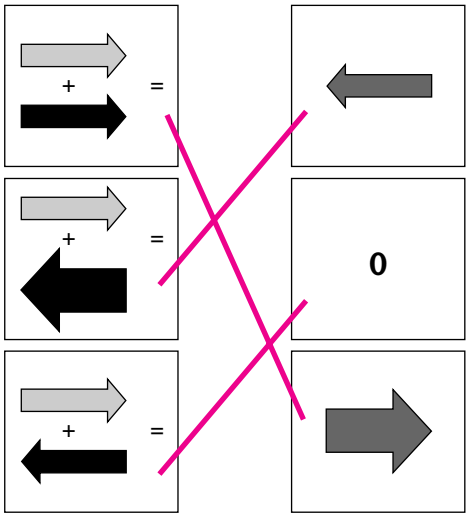
4. When two forces act in the same direction, they add together.

5. Adding a force acting in one direction to a force acting in another direction is the same as adding a(n) positive number and a(n) negative number.

6. Look at Figure 1 on page 117. What does the width of the arrows tell you about the forces they represent? The width of each arrow tells you the strength of a force. A wider arrow shows greater force.

7. The overall force on an object after all the forces are added together is called the net force.

8. The illustrations to the right represent ways that two forces can combine. Draw lines from the left column to the right column to show the result of each combination.



9. Unbalanced forces can cause an object to do three things. What are they?

Start moving, stop moving, or change direction

10. Is the following sentence true or false? Unbalanced forces acting on an object will change the object's motion. true

11. Circle the letter of each sentence that is true about unbalanced forces.

a. When two forces act in opposite directions, the net force is the difference between the two forces.

b. When two forces act in the same direction, the net force is the difference between the two forces.

c. When two forces act in opposite directions, the net force is equal to the greater force.

d. When two forces act in the same direction, the net force is the sum of the two individual forces.

▶ Balanced Forces and Motion (page 118)

12. Equal forces acting on one object in opposite directions are called balanced forces.

Name _____ Date _____ Class _____

13. Is the following sentence true or false? Balanced forces acting on an object will change the object's motion. false

14. When you add equal forces exerted in opposite directions, the net force is zero.

▶ Newton's First Law of Motion (pages 120–121)

15. Is the following sentence true or false? Once an object is in its natural resting place, it cannot move by itself. true

16. Is the following sentence true or false? Galileo suggested that once an object is in motion, no push or pull is needed to keep it moving. true

17. What is inertia? Inertia is the tendency of an object to resist change in its motion.

18. What is Newton's first law of motion? An object at rest will remain at rest, and an object that is moving at constant velocity will continue moving at constant velocity unless acted upon by an unbalanced force.

19. Newton's first law of motion is also called the law of inertia.

20. What explains why you continue moving forward if you are in a car that suddenly stops? inertia

21. What is mass? Mass is the amount of matter in an object.

22. What is the SI unit of mass? the kilogram, or kg

23. The amount of inertia an object has depends on its mass.

24. How can mass be defined in terms of inertia? Mass can be defined as a measure of the inertia of an object.

SECTION 4–2 Force, Mass, and Acceleration (pages 124–126)

This section explains how force and mass are related to the acceleration of an object.

▶ Newton's Second Law of Motion (pages 124–125)

1. What is Newton's second law of motion? The net force acting on an object is equal to the product of its acceleration and its mass.

2. What is the equation that describes the relationship among quantities of force, mass, and acceleration?

Force = Mass × Acceleration

3. Circle the letters of two answers below that are ways to write units of force.

a. m/s^2 **(b.)** N **(c.)** $kg \cdot ms^2$ **d.** 1 kg

4. Using Newton's second law, write an equation you can use to find acceleration.

$$\text{Acceleration} = \frac{\text{Force}}{\text{Mass}}$$

▶ Changes in Force and Mass (page 126)

5. How does an increase of force affect acceleration? An increase of force increases acceleration.

6. What are two ways you can increase the acceleration of an object?

You can increase the force or decrease the mass of the object.

Name _____ Date _____ Class _____

7. How does an increase of mass affect acceleration? An increase of mass decreases the acceleration when forces remain the same.

8. Is the following sentence true or false? One way to increase the force used to pull a wagon is to decrease the mass in the wagon.

true

SECTION 4–3 Friction and Gravity (pages 127–133)

This section describes the effects of friction on surfaces that rub against each other. It also describes how gravity acts between objects in the universe.

▶ Friction (pages 128–129)

1. Is the following sentence true or false? When two surfaces rub together, the irregularities of one surface get caught on those of the other surface.

true

2. What is friction? Friction is the force that one surface exerts on another when the two rub against each other.

3. Friction acts in a direction opposite to the object's direction of motion.

4. The strength of the force of friction depends on what two factors?

The types of surfaces involved and how hard the surfaces push together

5. How is friction useful in helping you walk? Friction acts between the soles of your shoes and the floor. Without friction, your shoes would only slide across the floor, and you would never move forward.

6. How does friction help an automobile move? An automobile moves because of rolling friction between its tires and the road.

7. Complete the following table about the different kinds of friction.

Kinds of Friction	
Kind of Friction	**Friction Occurs When . . .**
Fluid friction	An object moves through a fluid
Sliding friction	Solid surfaces slide over each other
Rolling friction	An object rolls over a surface

8. Which kind of friction requires more force to overcome, rolling friction or sliding friction? sliding friction

9. What kind of friction occurs when moving parts have ball bearings? rolling friction

10. How does oil between machine parts reduce friction? The oil keeps the machine parts from making direct contact, and there is fluid friction between the parts instead of sliding friction.

▶ Gravity (pages 130–132)

11. The force that pulls objects toward Earth is called gravity.

12. When is an object said to be in free fall? An object is in free fall when the only force acting on the falling object is gravity.

13. Near the surface of Earth, what is the acceleration of an object due to the force of gravity? 9.8 m/s^2

14. An object that is thrown is called a(n) projectile.

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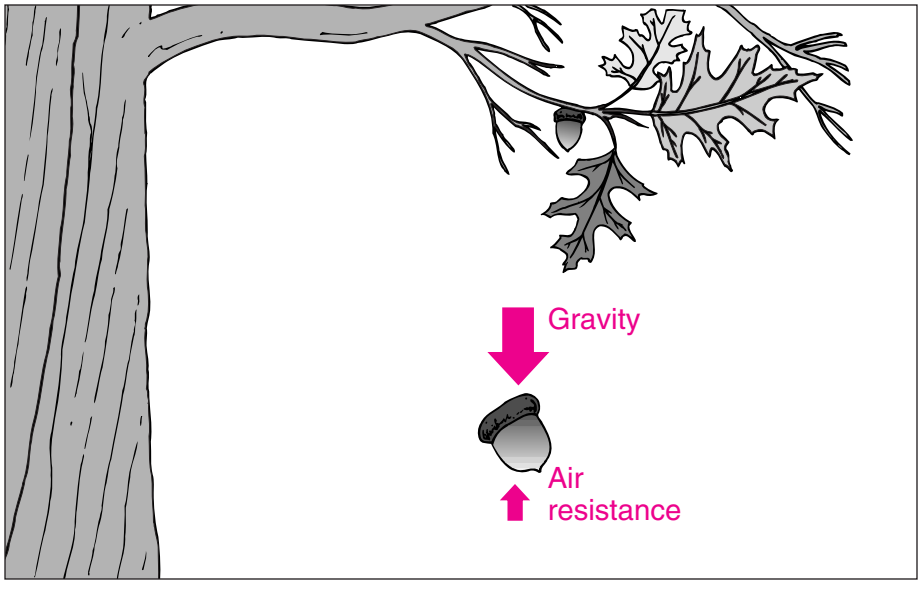
15. Is the following sentence true or false? An object that is dropped will hit the ground before an object that is thrown horizontally. false

16. Objects falling through air experience a type of fluid friction called air resistance.

17. Is the following sentence true or false? The greater the surface area of an object, the greater the air resistance. true

18. On the diagram below, draw arrows that show the forces acting on the falling acorn. Label each arrow with the name of the force.



19. The greatest velocity a falling object reaches is called terminal velocity.

20. What is weight? Weight is the force of gravity on a person or object at the surface of a planet.

21. How is weight different than mass? Weight is a measure of the force of gravity on an object, while mass is a measure of the amount of matter in an object.

22. Weight is usually measured in newtons.

▶ Universal Gravitation (pages 132–133)

23. Is the following sentence true or false? The force that makes an apple fall to the ground is the same force that keeps Earth orbiting the sun.

true

24. What does the universal law of gravitation state? The force of gravity acts between all objects in the universe.

25. Is the following sentence true or false? On the moon, your mass would be less than it is on Earth. false

26. The force of attraction between two objects varies with what two factors? Mass and the distance between the objects

SECTION 4–4 Action and Reaction (pages 134–139)

This section explains Newton's third law of motion. It also explains the law of conservation of momentum.

▶ Newton's Third Law of Motion (pages 134–136)

1. What is Newton's third law of motion? If one object exerts a force on another object, then the second object exerts a force of equal strength in the opposite direction on the first object.

2. What did Newton call the force exerted by the first object on a second object? action force

Name _____ Date _____ Class _____

3. What did Newton call the force exerted by the second object back on the first object? reaction force

4. The action and reaction forces in any situation will always be equal and opposite.

5. Complete the flowchart below, which describes how a squid moves through water.

Newton's Squid

A squid expels water out its back end. This is the action force.

↓

The water expelled out of the back end of the squid pushes back, exerting an equal and opposite force on the squid. This is the reaction force.

↓

The squid moves ahead through the water as a result of the reaction force.

6. Explain why the equal action and reaction forces do not cancel each other when one person hits a ball. Forces can be added together only if they are acting on the same object. When one person hits a ball, the action force is exerted on the ball, while the equal reaction force is exerted back on the person. Therefore, the equal forces in this situation cannot be added together and do not cancel each other.

Name _____ Date _____ Class _____

▶ Momentum (page 137)

7. The product of an object's mass and velocity is its momentum.

8. What is the equation you use to determine the momentum of an object?

Momentum = Mass × Velocity

9. What is the unit of measurement for momentum? kilogram-meters per second, kg • m/s

▶ Conservation of Momentum (pages 138–139)

10. What does the law of conservation of momentum state? The total momentum of the objects that interact does not change.

11. Suppose a train car moving down a track at 10 m/s hits another train car that is not moving. Explain how momentum is conserved after the collision. The result of the collision is that the first train car stops and the second train car moves forward at 10 m/s. In that case, the momentum of the first train car is transferred to the second train car.

Reading Skill Practice

A flowchart can help you remember the order in which a series of events occurs. Create a flowchart that describes how momentum is conserved when a moving train car collides with another moving train car. See your textbook on page 138 . The first step in the flowchart will be this: One train car moves down a track at 10 m/s. The last step in the flowchart will be this: Momentum is conserved. Do your work on a separate sheet of paper. For more information about flowcharts, see page 661 in the Skills Handbook of your textbook.

Students' flowcharts will vary. A typical flowchart might include these steps: One train car moves down a track at 10 m/s. The first train car collides with another train car, which is moving in the same direction at 5 m/s. During the collision, the first train car slows down to 5 m/s, and the second train car speeds up to 10 m/s. Momentum is conserved.

Name _____ Date _____ Class _____

SECTION 4–5 Forces in Fluids
(pages 140–150)

This section explains what causes pressure in fluids. It also explains Pascal's principle and Bernoulli's principle.

▶ What Is Pressure? (pages 140–141)

1. What do snowshoes do that makes it easier for the person wearing them to travel in deep snow? Snowshoes distribute a person's weight over the large area of the snowshoes, resulting in less downward pressure on the snow compared to regular shoes. With less downward pressure, the person doesn't sink into the snow.

2. Is the following sentence true or false? Force and pressure are the same thing. false

3. What is pressure equal to? The force exerted on a surface divided by the total area over which the force is exerted

4. Circle the letter of the term that is an SI unit of pressure.

a. newton **b.** liter
c. weight **(d.)** pascal

5. Circle the letter of the *two* answers below that are equal to each other.

(a.) 1 Pa **b.** 1 N/cm^2
(c.) 1 N/m^2 **d.** 1 N

6. Is the following sentence true or false? You can produce a lower pressure by decreasing the area a force acts on. false

▶ Fluid Pressure (page 142)

7. A substance that can flow easily is a(n) fluid.

8. Circle the letter of each of the following that are fluids.

(a.) helium gas (b.) liquid water **c.** ice (d.) air

9. Describe how molecules move in fluids. In fluids, molecules are constantly moving in all directions. They are constantly colliding with each other and with surfaces around them.

10. What causes the pressure exerted by a fluid? All of the forces exerted by the individual molecules in a fluid add together to make up the pressure exerted by the fluid.

11. The pressure exerted by a fluid is the total force exerted by the fluid divided by the area over which the force is exerted.

▶ Pascal's Principle (page 143)

12. What happens to the pressure in a bottle of water if you press the stopper at the top down farther? The pressure in the water increases everywhere in the bottle.

13. What is the relationship known as Pascal's principle? When force is applied to a confined fluid, an increase in pressure is transmitted equally to all parts of the fluid.

▶ Equilibrium in a Volcano (page 144)

14. Is the following sentence true or false? A volcano that is in equilibrium erupts. false

Name _____ Date _____ Class _____

▶ Force Pumps and Blood Flow (page 144)

15. What does a force pump do? It causes a fluid to move from one place to another by increasing the pressure in the fluid.

16. Describe the heart in terms of force pumps. The heart is a force pump. First, the heart pumps blood to the lungs. Then the blood returns to the heart and is pumped to the rest of the body.

▶ Using Pascal's Principle (page 145)

17. Suppose you push down on a small piston that is connected to a confined fluid, and another piston with the same area is connected by a U-shaped tube to the confined fluid. How much fluid pressure will the second piston experience compared to the first? Both pistons will experience the same fluid pressure.

18. In a hydraulic system, how is the force applied on a small surface area multiplied? The increase in pressure on a small surface area is transmitted to another part of a confined fluid, which pushes on a larger surface area.

▶ Pascal's Principle in Nature (page 148)

19. The tube feet of a sea star take advantage of what principle to move around? Pascal's principle

20. When a sea star contracts different muscles, it changes the pressure in the fluid of its tube foot.

21. The pressure a sea star exerts on the fluid in its system causes the tube foot to either push down or pull up on its sucker.

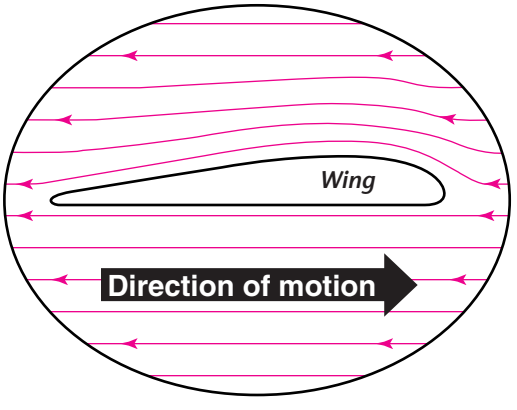
▶ Bernoulli's Principle (pages 148–150)

22. Is the following sentence true or false? The faster a fluid moves, the more pressure the fluid exerts. false

23. What does Bernoulli's principle state? The pressure exerted by a moving stream of fluid is less than the pressure of the surrounding fluid.

24. Is the following sentence true or false? A faster-moving fluid exerts less pressure than a slower-moving fluid. true

25. On the illustration of a wing below, draw arrows that show the path of air above and below the wing.



26. Air that moves over the top of an airplane wing must travel farther than air that moves along the bottom of the wing. As a result, the air moving over the top exerts less pressure than the air moving along the bottom.

27. What is lift? Lift is an upward force on a wing created by a difference in pressure.

28. How do differences in air pressure cause smoke to rise up a chimney? Wind blowing across the top of a chimney lowers the air pressure there. The higher pressure at the bottom then pushes air and smoke up the chimney.

Name _____ Date _____ Class _____

WordWise

Use the clues to help you find the key terms from Chapter 4 hidden in the puzzle below. The terms may occur vertically, horizontally, or diagonally.

1. A _____ force _____ is a push or pull.
2. The overall force on an object after all forces are added together is called the _____ net _____ force.
3. The tendency of an object to resist change in its motion is called _____ inertia _____.
4. One _____ newton _____ equals the force required to accelerate 1 kilogram of mass at 1 meter per second per second.
5. The force that one surface exerts on another when the two rub against each other is called _____ friction _____.
6. When solid surfaces slide over each other, the kind of friction that occurs is _____ sliding _____ friction.
7. A substance that can flow easily is called a(n) _____ fluid _____.
8. The force that pulls objects toward Earth is _____ gravity _____.
9. When the only force acting on a falling object is gravity, the object is said to be in _____ free _____ fall.
10. Objects falling through air experience a type of fluid friction called _____ air _____ resistance.
11. The _____ momentum _____ of an object is the product of its mass and velocity.
12. The force exerted on a surface divided by the area over which the force is exerted is called _____ pressure _____.

s	q	m	o	m	e	n	t	u	m
m	f	g	i	n	e	r	t	i	a
a	o	r	l	i	o	l	n	g	f
s	r	a	i	q	a	z	y	n	r
w	c	v	p	c	f	r	e	e	i
g	e	i	w	h	t	a	e	w	c
u	p	t	f	l	u	i	d	t	t
i	e	y	c	n	i	r	o	o	i
n	s	l	i	d	i	n	g	n	o
p	r	e	s	s	u	r	e	e	n

MathWise

For the problems below, show your calculations on another sheet of paper. Write the answers for the problems on the lines below.

▶ Newton's Second Law of Motion (pages 124–126)

1. Force = 65 kg × 3ms^2 = 195 N

2. A 250-kg trailer is being pulled by a truck. The force causes the trailer to accelerate at 4 m/s^2. What is the net force that causes this acceleration?

Force = 250 kg × 4 m/s^2 = 1,000 N

Answer: Force = 1,000 N

▶ Weight and Mass (page 132)

3. Weight = 45 kg × 9.8 m/s^2 = 441 N

4. What is the weight of a rock that has a mass of 7 kg?

Weight = 7 kg × 9.8 m/s^2 = 68.6 N

Answer: Weight = 68.6 N

▶ Momentum (page 137)

5. Momentum = 5 kg × 6.5 m/s = 32.5 kg • m/s

6. A baseball (mass = 0.14 kg) travels at 7 m/s, while a basketball (mass = 0.5 kg) moves at 3 m/s. Which has the greater momentum?

The baseball's momentum is 0.98 kg • m/s, while the basketball's momentum is 1.5 kg • m/s. The basketball has the greater momentum.

▶ Calculating Pressure (page 141)

1. Pressure = $\frac{20\text{ N}}{10\text{ m}^2}$ = 2 Pa

2. A force of 25 N is exerted on a surface with an area of 5 m^2. What is the pressure on that area?

Pressure = $\frac{25\text{ N}}{5\text{ m}^2}$ = 5 Pa

Answer: Pressure = 5 Pa

Name _____ Date _____ Class _____

CHAPTER 5

Work and Machines

SECTION 5–1 What Is Work? (pages 156–159)

This section explains the scientific meaning of work and describes how to calculate the work done on an object.

▶ The Meaning of Work (pages 156–158)

1. In scientific terms, when do you do work? You do work when you exert a force on an object that causes the object to move some distance.

2. Complete the following table by classifying each example as either work or no work.

Work?	
Example	**Work or No Work?**
You pull your books out of your book bag.	work
You lift a bin of newspapers.	work
You push on a car stuck in the snow.	no work
You hold a heavy piece of wood in place.	no work
You pull a sled through the snow.	work
You hold a bag of groceries.	no work

3. In order for you to do work on an object, the object must move some _____distance_____ as a result of your force.

4. Explain why you don't do any work when you carry an object at a constant velocity. In carrying an object, you exert an upward force. But to do work, you must exert a force in the same direction as the object's motion. Since the object's motion is horizontal and the force exerted is vertical, no work is done.

5. When you pull a sled through the snow, why does only part of your force do work? When you pull a sled, you pull on the rope at an angle to the ground. Your force has a horizontal part and a vertical part. Only the horizontal part does work because that force is in the same direction as the motion of the sled.

▶ Calculating Work (pages 158–159)

6. Is the following sentence true or false? Lifting a heavier object demands greater force than lifting a lighter object. true

7. Is the following sentence true or false? Moving an object a shorter distance requires more work than moving an object a greater distance. false

8. The amount of work you do depends on both the amount of force you exert and the distance the object moves.

9. What formula do you use to determine the amount of work done on an object? Work = Force × Distance

10. What is the SI unit of work? joule

11. What is the amount of work you do when you exert a force of 1 newton to move an object a distance of 1 meter? 1 joule

Name _____ Date _____ Class _____

SECTION 5–2 Mechanical Advantage and Efficiency

(pages 160–165)

This section explains how machines make work easier and describes how to calculate how efficient a machine is.

▶ What Is a Machine? (pages 160–162)

1. What is a machine? A machine is a device with which you can do work in a way that is easier or more effective.

2. Is the following sentence true or false? A machine decreases the amount of work needed to do a job. false

3. Circle the letter of each sentence that is true about how a machine makes work easier.

a. A machine makes work easier by multiplying force you exert.

b. A machine makes work easier by reducing the amount of force needed to do the job.

c. A machine makes work easier by multiplying the distance over which you exert force.

d. A machine makes work easier by changing the direction in which you exert force.

4. The force you exert on a machine is called the input force.

5. The force exerted by the machine is called the output force.

6. Is the following sentence true or false? In some machines, the output force is greater than the input force. true

7. If a machine allows you to use less force to do some amount of work, then you must apply the input force over a greater distance.

8. Is the following sentence true or false? In some machines, the output force is less than the input force. true

9. Write labels on the illustration below to show which arrow represents the input force and which represents the output force.

▶ Mechanical Advantage (page 163)

10. What is a machine's mechanical advantage? The number of times a force exerted on a machine is multiplied by the machine

11. What is the formula you use to determine the mechanical advantage of a machine?

Mechanical advantage = $\frac{\text{Output force}}{\text{Input force}}$

12. In a machine that has a mechanical advantage of more than 1, the output force is greater than the input force.

▶ Efficiency of Machines (pages 164–165)

13. In any machine, some work is wasted overcoming friction.

14. The comparison of a machine's output work to its input work is efficiency.

15. What is the formula you use to calculate the efficiency of a machine?

Efficiency = $\frac{\text{Output work}}{\text{Input work}} \times 100\%$

Name _____ Date _____ Class _____

16. The mechanical advantage that a machine provides in a real situation is called the actual mechanical advantage.

17. The mechanical advantage of a machine without friction is called the machine's ideal mechanical advantage.

Reading Skill Practice

By looking carefully at photographs and illustrations in textbooks, you can help yourself understand better what you have read. Look carefully at Figure 5 on page 161. What important idea does this illustration communicate?

A machine can make a task easier in three ways. It can multiply the input force. It can multiply the distance over which the force is exerted. Or it can neither multiply force or distance; in that case, a machine changes the direction in which you exert your force.

SECTION 5–3

Simple Machines

(pages 168–178)

This section describes the six kinds of simple machines. It also explains how to calculate the ideal mechanical advantage for each simple machine.

▶ Introduction (page 168)

1. What are the six basic kinds of simple machines?

a. inclined plane b. wedge c. screw

d. lever e. wheel and axle f. pulley

▶ Inclined Plane (pages 169–170)

2. What is an inclined plane? An inclined plane is a flat, slanted surface that allows you to exert your input force over a distance.

3. What formula do you use to determine the ideal mechanical advantage of an inclined plane?

Ideal mechanical advantage = $\frac{\text{Length of incline}}{\text{Height of incline}}$

4. Circle the letter of each sentence that is true about inclined planes.
   - (a.) The necessary input force is less than the output force.
   - (b.) A ramp is an example of an inclined plane.
   - c. The necessary input force is more than the output force.
   - (d.) An inclined plane allows you to exert your force over a longer distance.

5. You can increase the efficiency of an inclined plane by decreasing the friction.

▶ Wedge (page 170)

6. What is a wedge? A wedge is a device that is thick at one end and tapers to a thin edge at the other end.

7. Is the following sentence true or false? In a wedge, the inclined plane itself moves. true

8. Is the following sentence true or false? A wedge multiples force to do the job. true

▶ Screws (page 171)

9. What is a screw? A screw is an inclined plane wrapped around a cylinder.

10. A spiral inclined plane forms the threads of a screw.

11. When using a screwdriver to twist a screw into a piece of wood, where is the input force applied and where is the output force exerted?
    The input force is applied to the handle of the screwdriver, which exerts a force on the threads of the screw. As the screw turns, the threads exert an output force on the wood.

Name _____ Date _____ Class _____

▶ Levers (pages 171–173)

12. What is a lever? A lever is a rigid bar that is free to pivot, or rotate, around a fixed point.

13. The fixed point that a lever pivots around is called the fulcrum.

14. Circle the letter of each sentence that is true about levers.

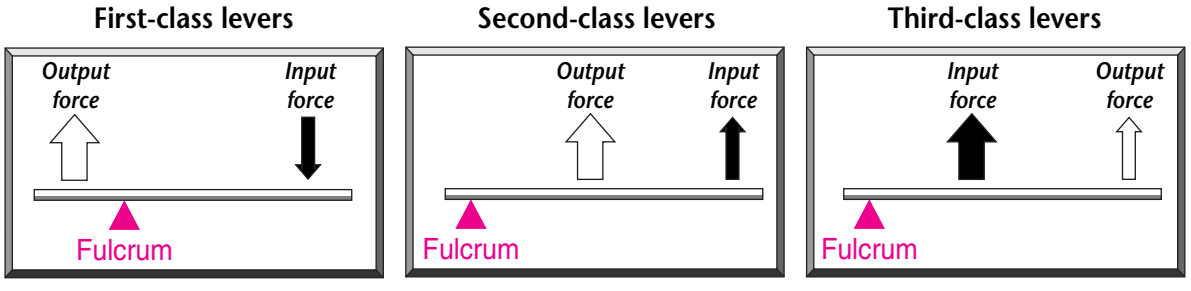
a. A lever can increase the effect of your input force.

b. There are three different types of levers.

c. A lever can change the direction of your input force.

d. The fulcrum is always located at the same place on a lever.

15. On each diagram below, draw a triangle below the lever to show where the fulcrum is located on each class of lever.



16. Complete the following table about levers.

Levers	
Class of Lever	**Examples**
Second-class lever	Door, wheel barrow, bottle opener
First-class lever	Seesaw, scissors, pliers
Third-class lever	Baseball bat, shovel, rake

17. What formula do you use to calculate the ideal mechanical advantage of a lever?

$$\text{Ideal mechanical advantage} = \frac{\text{Distance from fulcrum to input force}}{\text{Distance from fulcrum to output force}}$$

▶ Wheel and Axle (pages 174–176)

18. What is a wheel and axle? A wheel and axle is a simple machine made of two circular or cylindrical objects that are fastened together and that rotate around a common axis.

19. What formula do you use to calculate the ideal mechanical advantage of a wheel and axle?

Ideal mechanical advantage = $\frac{\text{Radius of wheel}}{\text{radius of axle}}$

▶ Pulley (pages 176–177)

20. What is a pulley? A pulley is a grooved wheel with a rope (or chain, or even a steel cable) wrapped around it.

21. What kind of pulley changes the direction of the input force but does not change the amount of force you apply? fixed pulley

22. What kind of pulley always has an ideal mechanical advantage of 2? movable pulley

▶ Compound Machines (page 178)

23. What is a compound machine? A compound machine is a machine that utilizes two or more simple machines.

24. What do you need to know to calculate the mechanical advantage of a compound machine? You must know the mechanical advantage of each simple machine utilized in the compound machine.

25. A system of gears is a device with toothed wheels that fit into one another.

Name _____ Date _____ Class _____

SECTION 5–4 Machines in Human Systems
(pages 182-184)

This section describes how the body uses natural levers and wedges.

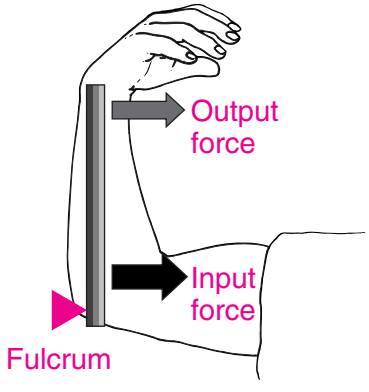
▶ Body Systems—Living Levers (pages 182–184)

1. What do most of the levers in your body consist of? They consist of bones and muscles.

2. Your muscles are attached to your bones by tough connective tissue called tendons.

3. In a living lever in your body, what acts as the lever's fulcrum?
The joint, near where the tendon is attached to the bone, acts as the fulcrum.

4. On the illustration of a living lever, label each arrow to show where the input force and the output force are located. Also show where the fulcrum is located.



▶ Working Wedges (page 184)

5. What simple machines do your incisors resemble? wedges

6. Explain how your front teeth are like an ax. When you bite down on something, the wedge shape of your teeth produces enough force to break it in half, just as an ax is used to split a log.

WordWise

Complete the sentences by using one of the scrambled words below.

Word Bank

lelyup xela oounmpdc fiienycef ttuuop veelr

euojl deegw tupni rwko wecrs clruumf iclndeni enihcam

A device that is thick at one end and tapers to a thin edge at the other end is a(n) wedge.

A machine that utilizes two or more simple machines is called a(n) compound machine.

The force exerted by a machine is called the output force.

The fixed point that a lever pivots around is called the fulcrum.

You do work on an object when you exert a force on the object that causes the object to move some distance.

A wheel and axle is a simple machine made of two circular or cylindrical objects that are fastened together and that rotate around a common axis.

The efficiency of a machine compares the output work to the input work.

A rigid bar that is free to pivot, or rotate, about a fixed point is a(n) lever.

The force you exert on a machine is called the input force.

A(n) inclined plane is a flat, slanted surface.

A grooved wheel with a rope wrapped around it is a(n) pulley.

A device with which you can do work in a way that is easier or more effective is a(n) machine.

The SI unit of work is called the joule.

A(n) screw can be thought of as an inclined plane wrapped around a cylinder.

Name _____ Date _____ Class _____

MathWise

For the problems below, show your calculations. If you need more space, use another sheet of paper. Write the answers for the problems on the lines below.

▶ Calculating Work (pages 158–159)

1. Work = 10 N × 35 m = 350 J

2. An elevator lifts a man with a weight of 500 N up three floors, or 30 m. How much work did the elevator do?

Work = 500 N × 30 m = 15,000 J

Answer: Work = 15,000 J

▶ Mechanical Advantage (page 163)

3. Mechanical advantage = $\frac{60\ \text{N}}{15\ \text{N}}$ = 4

4. Suppose you exert of force of 2,800 N to lift a desk up onto a porch. But if you use a ramp, you need to exert a force of only 1,400 N to push it up the ramp onto the porch. What is the mechanical advantage of the ramp?

Mechanical advantage = $\frac{2{,}800\ \text{N}}{1{,}400\ \text{N}}$ = 2

Answer: Mechanical advantage = 2

▶ Calculating Efficiency (pages 164–165)

5. Efficiency = $\frac{100\ \text{J}}{200\ \text{J}} \times 100\%$ = 50%

6. You do 4,000 J of work using a sledge hammer. The sledge hammer does 3,000 J of work on the spike. What is the efficiency of the sledge hammer?

Efficiency = $\frac{3{,}000\ \text{J}}{4{,}000\ \text{J}} \times 100\% = 0.75 \times 100\% = 75\%$

Answer: Efficiency = 75%

▶ Advantage of an Inclined Plane (page 169)

7. Ideal mechanical advantage = $\frac{8\text{ m}}{2\text{ m}}$ = 4

8. Suppose you built a ramp to the front door of the post office for people using wheel chairs. The post office door is 3 m above the level of the sidewalk. The ramp you build is 15 m long. What is the ideal mechanical advantage of your ramp?

Ideal mechanical advantage = $\frac{15\text{ m}}{3\text{ m}}$ = 5

Answer: Ideal mechanical advantage = 5

▶ Advantage of a Lever (page 172)

9. Ideal mechanical advantage = $\frac{4\text{ m}}{2\text{ m}}$ = 2

10. Suppose you held the handles of a wheel barrow 2.4 m from where they are attached to the wheel. The heavy stone in the wheel barrow was 1.2 m from the wheel. What is the ideal mechanical advantage of the wheel barrow?

Ideal mechanical advantage = $\frac{2.4\text{ m}}{1.2\text{ m}}$ = 2

Answer: Ideal mechanical advantage = 2

▶ Advantage of a Wheel and Axle (pages 175–176)

11. Ideal mechanical advantage = $\frac{36\text{ cm}}{3\text{ cm}}$ = 12

12. Suppose the radius of your bicycle's wheel is 30 cm. The radius of the bicycle's axle is just 5 cm. What is the ideal mechanical advantage of that wheel and axle?

Ideal mechanical advantage = $\frac{30\text{ cm}}{5\text{ cm}}$ = 6

Answer: Ideal mechanical advantage = 6

Name _____ Date _____ Class _____

CHAPTER 6

Energy and Power

SECTION 6–1 The Nature of Energy (pages 190–195)

This section explains how work and energy are related. It also identifies the two basic kinds of energy and describes some different forms of energy.

▶ What Is Energy? (pages 190–191)

1. The ability to do work or cause change is called energy.

2. Why can work be thought of as the transfer of energy? When an object or organism does work on an object, some of the energy is transferred to the object.

▶ Kinetic Energy (pages 191–192)

3. What are the two general kinds of energy?

   a. kinetic energy b. potential energy

4. What is kinetic energy? The energy of motion

5. The kinetic energy of an object depends on both its mass and its velocity.

6. Kinetic energy increases as velocity increases.

7. What formula do you use to calculate kinetic energy?

   Kinetic energy = $\frac{\text{Mass} \times \text{Velocity}^2}{2}$

8. Because velocity is squared in the kinetic energy equation, doubling an object's velocity will quadruple its kinetic energy.

▶ Potential Energy (pages 192–193)

9. What is potential energy? Potential energy is energy that is stored and held in readiness.

10. What is the potential energy called that is associated with objects that can be stretched or compressed? elastic potential energy

11. What is potential energy called that depends on height? gravitational potential energy

12. What is the formula you use to determine the gravitational potential energy of an object? Gravitational potential energy = Weight × Height

13. Is the following sentence true or false? The greater the height of an object, the greater its gravitational potential energy. true

▶ Different Forms of Energy (pages 194–195)

14. What is mechanical energy? Mechanical energy is the energy associated with the motion or position of an object.

15. What is thermal energy? Thermal energy is the total energy of the particles in an object.

16. Is the following sentence true or false? When the thermal energy of an object increases, its particles move faster. true

17. The potential energy stored in chemical bonds that hold chemical compounds together is called chemical energy.

18. What kind of energy is stored in the foods you eat? chemical energy

19. The energy that moving electric charges carry is called electrical energy.

20. What kind of energy is stored in the nucleus of an atom?

nuclear energy

21. Complete the table below on the different forms of energy.

Different Forms of Energy	
Form of Energy	**Examples**
Mechanical energy	School bus moving, frog leaping, sounds being made
Thermal energy	Ice cream melting, object feeling warm
Chemical energy	Foods, matches, stored in body cells
Electrical energy	Static shock, batteries, power lines
Electromagnetic energy	Visible light, ultraviolet radiation, microwaves, infrared radiation
Nuclear energy	Nuclear fission, nuclear fusion

Reading Skill Practice

Outlining is a way to help yourself understand better and remember what you have read. Write an outline of Section 6–1, *The Nature of Energy.* In your outline, copy the headings in the textbook. Under each heading, write the main idea of that part of the section. Then list the details that support, or back up, the main idea.

The major heads of student's outlines of the section should be *What Is Energy?, Kinetic Energy, Potential Energy,* and *Different Forms of Energy*. The section's subheads should form the next level of the outline.

SECTION 6–2

Energy Conversion and Conservation

(pages 198–203)

This section explains how different forms of energy are related and describes the law of conservation of energy.

▶ Conversions Between Forms of Energy (page 199)

1. A change from one form of energy to another is called a(n)

energy conversion.

2. Is the following sentence true or false? Most forms of energy can be converted into other forms. true

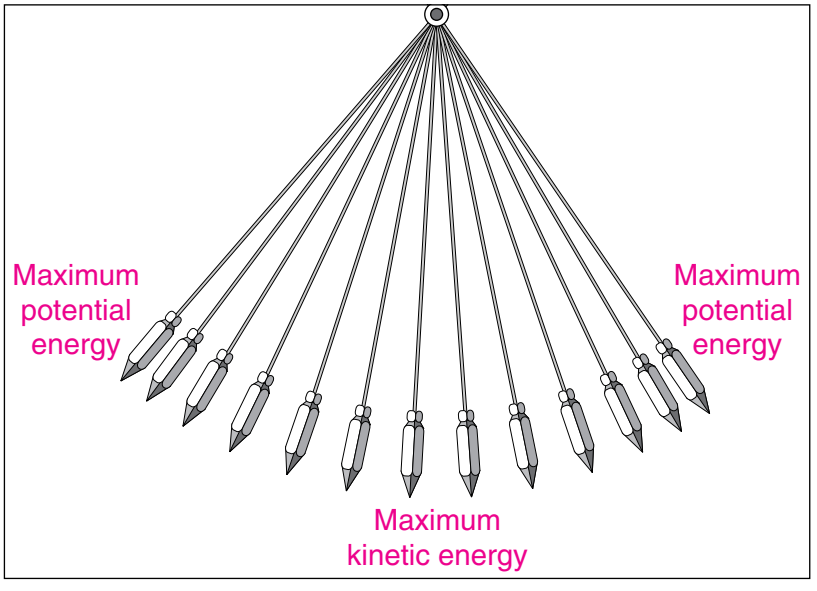
3. Describe the conversion of chemical energy to mechanical energy in your body. The body converts the chemical energy in food to the mechanical energy needed to move muscles.

▶ Kinetic and Potential Energy (pages 200–201)

4. When you throw an object up into the air, what kind of energy increases as its height increases? potential energy

5. As an object falls from its greatest height, what kind of energy increases and what kind of energy decreases? Its kinetic energy increases, and its potential energy decreases.

6. On the diagram of a moving pendulum, label the places where the pendulum has maximum potential energy and where it has maximum kinetic energy.



Name _____ Date _____ Class _____

▶ Conservation of Energy (pages 202–203)

7. What does the law of conservation of energy state? When one form of energy is converted to another, no energy is destroyed in the process.

8. Friction converts mechanical energy to thermal energy.

9. Explain why no machine is 100 percent efficient? Some of the mechanical energy is converted to thermal energy by friction.

10. How did Albert Einstein's theory of relativity change the law of conservation of energy? He explained that energy can sometimes be created by destroying matter.

11. Is the following sentence true or false? Matter and energy together are always conserved. true

▶ Conserving Energy (page 203)

12. In environmental science, conserving energy means to save energy, or not waste it.

13. In physical science, energy is conserved because the total quantity of energy remains constant.

SECTION 6-3

Photosynthesis and Fossil Fuels

(pages 204–)

This section explains how photosynthesis is the source of the energy stored in fossil fuels. It also describes how energy is converted when fossil fuels are used.

▶ Photosynthesis (page 205)

1. Photosynthesis is the process through which plants make their own food.

Name _____ Date _____ Class _____

▶ The Nature of Light (page 205)

2. The source of energy on Earth is the sun.

3. What can occur when light strikes an object? Light can be transmitted, reflected, or absorbed.

▶ Plants and Light (page 206)

4. The most abundant pigment in plants is chrorophyll.

▶ Energy Conversion in Photosynthesis (pages 206–208)

5. Plants and some other organisms convert the sun's radiant energy into chemical energy through the process of photosynthesis.

6. During the first stage of photosynthesis, chlorophyll and other pigments capture radiant energy.

7. Write the equation for photosynthesis using words.
carbon dioxide + water → (light energy) glucose + oxygen

▶ Glucose and Stored Energy (page 208)

8. Is the following sentence true or false? During respiration, the chemical energy stored in glucose is converted into other forms of energy, such as mechanical energy or thermal energy. true

▶ Fossil Fuels (pages 209–210)

9. Is the following sentence true or false? A fuel is a material that releases energy when it burns. true

10. Circle the letter of each of the following that is a fossil fuel.
(a.) coal **b.** sunlight (c.) petroleum (d.) natural gas

Name _____ Date _____ Class _____

▶ Using Fossil Fuels (page 211)

11. How is the potential chemical energy of fossil fuels converted to other forms? It is converted by burning the fossil fuels.

12. The process of burning fossil fuels is known as combustion.

13. What energy conversion occurs during combustion? The fuel's chemical potential energy is converted to thermal energy.

14. In a modern coal-fired power plant, the mechanical energy of turbines is converted into electrical energy by generators.

SECTION 6–4 Power (pages 212–216)

This section describes how you calculate power and explains the difference between power and energy.

▶ What Is Power? (pages 212–213)

1. What is power? Power is the rate at which work is done or the amount of work done in a unit of time.

2. Is the following sentence true or false? You exert more power when you run up a flight of stairs than when you walk up the stairs.
true

3. If one device is twice as powerful as another device, the more powerful device can do twice the amount of work in the same amount of time.

4. What is the formula you use to calculate power?
$\text{Power} = \frac{\text{Work}}{\text{Time}}$

5. Rewrite the equation for power in a way that shows what work equals.
$\text{Power} = \frac{\text{Force} \times \text{Distance}}{\text{Time}}$

6. 1 J/s = 1 watt

7. Is the following sentence true or false? Power is often measured in larger units than watts. true

8. 1 kilowatt = 1,000 watts

9. Is the following sentence true or false? An electric power plant produces millions of kilowatts. true

▶ Power and Energy (pages 214–215)

10. Is the following sentence true or false? Power is limited to situations in which objects are moved. false

11. Power is the rate at which energy is transferred from one object to another or converted from one form to another.

12. The power of a light bulb is the rate at which electrical energy is converted into electromagnetic energy and thermal energy.

13. Why is a 100-watt light bulb brighter than a 40-watt light bulb?

The 100-watt light bulb gives off more energy per second than the 40-watt light bulb.

▶ Horsepower (page 216)

14. Circle the letter of each sentence that is true about the unit known as horsepower.

a. Horsepower is an SI unit of power.

b. James Watt used the word *horsepower* to compare the work of a steam engine with the work of a horse.

c. People use the unit horsepower when talking about automobile engines.

d. 1 horsepower = 746 watts

Name _____ Date _____ Class _____

WordWise

Complete the following paragraphs using the list of words and phrases below. Each word or phrase is used only once.

Word Bank

law of conservation of energy nuclear energy kinetic energy
fossil fuels electromagnetic energy energy conversion electrical energy
power energy mechanical energy potential energy chemical energy

In nature, things are constantly changing, and the identification of what causes changes is important in physical science. The ability to do work or cause change is called _____energy_____. There are two general kinds of energy. The energy of motion is called _____kinetic energy_____. Energy that is stored and held in readiness is called _____potential energy_____.

There are different forms of the two general kinds of energy. The energy associated with the motion or position of an object is _____mechanical energy_____. The potential energy stored in chemical bonds that hold chemical compounds together is _____chemical energy_____. The energy that moving electric charges carry is _____electrical energy_____. Visible light and other waves of energy are forms of _____electromagnetic energy_____. The energy stored in the nucleus of an atom is _____nuclear energy_____.

Most forms of energy can be converted into other forms. A change from one form of energy to another is called _____energy conservation_____. Such changes from one form of energy to another do not mean any energy is lost. The _____law of conservation of energy_____ states that when one form of energy is converted to another, no energy is destroyed in the process.

A fuel is a material that stores chemical potential energy. For many purposes, we use _____fossil fuels_____, such as coal, petroleum, and natural gas. The energy conversions in modern coal-fired power plants result in the electricity you use for home electrical devices. You use these devices to do work. The rate at which work is done, or the amount of work done in a unit of time, is called _____power_____.

MathWise

For the problems below, show your calculations. If you need more space, use another sheet of paper. Write the answers for the problems on the lines below.

▶ Calculating Gravitational Potential Energy (page 193)

1. Gravitational potential energy = 25 N × 10 m = 250 J

2. A student stands at the edge of a diving board that is 3 m high. The student's weight is 350 N. What is the student's gravitational potential energy?

Gravitational potential energy = 350 N × 3 m = 1,050 J

Answer: Gravitational potential energy = 1,050 J

3. Gravitational potential energy = 60 kg × 9.8 m/s^2 × 5 m = 2,940 J

4. Suppose a boulder has a mass of 25 kg, and it is perched on the edge of a cliff that is 45 m high. What is the gravitational potential energy of the boulder?

Gravitational potential energy = 25 kg × 9.8 m/s^2 × 45 m = 11,025 J

Answer: Gravitational potential energy = 11,025 J

▶ Calculating Power (pages 212–213)

5. Power = $\frac{5{,}000\ \text{N} \times 15\ \text{m}}{3\ \text{s}}$ = 25,000 W or 25 kW

6. You exert a force of 300 N to lift a box 2 m from the floor to a shelf in 3 s. How much power did you use?

Power = $\frac{300\ \text{N} \times 2\ \text{m}}{3\ \text{s}}$ = 200 W

Answer: Power = 200 W

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CHAPTER 7

Weathering and Soil Formation

SECTION 7–1 Rocks and Weathering (pages 226–231)

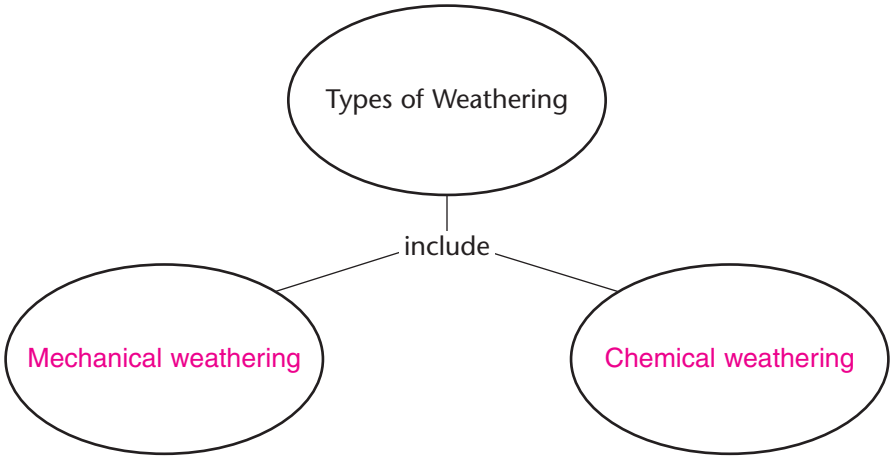
This section describes how rocks are broken down by forces of weathering. The section also describes factors that determine how quickly weathering occurs.

▶ The Effects of Weathering (pages 226–227)

Match the process with its description.

	Process	Description
b	1. weathering	**a.** Movement of rock particles by wind, water, ice, or gravity
a	2. erosion	**b.** Breaking down of rock and other substances at Earth's surface

3. Complete the concept map.



▶ Mechanical Weathering (pages 227–228)

4. The type of weathering in which rock is physically broken into smaller pieces is called _____mechanical_____ weathering.

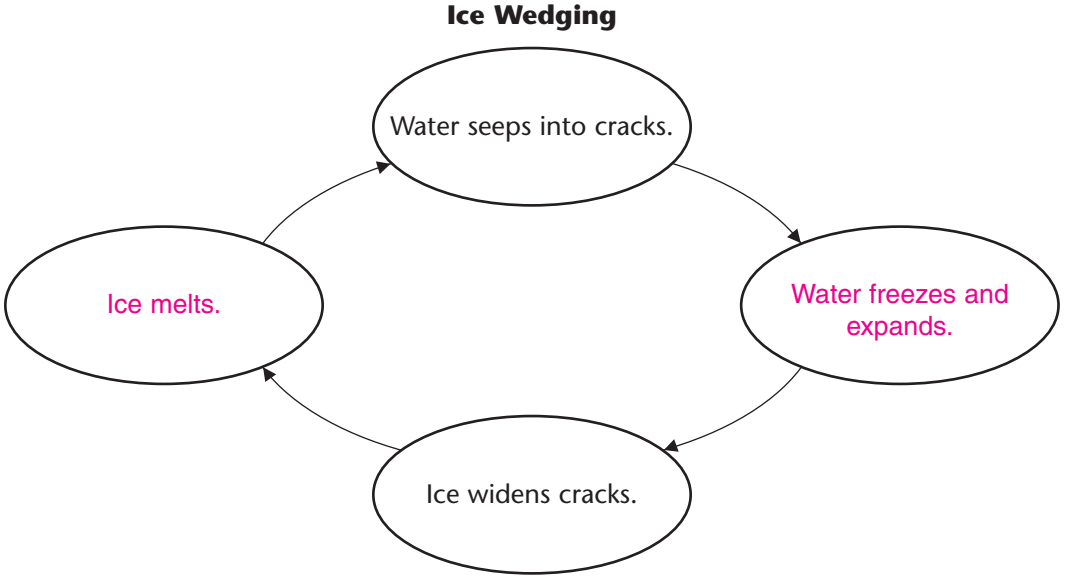
5. List the forces of mechanical weathering.

   a. freezing and thawing b. release of pressure c. growth of plants

   d. actions of animals e. abrasion

6. What is abrasion? Abrasion is the grinding away of rock by rock particles carried by water, ice, wind, or gravity.

7. Complete the cycle diagram.



▶ Chemical Weathering (pages 229–230)

8. The process that breaks down rock through chemical changes is chemical weathering.

9. List the agents of chemical weathering.

   a. water b. oxygen c. carbon dioxide

   d. living organisms e. acid rain

10. Is the following sentence true or false? Chemical weathering produces rock particles with the same mineral makeup as the rock they came from. false

Name _____ Date _____ Class _____

Match the agent of chemical weathering with the statement that is true about it.

Agent	Statement
c 11. water	a. It causes iron to rust.
a 12. oxygen	b. It's caused by pollution.
d 13. carbon dioxide	c. It's the most important agent.
e 14. living organisms	d. It forms carbonic acid.
b 15. acid rain	e. Lichens are one example.

16. Is the following sentence true or false? Water weathers rock by dissolving it. true

17. Oxygen weathers rock through a process called oxidation.

18. List two kinds of rock that are easily weathered by carbonic acid.
a. marble b. limestone

19. How do plants dissolve rock? Plants dissolve rock by producing weak acids around their roots.

▶ Rate of Weathering (page 231)

20. The most important factors that determine the rate of weathering are type of rock and climate.

21. Is the following sentence true or false? The minerals that make up a rock determine how fast it weathers. true

22. A rock that is full of tiny, connected air spaces is said to be permeable.

23. Why does a permeable rock weather chemically at a fast rate? As water seeps through the spaces in the rock, it removes dissolved material formed by weathering.

24. Why does chemical weathering occur more quickly in a hot climate?

It occurs more quickly because chemical reactions occur faster at higher temperatures.

SECTION 7–2 Soil Formation and Composition (pages 235–241)

This section explains how soil forms. The section also describes several features of soil, the living things found in soil, and the types of soil found in the United States.

▶ Soil Formation (page 235)

1. The loose, weathered material on Earth's surface in which plants can grow is soil.

2. How does soil form? Soil forms as rock is broken down by weathering and mixes with other materials on the surface.

3. The solid layer of rock beneath the soil is called bedrock.

▶ Soil Composition (page 236)

4. What two factors determine the type of rock particles and minerals in any given soil? The two factors are the type of bedrock that was weathered to form the soil and the type of weathering that was involved.

5. List the three types of weathered rock particles found in soil.

a. sand **b.** silt **c.** clay

6. The decayed organic material in soil is called humus.

Name _____ Date _____ Class _____

▶ Soil Texture (page 236)

7. Circle the letter of the choice that lists soil particles from largest to smallest.

a. sand, gravel, clay, silt

b. gravel, sand, silt, clay

c. gravel, silt, sand, clay

d. gravel, sand, clay, silt

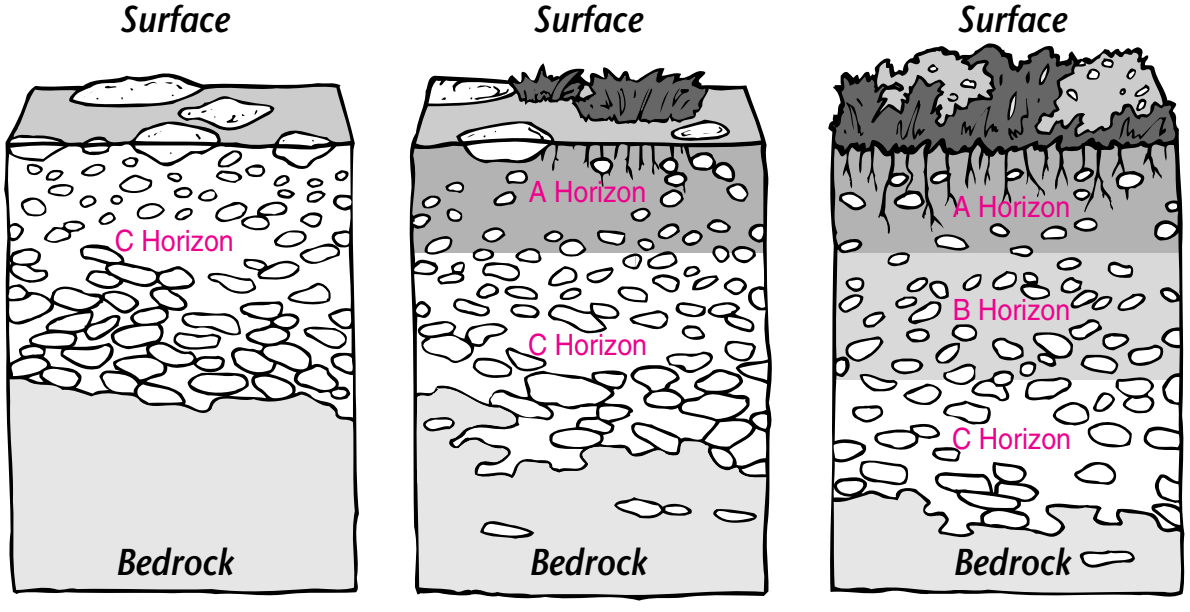
8. Soil that is made up of about equal parts of clay, sand, and silt is called loam.

▶ Soil Horizons (page 237)

Match the soil horizon with its makeup.

	Soil Horizon	Makeup
a	**9.** A	**a.** Topsoil
c	**10.** B	**b.** Rock particles
b	**11.** C	**c.** Subsoil

12. Label each of the soil horizons shown in the three drawings as A, B, or C horizon.



▶ Rate of Soil Formation (page 237)

13. Circle the letter of each sentence that is true about the rate of soil formation.

a. It is faster in areas that are cold.

b. It is slower in areas that are dry.

c. It is faster with limestone than granite.

d. It is unaffected by the type of rock being weathered.

▶ Life in Soil (pages 238–240)

14. How do soil organisms improve soil? Some soil organisms mix the soil and make spaces in it for air and water. Other soil organisms make humus, the material that makes soil fertile.

15. Is the following sentence true or false? Animals contribute most of the organic remains that form humus. false

16. As plants shed leaves, they form a loose layer called litter.

17. Soil organisms that turn dead organic matter into humus are called decomposers.

18. List the main soil decomposers.

a. fungi **b.** protists **c.** bacteria **d.** worms

19. Circle the letter of each choice that is an example of fungi.

a. molds **b.** mushrooms **c.** bacteria **d.** earthworms

20. Is the following sentence true or false? Earthworms do most of the work of mixing humus with other materials in soil. true

21. How can burrowing mammals improve soil? They can break up hard compacted soil, mix humus through soil, add nitrogen and organic material to soil, and aerate soil.

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▶ Soil Types in the United States (pages 240–241)

22. Circle the letter of each factor that scientists use to classify the different types of soil into groups.

a. climate

b. plant types

c. soil composition

d. size of animal populations

23. Is the following sentence true or false? The soil type of northeastern United States and Canada is southern forest soils. false

Reading Skill Practice

When you read a section that contains new or difficult material, identifying the sentence that best expresses the main topic under each heading can help you focus on the most important points. For each heading in Section 7–2, identify and copy the sentence that best expresses the main topic under that heading. Do your work on a separate sheet of paper.

Good choices of topic sentences include the boldfaced sentences. Other good choices include: "Soil texture depends on the size of individual soil particles." "Gradually, soil develops layers called horizons." "The rate at which soil forms depends on the climate and type of rock."

SECTION 7–3 Soil Conservation (pages 243–246)

This section explains why soil is valuable. The section also explains how soil can be damaged or lost, as well as how it can be conserved.

▶ Introduction (pages 243)

1. The thick mass of tough roots at the surface of the soil is called sod.

2. Prairie soils are among the most fertile soils in the world.

▶ The Value of Soil (pages 243–244)

3. Why is soil one of Earth's most valuable resources? Soil is so valuable because everything that lives on land depends directly or indirectly on soil.

4. Circle the letter of each sentence that is true about soil.
   - **a.** Soil is a nonrenewable resource.
   - **b.** Soil formation takes a long time.
   - **c.** Fertile soil is plentiful.
   - **d.** Half of Earth has soils good for farming

5. List four reasons why farming is difficult in many areas on Earth.
   - a. Low soil fertility
   - b. Lack of water
   - c. Steep slopes
   - d. Short growing season

▶ Soil Damage and Loss (page 244)

6. How can soil be damaged? Soil can be damaged by becoming exhausted, or losing its fertility.

7. How can soil be lost? Soil can be lost to erosion by water and wind.

8. Parts of Oklahoma and surrounding states that lost soil in the 1930s were called the Dust Bowl.

▶ The Dust Bowl (page 244)

9. As you go from east to west across the Great Plains, the amount of rainfall decreases steadily.

Name _____ Date _____ Class _____

10. Why did the Dust Bowl occur? Plowing removed the grass and exposed the soil. Then drought dried out the topsoil, which turned to dust and blew away.

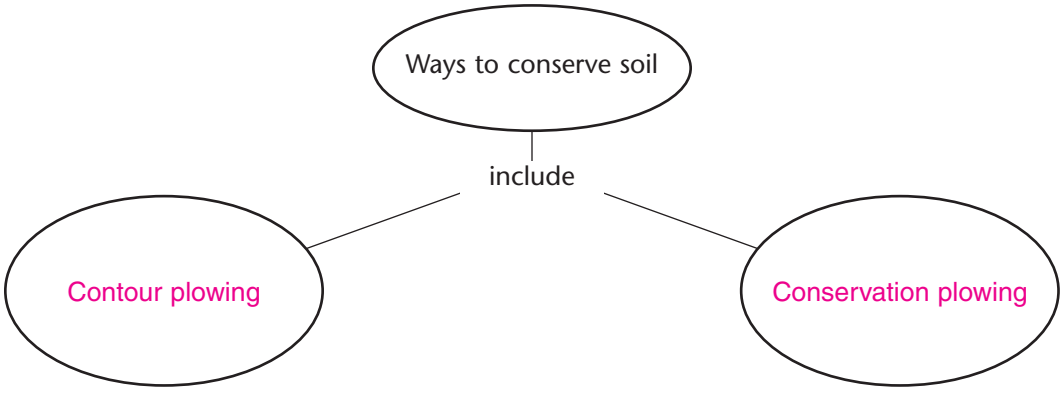
11. The soil lost from the Dust Bowl ended up in the Atlantic Ocean.

12. In the southern Plains states, the drought and topsoil loss lasted until 1938.

▶ Soil Conservation (page 246)

13. The management of soil to prevent its destruction is referred to as soil conservation.

14. Complete the concept map.



15. The practice of plowing fields along the curve of a slope is called contour plowing.

16. A method of farming that disturbs the soil and its plant cover as little as possible is called conservation plowing.

WordWise

Test your knowledge of key terms from Chapter 7 by solving the clues. Then copy the numbered letters in order to reveal the hidden message.

Clues	Key Terms
Process of moving fragments of rock and soil	e r o s i o n (1, 2)
Solid layer of rock beneath soil	b e d r o c k (3, 4)
Thick mass of grass roots and soil	s o d (5)
Grinding away of rock by rock particles	a b r a s i o n (6)
Loose layer of dead plant material on the soil surface	l i t t e r (7)
Organisms that break down wastes and dead organisms	d e c o m p o s e r s (8, 9)
Organic material in soil	h u m u s (10)
Processes that break down rock at Earth's surface	w e a t h e r i n g (11)
Topmost layer of soil	t o p s o i l (12)
Soil with about equal parts of clay, sand, and silt	l o a m (13)
Layer of soil beneath the topsoil	s u b s o i l (14)
Loose, weathered material in which plants can grow	s o i l (15)

Hidden Message

R o c k s (1 2 3 4 5) b e c o m e (6 7 8 9 10 11) s o i l (12 13 14 15).

Name _____ Date _____ Class _____

CHAPTER 8

EROSION AND DEPOSITION

SECTION 8–1 Changing Earth's Surface (pages 252–255)

This section explains how sediment is carried away and deposited elsewhere to wear down and build up Earth's surface. The section also describes ways that gravity moves sediment downhill.

▶ Wearing Down and Building Up (page 253)

1. What is erosion? Erosion is the process by which natural forces move weathered rock and soil from one place to another.

2. List the forces that cause erosion.

   a. gravity b. running water c. glaciers

   d. waves e. wind

3. The material moved by erosion is called sediment.

4. Where does deposition occur? Deposition occurs where the agents of erosion lay down sediment.

▶ Mass Movement (pages 253–255)

5. Circle the letter of each sentence that is true about gravity.

   (a.) It pulls things toward Earth's center.

   (b.) It causes landslides.

   (c.) It causes mass movement.

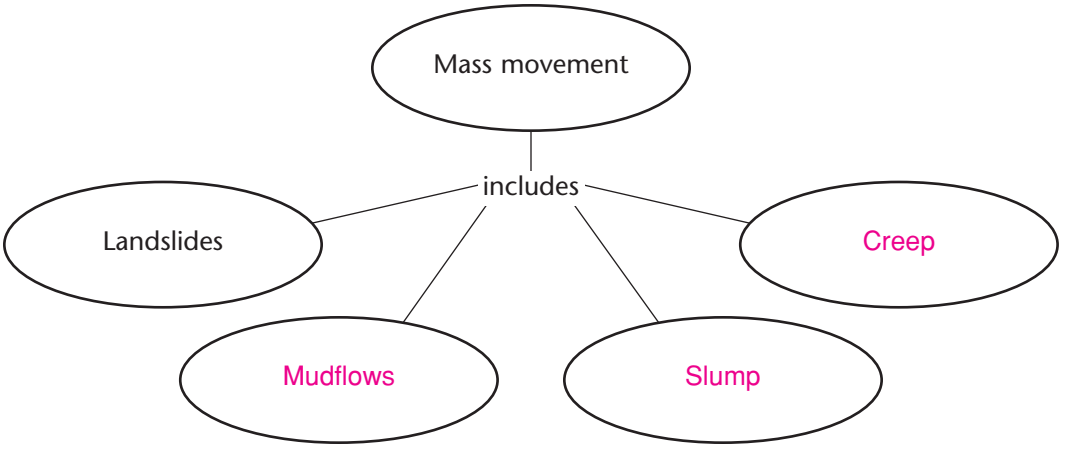
   (d.) It is a force of erosion.

CHAPTER 8, Erosion and Deposition *(continued)*

6. Is the following sentence true or false? A very destructive kind of mass movement is creep. false

7. Is the following sentence true or false? Mudflows and slump are especially likely in soils high in clay. true

8. Complete the concept map.



Match the type of mass movement with its description.

	Mass Movement	Description
b	**9.** landslide	**a.** Rock and soil suddenly slip down a slope in one large mass.
d	**10.** mudflow	**b.** Rock and soil slide quickly down a slope.
a	**11.** slump	**c.** Rock and soil move very slowly downhill.
c	**12.** creep	**d.** A mixture of water, rock, and soil moves rapidly downhill.

Reading Skill Practice

When reading about cyclical processes, making a cycle diagram can help you understand how the processes are related. As you read or review Section 8-1, make a cycle diagram showing how the processes of weathering, erosion, and deposition are related. For more information on cycle diagrams, see page 661 in the Skills Handbook of the textbook. Do your work on a separate sheet of paper.

Students' cycle diagrams should show how weathering, erosion, and deposition act together in a continuous cycle that wears down and builds up Earth's surface.

Name _____ Date _____ Class _____

SECTION 8–2 Water Erosion
(pages 258–267)

This section describes how moving water erodes and deposits sediment to create landforms such as valleys and deltas.

▶ Runoff and Erosion (pages 259–260)

1. Is the following sentence true or false? Moving water is the major agent of erosion. true

2. Water that moves over Earth's surface when it rains is called runoff.

3. Fill in the first column of the table with the correct form of moving water.

Forms of Moving Water	
Form	**Description**
Rill	Tiny groove in soil formed by runoff
Gully	Channel that carries runoff after a rainstorm
Stream	Channel with water continually flowing down a slope
River	Large stream

4. Other than how people use the land, list four factors that determine the amount of runoff in an area.
   a. amount of rain
   b. presence of vegetation
   c. type of soil
   d. shape of land

5. Is the following sentence true or false? More runoff generally means less erosion. false

▶ River Systems (pages 260–261)

6. A stream that flows into a larger stream is called a(n) tributary.

7. The area of land from which a river and its tributaries collect water is the drainage basin.

8. Is the following sentence true or false? The high ground between two drainage basins is called a divide. true

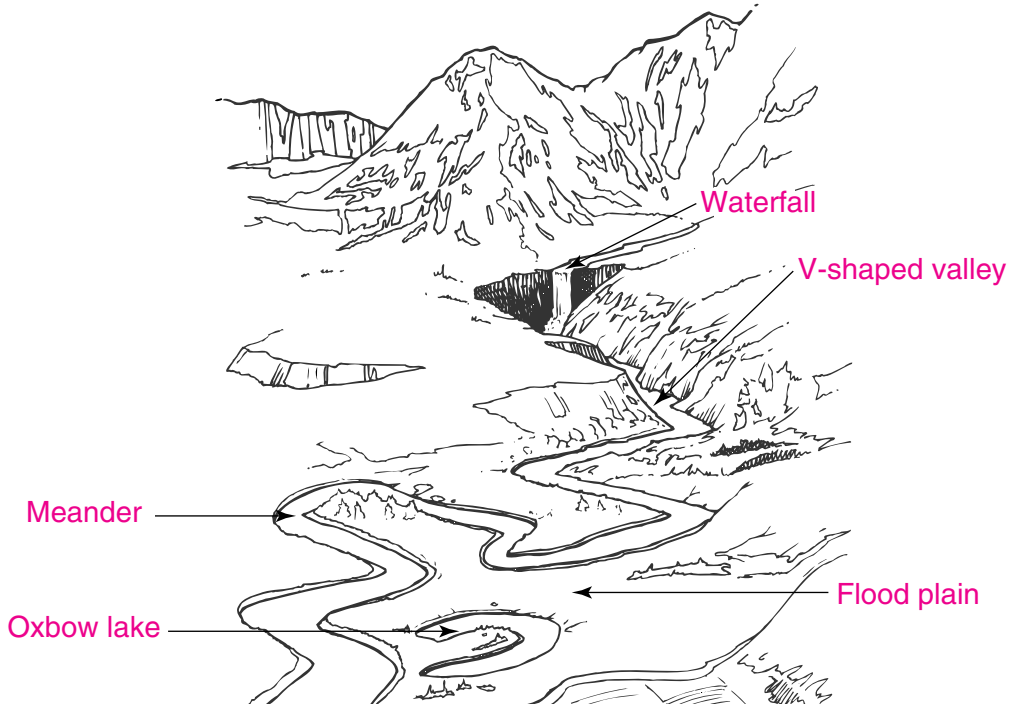
▶ Erosion by Rivers (pages 261–262)

9. How do V-shaped valleys form? V-shaped valleys form when rivers erode rapidly as they flow quickly over steep slopes.

10. When does a river develop meanders? A river develops meanders when it flows through easily eroded rock or sediment.

11. A meander that has been cut off from a river is called a(n) oxbow lake.

12. Identify and label each of the following landforms in the illustration: waterfall, oxbow lake, meander, flood plain, and V-shaped valley.



Name _____ Date _____ Class _____

▶ Deposits by Rivers (pages 263–265)

13. List two landforms created from deposits by rivers.

a. alluvial fans **b.** deltas

14. What is an alluvial fan? An alluvial fan is a wide, sloping fan-shaped deposit of sediment formed where a stream leaves a mountain range.

15. Sediments deposited where a river flows into an ocean or lake form a(n) delta.

16. What makes a river valley fertile? Deposition of sediment over the flood plain during floods makes a river valley fertile.

▶ Groundwater Erosion and Deposition (pages 266–267)

17. Underground water is called groundwater.

18. Is the following sentence true or false? Unlike moving surface water, groundwater does not cause erosion. false

19. How does groundwater cause chemical weathering of limestone? Groundwater combines with carbon dioxide to form a weak acid, called carbonic acid, which dissolves limestone.

20. Complete the compare/contrast table.

Groundwater Deposits In Limestone Caves	
Type of Deposit	**Where It Forms**
Stalactite	Roof of cave
Stalagmite	Floor of cave

21. Is the following sentence true or false? An area where sinkholes are common is said to have karst topography. true

SECTION 8–3 The Force of Moving Water (pages 271–274)

This section explains why moving water has energy and how it erodes and carries sediment. The section also identifies the factors that determine how much sediment a river can erode and carry.

▶ Work and Energy (pages 271–272)

1. The ability to do work or cause change is energy.
2. Energy that is stored for later use is called potential energy.
3. Is the following statement true or false? Kinetic energy is the energy an object has due to its motion. true

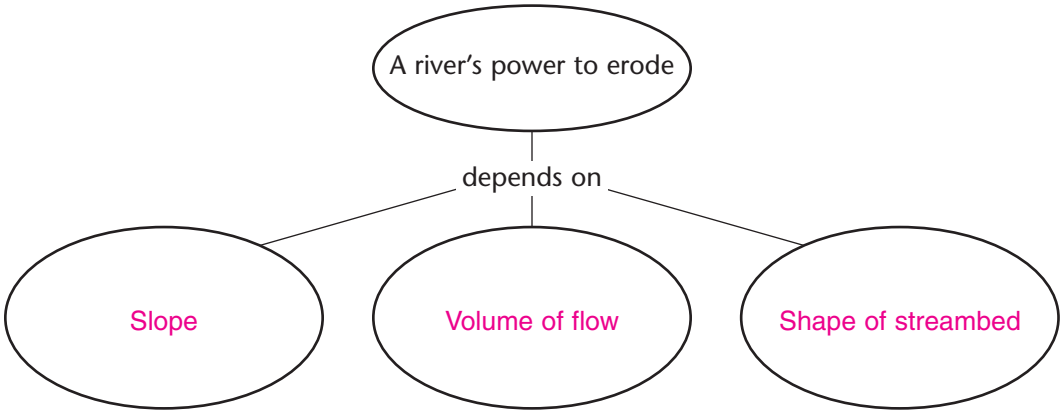
▶ How Water Erodes and Carries Sediment (page 272)

4. In what ways can sediment enter a river? Sediment can wash into a river due to runoff, fall into a river due to mass movement, erode from the bottom or sides of the river, or be dropped into the river by the wind.
5. The wearing away of rock by a grinding action is called abrasion.
6. Is the following sentence true or false? Sediment in a river abrades the streambed and is abraded by the streambed in return. true
7. The amount of sediment that a river carries is its load.
8. Circle the letter of each sentence that is true about a river's sediment.
   - (a.) Gravity and the force of the water cause sediment to move downstream.
   - b. Most small sediments move by rolling and sliding along the bottom.
   - c. Most large sediments move by bouncing.
   - (d.) Some sediments are dissolved by the water and carried in solution.

Name _____ Date _____ Class _____

▶ Erosion and Sediment Load (pages 273–274)

9. Complete the concept map.



10. Is the following sentence true or false? When a river slows down and deposits its sediment load, smaller particles of sediment are deposited first. false

11. Circle the letter of each factor that increases the speed of a river.

a. Steep slope **b.** Low volume

c. Deep streambed **d.** Boulders in streambed

12. Circle the letter of each factor that decreases the speed of a river.

a. Gentle slope **b.** High volume

c. Shallow streambed **d.** Boulders in streambed

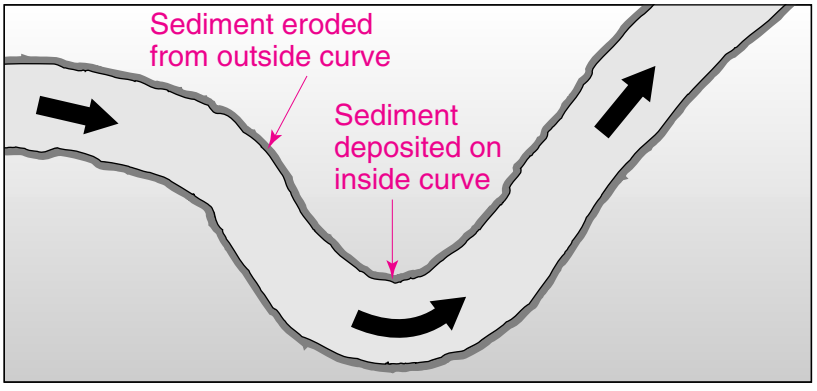
Match the term with its definition.

	Term	Definition
c	**13.** flow	**a.** Movement of water every which way instead of downstream
b	**14.** friction	**b.** Force that opposes the motion of one surface across another
a	**15.** turbulence	**c.** Volume of water that moves past a point on a river in a given time

16. Is the following sentence true or false? Where a river flows in a straight line, the water flows faster along the river's sides than near the center.

false

17. Label the drawing to show where the river erodes sediment and where it deposits sediment as it flows around the curve.



SECTION 8–4 Glaciers (pages 275-279)

This section describes huge ice masses, called glaciers. The section also describes the ice ages, a time when glaciers covered much of Earth. In addition, the section explains how glaciers form and move and how they cause erosion and deposition.

▶ Kinds of Glaciers (pages 275–276)

1. Any large mass of ice that moves slowly over land is a(n) _____glacier_____.

2. Circle the letter of each sentence that is true about valley glaciers.

a. They are long, narrow glaciers.

b. They are found on many high mountains.

c. They are larger than continental glaciers.

d. They follow river valleys.

3. Circle the letter of each sentence that is true about continental glaciers.

a. They are larger than valley glaciers.

b. They spread out over wide areas.

c. They are found only in Antarctica.

d. They cover 2 percent of Earth's land.

Name _____ Date _____ Class _____

▶ Ice Ages (page 276)

4. What are ice ages? Ice ages are times in the past when continental glaciers covered large parts of Earth's surface.

5. Is the following sentence true or false? The most recent ice age ended about 10,000 years ago. true

6. Is the following sentence true or false? All of North America was covered by a continental glacier in the last ice age. false

▶ How Glaciers Form and Move (page 276)

7. Where can glaciers form? Glaciers can form only in an area where more snow falls than melts.

8. When does gravity begin to pull a glacier downhill? Gravity pulls it when the depth of snow and ice reaches more than 30 to 40 meters.

9. Complete the table.

How Glaciers Move	
Type of Glacier	**How It Moves**
Continental glacier	Flows in all directions
Valley glacier	Flows in a surge

▶ Glacial Erosion (pages 276–277)

10. List two processes by which glaciers erode the land.

a. plucking b. abrasion

11. Is the following sentence true or false? Plucking can move only small stones. false

12. Describe the process of abrasion by a glacier and the effect abrasion has on the bedrock. Rocks on the bottom of the glacier are dragged across the land as the glacier moves. This gouges and scratches the bedrock.

▶ Glacial Deposition (pages 277–279)

13. When does a glacier deposit the sediment it is carrying? Sediment is deposited when the glacier melts.

Match each type of glacial landform with its description.

	Landform	Description
b	**14.** till	**a.** Small depression formed by a chunk of ice and filled with water
c	**15.** moraine	**b.** Mixture of sediments a glacier deposits on the surface
e	**16.** terminal moraine	**c.** Ridge formed at the edge of a glacier
d	**17.** prairie pothole	**d.** Shallow depression formed by flowing water
a	**18.** kettle	**e.** Ridge at the farthest point reached by a glacier
g	**19.** cirque	**f.** Sharp ridge separating two cirques
f	**20.** arête	**g.** Bowl-shape hollow eroded by a glacier
h	**21.** fiord	**h.** Sea-filled valley cut by a glacier in a coastal region

22. How were the Great Lakes formed? The continental glacier of the last ice age scooped out sediment and rock in river valleys, forming basins that filled with water as the glacier melted.

Name _____ Date _____ Class _____

SECTION 8–5 Waves and Wind
(pages 280–285)

This section explains how waves form. The section also describes the erosion and deposition that waves and wind cause.

▶ How Waves Form (pages 280–281)

1. Circle the letter of each sentence that is true about the energy in waves.

a. It comes from wind.

b. It moves water particles up and down.

c. It moves water particles forward.

d. It moves across the water.

2. What part of the water is affected by a wave in deep water? Only the water near the surface is affected.

3. Circle the letter of each sentence that is true about a wave approaching land.

a. It begins to drag on the bottom.

b. It encounters more friction.

c. It speeds up.

d. It moves the water toward the land.

▶ Erosion by Waves (page 281)

4. Is the following sentence true or false? Waves are the major force of erosion along coasts. true

5. List two ways that waves erode land.

a. impact **b.** abrasion

6. Part of the shore that sticks out into the ocean because it is made of harder rock is called a(n) headland.

▶ Landforms Created by Wave Erosion (page 282)

7. List three landforms created by wave erosion.

a. sea cave **b.** wave-cut cliff **c.** sea arch

▶ Deposits by Waves (pages 282–283)

8. An area of wave-washed sediment along a coast is a(n) beach.

9. The process in which beach sediment is moved down the beach with the current is called longshore drift.

10. How does a spit form? A spit forms where a headland or other obstacle interrupts longshore drift and deposition occurs.

11. How is a barrier beach formed? A barrier beach is formed when storm waves pile up sand above sea level.

12. Is the following sentence true or false? Storm winds can wash away barrier beaches. true

▶ How Wind Causes Erosion (pages 283–284)

13. A deposit of wind-blown sand is a(n) sand dune.

14. Is the following sentence true or false? Wind alone is the strongest agent of erosion. false

15. Why is wind very effective at causing erosion in deserts? Wind is very effective in deserts because there are few plants to hold the soil in place.

Name _____ Date _____ Class _____

4. Circle the letter of each sentence that is true about deflation.

a. It is the main way wind causes erosion.

b. It usually has a great effect on the land.

c. It can create blowouts.

d. It can create desert pavement.

5. Circle the letter of each sentence that is true about abrasion.

a. It can polish rock.

b. It is caused by wind-carried sand.

c. It causes most desert landforms.

d. It causes most erosion.

▶ Deposits Resulting From Wind Erosion (page 285)

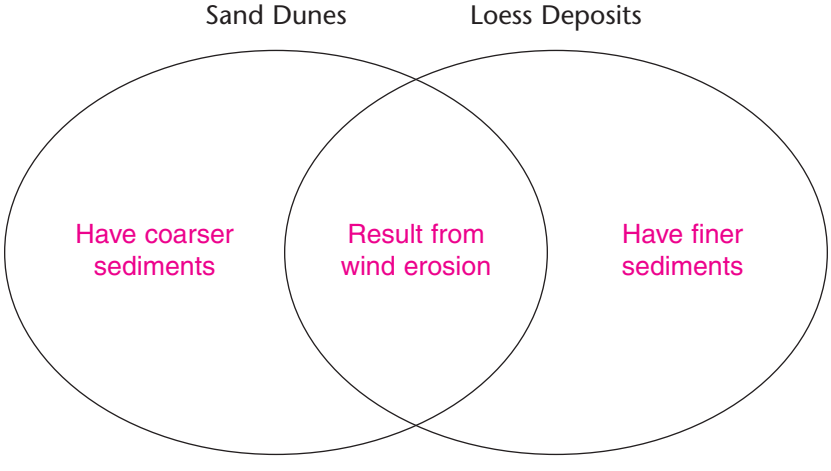
6. Is the following sentence true or false? All the sediment picked up by wind eventually falls to the ground. true

7. When does wind-carried sediment fall to the ground? Sediment falls when the wind slows down or when some obstacle traps the windblown sediment.

8. List two types of deposits formed by wind erosion and deposition.

a. sand dunes **b.** loess deposits

9. Complete the Venn diagram by adding the following phrases: have finer sediments, have coarser sediments, result from wind erosion.



SECTION 8–6 Earth Systems and Catastrophic Events (pages 286-290)

This section describes natural hazards and explains how human activities can increase the effects of natural hazards.

▶ Natural Hazards and Catastrophic Events (page 287)

1. What is a natural hazard? A natural hazard is an event that results from Earth processes and that can cause damage and endanger human life.

2. List six examples of natural hazards.

   a. hurricanes b. tornadoes c. earthquakes

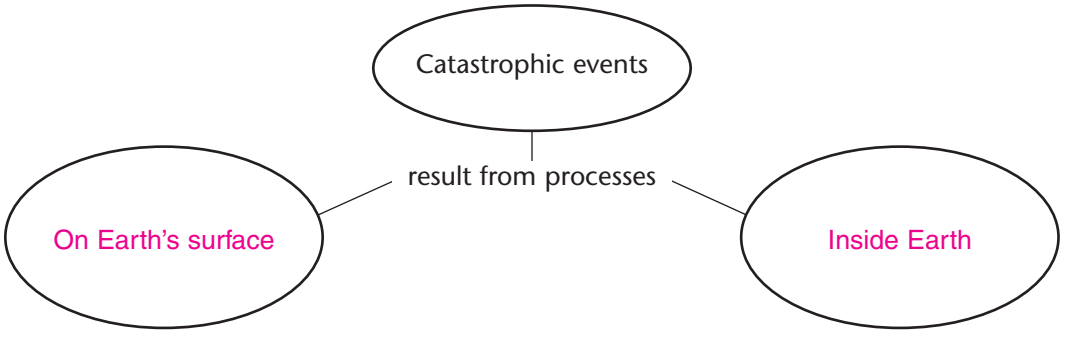
   d. volcanoes e. tsunamis f. droughts

3. Is the following sentence true or false? Natural hazards care the result of processes that take place in Earth systems. true

4. Why are hurricanes and earthquakes natural hazards? A powerful hurricane might form and strike coastal areas where people live. A strong earthquake in a built-up area has the potential to cause catastrophic damage and injury.

▶ Impact on Earth (pages 288-289)

5. Compete the concept map.



Name _____ Date _____ Class _____

6. Describe two ways catastrophic events can change Earth's crust. When volcanoes erupt, molten lava hardens to form solid rock, which is new crust. Earthquakes push the land near a fault up, down, or sideways.

▶ Human Activities (pages 289–290)

7. Is the following sentence true or false? Where people locate their activities can increase the damaging effects of natural hazards.

true

8. Complete the flowchart to show how land use affects the impact of a natural hazard.

Forests on slopes hold soil in place and absorb rainfall.

↓

People clear forests for farming and ranching.

↓

Soil is not protected from erosion.

↓

Hurricanes bring heavy rain.

↓

Runoff loosens the soil and mud flows into river valleys.

9. Why is building a home on a flood plain risky? The next time there is a flood, structures on the flood plain could be damaged or destroyed.

10. What is a tsunami? A tsunami is a wave up to 20 meters high caused by an earthquake on the ocean floor.

Name _____ Date _____ Class _____

WordWise

Use the clues to help you unscramble the key terms from Chapter 8. Then put the numbered letters in the right order to spell out the answer to the riddle.

Clues		Key Terms
It's how sediment moves.	sorineo	e(1) r(2) o s i o n
It's how sediment settles.	oisontipde	d e p o(3) s i t i o n
It's a small particle that moves.	ideemtns	s(4) e d i(5) m e n t
It's how much sediment a river carries.	adol	l o(6) a d
It's the force that opposes motion of one surface across another.	nfcotiri	f r i c t i o n(7)
It's how rocks are polished.	barinoas	a(8) b r a s i o n(9)
It can be found where a river enters a lake.	ldtae	d(10) e l t a
It separates two drainage basins.	vdeiid	d(11) i v i d e
It's formed by a chunk of ice.	teketl	k e(12) t t l e
It sticks out in the water like a finger.	ipst	s p(13) i t
It's a ridge at the edge of a glacier.	noamire	m o(14) r a i n e
It's a deposit of clay and silt.	seols	l o e s(15) s
It's how most wind erosion occurs.	otefdalni	d e f l a t i(16) o n
It flows into a larger stream.	tutyrabir	t(17) r i(18) b u t a r y
It's a kind of lake created by a river.	wxoob	o(19) x b o w
It's the ability to do work or cause change.	ynreeg	e n(20) e r g y

Riddle: What shapes Earth's surface?

Answer: e(1) r(2) o(3) s(4) i(5) o(6) n(7) a(8) n(9) d(10) d(11) e(12) p(13) o(14) s(15) i(16) t(17) i(18) o(19) n(20)

Name _____ Date _____ Class _____

CHAPTER 9

THE EARTH-MOON SYSTEM

SECTION 9–1 Earth in Space (pages 296–303)

This section explains what causes day and night and what causes the cycle of seasons on Earth.

▶ The Lengths of Days and Years (pages 297–299)

1. The study of the moon, stars, and other objects in space is called astronomy.

Match the term with its definition.

	Term	Definition
b	**2.** axis	**a.** The movement of one object around another object
d	**3.** rotation	**b.** The imaginary line that passes through Earth's center and the North and South poles
a	**4.** revolution	**c.** The path of an object as it revolves around another object in space
c	**5.** orbit	**d.** The spinning motion of a planet around its axis

6. Each 24-hour cycle of day and night is called a(n) day.

7. Why is an extra day added to February every four years? Earth's orbit around the sun takes about 365¼ days. Four years of about 365¼ days each can be approximated by taking three years of 365 days and a fourth year of 366 days.

8. What causes day and night? Earth's rotation on its axis causes day and night.

▶ Changes in Seasons (pages 300–303)

9. Why is it warmer near the equator than near the poles? It is warmer near the equator because sunlight hits Earth's surface directly and is less spread out at the equator.

10. Why does Earth have seasons? Earth has seasons because its axis is tilted as it moves around the sun.

11. Circle the letter of each sentence that is true when the Northern Hemisphere has summer.

(a.) The Southern Hemisphere is tilted away from the sun.

b. The Northern Hemisphere is tilted away from the sun.

c. The Southern Hemisphere is tilted toward the sun.

(d.) The Northern Hemisphere is tilted toward the sun.

12. What is latitude? Latitude is a measurement of distance from the equator, expressed in degrees north and south.

13. Circle the letter of each sentence that is true about Earth's seasons.

a. Earth is closest to the sun when it is summer in the Northern Hemisphere.

b. The hemisphere that is tilted away from the sun has more daylight than the other hemisphere.

(c.) When it is summer in the Northern Hemisphere it is winter in the Southern Hemisphere.

(d.) In December, the sun's rays in the Northern Hemisphere are indirect.

Name _____ Date _____ Class _____

14. Each of the two days of the year when the sun is overhead at either 23.5° south or 23.5° north is called a(n) solstice.

15. Each of the two days of the year when neither hemisphere is tilted toward or away from the sun is called a(n) equinox.

16. Complete the table.

Earth's Seasons			
Day in Northern Hemisphere	**Approximate Date Each Year**	**Length of Daytime**	**Which Hemisphere Is Tilted Toward the Sun?**
Summer solstice	June 21	Longest daytime	Northern Hemisphere
Autumnal equinox	September 23	Daytime equals nighttime	Neither
Winter solstice	December 21	Shortest daytime	Southern Hemisphere
Vernal equinox	March 21	Daytime equals nighttime	Neither

SECTION 9–2 Phases, Eclipses, and Tides (pages 306-316)

This section explains what causes phases of the moon, what causes eclipses, and what causes the tides.

▶ Introduction (page 306)

1. What causes the phases of the moon, eclipses, and tides? These are all caused by the positions of the moon, Earth, and sun.

▶ The Moon's Orbit (pages 306–307)

2. Circle the letter of each sentence that is true about motions of the moon.

a. The moon revolves around the Earth once a year.

b. The "near side" of the moon always faces Earth.

c. The moon rotates slowly on its axis once every 27.3 days.

d. The moon's orbit around Earth is an oval shape.

▶ Cyclical Phases of the Moon (pages 307–309)

3. The different shapes of the moon you see from Earth are called phases.

4. How often does the moon go through a whole set of phases? It goes through a whole set of phases each time it revolves around Earth, or about once a month.

5. What does the phase of the moon you see depend on? It depends on how much of the sunlit side of the moon faces Earth.

6. Complete the table about phases of the moon.

Phases of the Moon	
Phase	**What You See**
New moon	The side of the moon facing Earth is dark.
First quarter	Half the moon is lighted.
Full moon	Whole side of the moon is lighted.
Third quarter	Half the moon is lighted.

7. What causes the moon's phases? The moon's phases are caused by changes in the relative positions of the moon, Earth, and the sun.

8. Is the following sentence true or false? Half the moon is almost always in sunlight. true

9. How long after the last new moon until a new moon occurs again? A new moon occurs again in 29.5 days.

Name _____ Date _____ Class _____

▶ Eclipses (page 309)

10. When the moon's shadow hits Earth or Earth's shadow hits the moon, what occurs? An eclipse occurs.

11. What are the two types of eclipses?

a. solar eclipse **b.** lunar eclipses

▶ Solar Eclipses (page 310)

12. What happens to cause a solar eclipse? The moon passes between Earth and the sun, blocking the sunlight from reaching Earth.

13. The darkest part of a shadow is called the umbra.

14. The larger part of a shadow, surrounding the umbra, is called the penumbra.

15. Circle the letter of each sentence that is true about solar eclipses.

a. People in the umbra see only a partial solar eclipse.

b. During a partial solar eclipse, part of the sun remains visible.

c. During a total solar eclipse, the sky is dark.

d. People in the penumbra see a total solar eclipse.

▶ Lunar Eclipses (page 311)

16. What is the arrangement of Earth, moon, and sun during a lunar eclipse? Earth is directly between the moon and the sun.

17. Circle the letter of each sentence that is true about lunar eclipses.

a. People in Earth's umbra see a total lunar eclipse.

b. A lunar eclipse occurs at a full moon.

c. During a lunar eclipse, Earth blocks sunlight from reaching the moon.

d. A partial lunar eclipse occurs when the moon passes partly into the umbra of Earth's shadow.

CHAPTER 9, The Earth-Moon System *(continued)*

▶ Tides (page 314)

18. The rise and fall of the level of the ocean are called tides.

19. What force pulls the moon and Earth toward each other?

gravity

20. Why do tides occur? Tides occur mainly because of differences in how much the moon pulls on different parts of Earth.

21. Circle the letter of each sentence that is true about tides.

a. The point on Earth that is closest to the moon has a high tide.

b. Every location on Earth has two high tides per month.

c. A low tide occurs at the point on Earth farthest from the moon.

d. The water left behind at the point on Earth farthest from the moon has a high tide.

22. What does the force of gravity between two objects depend on?

It depends on the masses of the objects and the distance between them.

23. Is the following sentence true or false? The sun has no influence on Earth's tides. false

24. What factors can make tides vary, even in places that are close to each other? The shapes of bays, inlets, and the ocean floor can affect the flow of water, so that the height and timing of the tides can vary, even in places that are close to each other.

Reading Skill Practice

By looking carefully at illustrations in textbooks, you can help yourself understand better what you have read. Look carefully at Figure 6 on page 309. What important idea does this figure communicate?

It shows that the moon's orbit around Earth is slightly tilted with respect to Earth's orbit around the sun. As a result, in most months the moon revolves completely around Earth without moving into Earth's shadow or the moon's shadow hitting Earth.

Name _____ Date _____ Class _____

SECTION 9–3 Earth's Moon
(pages 317-322)

This section describes the features of the moon that can be seen with a telescope. It also describes the missions to the moon.

▶ The Structure and Origin of the Moon (page 318)

1. Circle the letter of the approximate size of the moon.

a. about twice the size of Earth

b. about half Earth's diameter

c. about the size of Hawaii

d. about one quarter Earth's diameter

2. Complete the flowchart about the collision theory of the moon's origin.

A Theory of the Moon's Origin

A large object strikes Earth.

↓

Material from Earth's outer layer breaks off.

↓

The material from Earth is thrown into orbit.

↓

Material in orbit forms the moon.

▶ Looking at the Moon From Earth (pages 318-319)

3. Who made a telescope in 1609 that allowed him to see details of the moon nobody had ever seen before? Italian astronomer Galileo Galilei

4. Name three features on the moon's surface.

   a. craters

   b. highlands

   c. maria

5. Round pits on the surface of the moon are called craters.

6. What are craters on the moon caused by? They are caused by the impacts of meteoroids, rocks from space.

7. Circle the letter of the phrase that best describes maria.

   a. Highland peaks that cast dark shadows

   (b.) Low, dry areas that were once flooded with molten material

   c. Vast oceans that cover much of the moon

   d. Craters made from exploded volcanoes

▶ Missions to the Moon (pages 320–322)

8. Which president of the United States launched an enormous program of space exploration and scientific research in the early 1960s?

   President John F. Kennedy

9. Circle the letter of the spacecraft that flew into orbit around the moon in July, 1969.

   a. *Surveyor* b. *Sputnik 1* c. *Skylab* (d.) *Apollo 11*

10. Who was the first person to walk on the moon? *Apollo 11* astronaut

    Neil Armstrong was the first to walk on the moon.

11. What did Neil Armstrong say when he took his first step onto the moon?

    That's one small step for man, one giant leap for mankind.

Name _____ Date _____ Class _____

12. How have scientists learned about the material that makes up the moon's surface? Much of what they have learned about the moon comes from detailed study of the moon rocks gathered by astronauts.

13. How do scientists know that the moon's surface once was very hot? Almost all of the moon rocks brought back by astronauts were formed from the cooling of molten material.

14. What did scientists conclude from moon rocks that had been broken apart and then reformed? Scientists concluded that meteoroids had bombarded the moon's surface.

15. Is the following sentence true or false? Seismometers detected extremely strong moonquakes on the moon. false

16. Is the following sentence true or false? The interior of the moon remains very hot. false

17. Circle the letter of each sentence that is true about the far side of the moon.

a. It is almost completely covered with maria.

b. It is rougher than the near side.

c. It has few maria.

d. It is very smooth with no visible craters.

18. In 1998, what did the *Lunar Prospector* discover about the moon's poles? It found evidence that there is ice frozen into the lunar soil near the moon's poles.

SECTION 9-4 Is There Life Beyond Earth? (pages 323-326)

This section describes what conditions living things need to exist on Earth and explains why life might exist on Mars and Europa.

▶ Introduction (page 323)

1. Life other than that on Earth would be called extraterrestrial life.

▶ The "Goldilocks Conditions" (pages 323–324)

2. What are the three "Goldilocks conditions" that Earth has that life as we know it needs to exist?
   a. liquid water
   b. suitable temperature range
   c. suitable atmosphere
3. On Earth, water exists as liquid, solid, and gas.

▶ Life on Earth (page 324)

4. Where has life been found on Earth that suggests that life forms can exist that do not need the "Goldilocks conditions"? Life has been found deep in the ocean, in caves, inside solid rocks, and in hot springs.

Name _____ Date _____ Class _____

▶ Life on Mars? (pages 325–326)

5. Why is Mars the most obvious place to look for living things like those on Earth? Mars is the planet that is most similar to Earth.

6. Why do scientists hypothesize that Mars may once have had the conditions needed for life to exist? There are regions on Mars that were almost certainly formed by flowing water. Life as we know it requires water to exist.

7. A meteorite from Mars found in Antarctica in 1996 shows tiny shapes that look like fossils.

8. Is the following sentence true or false? All scientists agree that the meteorite from Mars shows that life once existed on Mars.
false

9. What tested the soil of Mars for signs of life? A biology laboratory on a *Viking* lander spacecraft.

10. Is the following sentence true or false? Life has been discovered in Martian soil. false

▶ Life on Europa? (page 326)

11. What suggests that there might be liquid water on Europa? Close-up views from *Galileo* show that Europa's ice has broken up and re-formed. Similar patterns occur in the ice crust over Earth's Arctic Ocean.

12. Is the following sentence true or false? If there is liquid water on Europa, there might also be life. true

Name _____ Date _____ Class _____

WordWise

The hidden-word puzzle below contains 12 key terms from Chapter 9. You might find them across, down, or on the diagonal. Use the clues to identify the hidden terms. Then circle each term in the puzzle.

Clues	Key Terms
The spinning motion of a planet around its axis	rotation
The study of the moon, stars, and other objects in space	astronomy
The shapes of the moon you see from Earth	phases
The imaginary line that passes through Earth's center and the North and South poles	axis
The two days of the year on which the sun is directly overhead at either 23.5° north or south	solstice
Earth's path as it revolves around the sun	orbit
The movement of one object around another object	revolution
The rise or fall of the level of water in the ocean	tide
A round pit on the moon's surface	crater
The darkest part of a shadow	umbra
Dark, flat areas on the moon's surface	maria
The part of a shadow that surrounds the darkest part	penumbra

x	c	r	a	t	e	r	u	q	r
p	a	s	t	r	o	n	o	m	y
e	x	o	m	o	n	t	t	b	w
n	i	l	m	a	r	i	a	r	l
u	s	s	d	e	n	b	t	a	t
m	w	t	d	c	m	s	i	m	i
b	s	i	k	p	m	b	o	t	a
r	t	c	m	l	s	s	n	p	t
a	a	e	u	i	l	k	a	i	d
y	p	h	a	s	e	s	h	n	u

Name _____ Date _____ Class _____

CHAPTER 10

Bones, Muscles, and Skin

SECTION 10–1 Organization and Homeostasis (pages 336-343)

This section tells how an animal's body is organized and describes the four types of tissue in animals. It also describes how the body maintains stable internal conditions.

▶ Levels of Organization (pages 336–337)

1. Is the following sentence true or false? Each part of an organism has a specific job to do, and all of the different parts work independently of each other. false

2. List the levels of organization in organisms, starting with the smallest.

   a. cells b. tissues

   c. organs d. organ systems

▶ Cells: Structure and Function (page 337)

3. The basic unit of structure and function in a living thing is a(n) cell.

4. Circle the letter of the outside boundary of an animal cell.

   a. cytoplasm **b.** nucleus **c.** tissue **d.** cell membrane

5. The control center that directs the cell's activities and contains information that determines the cell's characteristics is the nucleus.

6. What is the cytoplasm? The cytoplasm is the area between the cell membrane and the nucleus. It contains a clear, jellylike substance in which other cell structures are found.

7. Is the following sentence true or false? Cells carry on the processes that keep organisms alive. true

▶ Tissues (pages 338–339)

8. What is a tissue? A tissue is a group of similar cells that perform the same function.

9. Complete the table to show the functions and examples of the tissues in the human body. See Figure 2 on page 338.

Tissues in the Human Body

Tissue	Function	Example
Muscle	Makes parts of the body move by contracting, or shortening	muscles
Nerve	Carries messages back and forth between the brain and other parts of the body	brain, spinal cord, or nerves
Connective	Supports the body and connects all its parts	blood, fat, cartilage, bones, or tendons
Epithelial	Covers the surfaces of the body, inside and out	skin, lining of digestive system

▶ Organs and Organ Systems (page 339)

10. A structure that is made up of different kinds of tissues is a(n) organ.

11. Circle the letter of the organ.

a. muscle cell **b.** blood **(c.)** lungs **d.** digestive system

12. What is an organ system? An organ system is a group of organs working together to perform a major function.

13. Organs in the circulatory system include the heart and blood vessels.

Name _____ Date _____ Class _____

Match the organ system with its function. See Figure 3 on page 475.

	Organ Systems	Functions
d	**14.** endocrine	**a.** Takes oxygen into the body
f	**15.** circulatory	**b.** Fights disease
c	**16.** excretory	**c.** Removes wastes
a	**17.** respiratory	**d.** Controls body process with chemicals
e	**18.** digestive	**e.** Takes food into the body and breaks it down
b	**19.** immune	**f.** Carries materials to and from body cells

▶ Maintaining Stable Internal Conditions (pages 340–341)

20. Is the following sentence true or false? The different body systems work together and depend on one another. true

21. The process by which an organism's internal environment is kept stable in spite of changes in the external environment is called homeostasis.

22. How do an animal's kidneys regulate water balance?

By adjusting the amount of water in urine

23. How do pores in the leaves of plants help control water balance?

When the pores open, water leaves the plant. When the pores are closed, water stays inside.

24. How does perspiration help maintain constant body temperature?

As the water in perspiration evaporates, it absorbs heat from your body. This removal of heat helps you cool down.

25. An organism's response is the action or change in behavior that occurs as a result of a stimulus.

26. Hunger is a(n) internal stimulus.

▶ Stress and Homeostasis (pages 342–343)

27. What is stress? Stress is the reaction of the body and mind to threatening, challenging, or disturbing events.

28. An event, such as an argument or an upcoming oral report, that causes stress is a(n) stressor.

29. Is the following sentence true or false? Stress does not affect homeostasis.

false

30. What is adrenaline? Adrenaline is a chemical that the body releases into the bloodstream during the alarm stage of stress.

31. Complete the flowchart to show the effects of adrenaline on the body.

Adrenaline's Effects

Breathing quickens, sending more oxygen to body cells to provide energy for the muscles.

↓

Extra oxygen gets to cells rapidly because the heart beats faster.

↓

Arms and legs get more blood flowing to them.

The skin and digestive system get less blood.

↓

The pupils of the eyes get bigger, so it is easier to see.

Name _____ Date _____ Class _____

32. What do the reactions of adrenaline prepare the body for? They prepare the body to fight the stressor or to take flight and escape.

▶ Long-Term Stress (page 343)

33. Is the following sentence true or false? The alarm stage of stress lasts for a long time. false

34. Is the following sentence true or false? Even if a stressful situation does not go away, the body can still restore homeostasis. false

35. What can happen to your body if you do not deal with stress? You may become tired, irritable, and have trouble getting along with others.

36. Circle the letter of each sentence that is true about dealing with stress.

a. It is important to ignore stressful situations so that they will go away.

b. If you accept that you have a problem and deal with it, then your stress will decrease.

c. You can avoid stress entirely.

d. Talking to family members and friends about the stressful situation will help.

Reading Skill Practice

A concept map is a useful tool to show the relationships between concepts. This helps make the concepts easier to understand. Make a concept map to show the levels of organization in complex organisms. For more information about concept maps, see page 660 in the Skills Handbook of your textbook. Do your work on a separate sheet of paper.

Concept maps should show that the levels of organization in the body are cells, tissues, organs, and organ systems.

SECTION 10–2 The Skeletal System (pages 344-351)

This section describes the skeletal system and its function. It also tells how to keep your bones strong and healthy.

▶ Functions of the Skeletal System (pages 344–346)

1. List the five major functions of the skeleton.
   a. Provides shape and support
   b. Enables the body to move
   c. Protects the internal organs
   d. Produces blood cells
   e. Stores certain materials until the body needs them

2. Is the following sentence true or false? The structures of an organism's organs and organ systems are related to the functions they perform.
   true

3. The 26 small bones that make up the backbone are the vertebrae.

4. Is the following sentence true or false? Since the backbone is just one long bone, it allows your body to easily bend and twist. false

5. How does the skeleton help the body move? Muscles pull on the bones to make the body move.

6. Circle the letter of the bone that protects the brain.
   a. backbone **b.** pelvic girdle **c.** ribs **(d.)** skull

7. The long bones of the arms and legs make blood cells.

8. Calcium and phosphorus are minerals that are stored in bones.

Name _____ Date _____ Class _____

▶ Bones—Strong and Living (pages 346-347)

9. Circle the letter of each sentence that is true about bones.

(a.) Bones are very strong and lightweight.

b. Concrete can absorb more force without breaking than can bone.

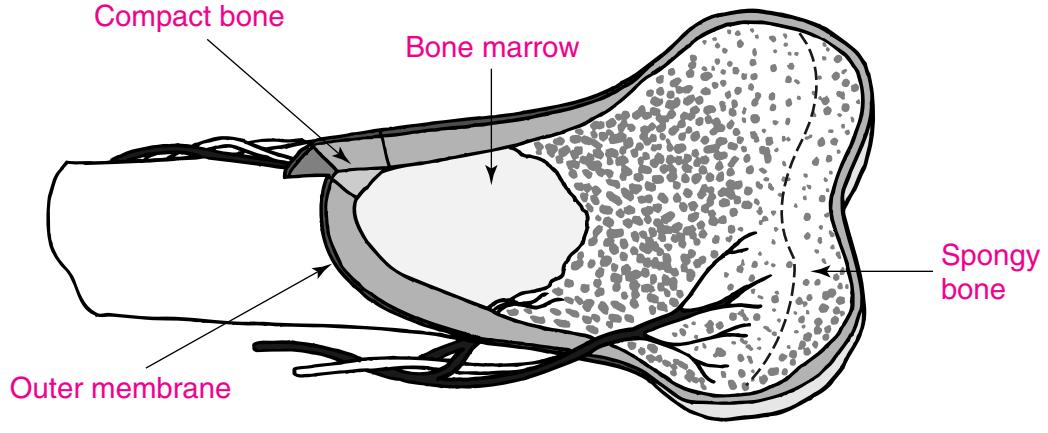
c. Bones make up over half of an adult's body weight.

(d.) Bones are hard because they contain minerals.

10. When do bone cells form new bone tissue? Bone cells form new tissue during growth, in response to the force of the body's weight, and to heal broken bones.

▶ The Structure of Bones (pages 347–348)

11. Label the parts of the bone in the diagram below.



Match each part of a bone with its characteristics.

Bone Parts	Characteristics
d **12.** marrow	**a.** Where blood vessels and nerves enter and leave the bone
a **13.** outer membrane	**b.** Has small canals with blood vessels running through
b **14.** compact bone	**c.** Strong, but lightweight layer because it has many small spaces within it
c **15.** spongy bone	**d.** Soft connective tissue in the spaces in bone

▶ How Bones Form (page 348)

16. A connective tissue that is more flexible than bone is called cartilage.

17. Circle the letter of each sentence that is true about how bones form.

a. Much of an infant's skeleton is bone.

b. As the body grows, the cartilage in the skeleton is replaced with hard bone tissue.

c. By the time the body stops growing, all of the cartilage has been replaced with bone.

d. Cartilage covers the ends of many bones in the body of an adult.

▶ Joints of the Skeleton (pages 348–350)

18. What is a joint? A joint is a place in the body where two bones come together.

19. What are the two kinds of joints in the body?

a. immovable joints **b.** movable joints

20. Circle the letter of the bones that are held together by immovable joints.

a. knee **b.** ankle **c.** ribs **d.** shoulder blade

21. Complete the table to show the four types of movable joints.

Movable Joints		
Joint	**Kind of Motion**	**Where It's Found in the Body**
Ball-and-socket	Allows the bone to swing in a circle	shoulders and hips
Hinge	Allows forward or backward motion	knees and elbows
Pivot	Allows one bone to rotate around another	neck
Gliding	Allows one bone to slide over another	wrists and ankles

Name _____ Date _____ Class _____

22. The bones in movable joints are held together by strong connective tissues called ligaments.

▶ Taking Care of Your Bones (pages 350–351)

23. What can you do to keep your bones healthy? A combination of a balanced diet and regular exercise will keep the bones healthy.

24. A condition in which the body's bones become weak and break easily is called osteoporosis.

Reading Skill Practice

Photographs and illustrations help explain the ideas described in the reading. Look at Figure 10 on page 348. What idea is this photograph communicating? Do your work on a separate sheet of paper.

Cartilage is replaced by hard bone tissue as the body grows.

SECTION 10–3 The Muscular System (pages 352–356)

This section tells about the three kinds of muscle tissue in the human body, how muscles work to move the body, and how to care for your muscles.

▶ Muscle Action (page 352)

1. List the two groups of muscles in the body and describe how they are controlled.

   a. Involuntary muscles are not under conscious control.

   b. Voluntary muscles are under your control.

2. Circle the letter of the action that is controlled by involuntary muscles.

   a. smiling (b.) breathing c. walking d. standing up

▶ Types of Muscles (pages 353–355)

3. Complete the table to compare and contrast the three types of muscle tissue in the body.

Types of Muscles			
Muscles	**Location in Body**	**Voluntary or Involuntary**	**Striated or Not**
Skeletal	Attached to bones of skeleton	Voluntary	Striated
Smooth	Inside many internal organs	Involuntary	Not
Cardiac	Only in heart	Involuntary	Striated

4. A strong connective tissue that attaches muscles to bone is a(n) tendon.

5. List two characteristics of skeletal muscles.

   a. React very quickly

   b. Tire easily

6. Is the following sentence true or false? Smooth muscles react more quickly and tire more easily than skeletal muscles. false

7. The repeated contractions of cardiac muscle are called heartbeats.

▶ Muscles at Work (page 355)

8. When do muscles contract, or become shorter and thicker? Muscles contract when they receive messages from the nervous system.

9. Is the following sentence true or false? Muscle cells can extend, or get longer, as well as contract, or get shorter. false

Name _____ Date _____ Class _____

10. Why do skeletal muscles work in pairs to move a bone? Because muscle cells can only contract, not extend, skeletal muscles must work in pairs. While one muscle contracts, the other muscle returns to its original length.

11. To bend the elbow, the biceps muscle contracts and the triceps muscle returns to its original length.

▶ Taking Care of Your Skeletal Muscles (page 356)

12. Circle the letter of the sentence that is true about taking care of muscles.
   a. Exercise makes muscles thicker and stronger.
   b. Warming up muscles before exercise makes muscles more flexible.
   c. Muscles never get injured if you take proper care of them.
   d. Don't rest an injured muscle, it will heal on its own.

13. What causes a muscle strain, or pulled muscle? Overworking or overstretching a muscle can strain it.

14. What happens when a muscle cramps? When a muscle cramps, the entire muscle contracts strongly and stays contracted.

SECTION 10–4 The Skin (pages 358–364)

This section explains the structure of skin, what skin does, and how to keep skin healthy.

▶ The Body's Tough Covering (pages 358–359)

1. Circle the letter of each sentence that is true about the skin.
   a. The skin lets disease-causing microorganisms and harmful substances into the body.
   b. The skin keeps water from escaping from the body.
   c. The skin helps the body maintain homeostasis.
   d. The skin gathers information about the environment.

2. Is the following sentence true or false? To cool the body, blood vessels in the skin enlarge to let more blood run through them to move body heat to the outside. true

3. Why are pain messages important to the body? They warn you that something in the surroundings may have injured you.

4. Skin cells produce vitamin D in the presence of sunlight.

▶ The Epidermis (pages 360–361)

5. The outermost layer of skin is the epidermis.

6. Is the following sentence true or false? Nerves and blood vessels run through the epidermis. false

7. New cells that form deep in the epidermis gradually move upward to the surface of the skin, where after about two weeks, the cells die.

8. Is the following sentence true or false? The layer of dead cells on the surface of the skin gives the most protection to the body. true

9. Is the following sentence true or false? Melanin, a pigment that gives skin its color, protects the skin from burning in sunlight. true

▶ The Dermis (page 361)

10. The lower layer of the skin is the dermis.

11. What is the role of the layer of fat below the dermis? The fat layer pads the internal organs and helps keep heat in the body.

12. Circle the letter of each structure in the dermis.

(a.) hairs b. bones (c.) sweat glands (d.) oil glands

Name _____ Date _____ Class _____

13. Perspiration reaches the surface of the skin through openings called pores.

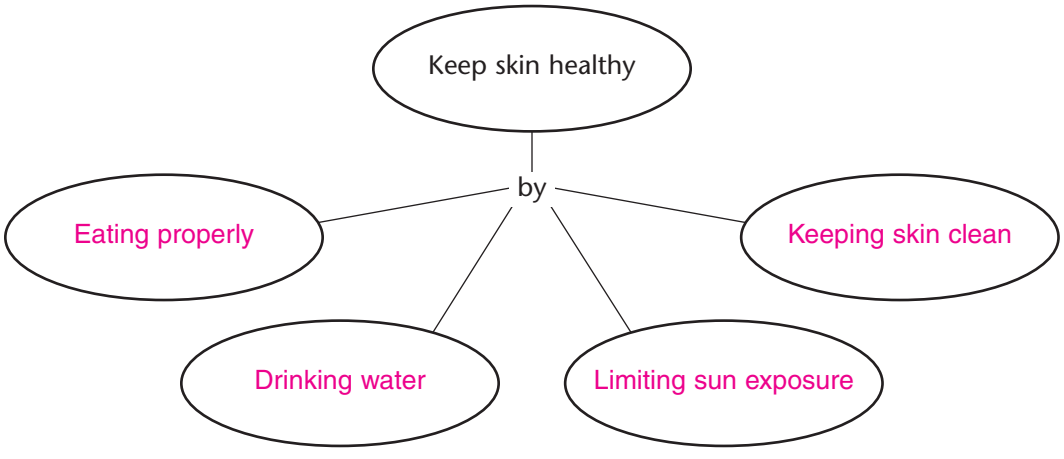
14. What are follicles? Follicles are structures in which strands of hair grow within the dermis.

15. Is the following sentence true or false? Oil produced in glands around the hair follicles waterproofs the hair and keeps the skin moist.

true

▶ Caring for Your Skin (pages 362–364)

16. Complete the concept map to show how to keep your skin healthy.



17. What should you do to replace the water that the skin loses during perspiration? Drink water or other beverages and eat foods that contain water.

18. A disease in which some body cells divide uncontrollably is called cancer.

19. In what two ways does the sun damage your skin?

a. It damages skin cells and causes them to become cancerous.

b. It causes the skin to become leathery and wrinkled.

20. What is acne? Acne is a bacterial infection of the skin that can be difficult to control.

WordWise

Use the clues below to identify key terms from Chapter 10. Write the terms on the line, putting one letter in each blank. When you finish, the word enclosed in the diagonal lines will reveal the name of the outermost layer of skin.

Clues

1. The basic unit of structure and function in a living thing

2. An opening in the dermis through which perspiration reaches the surface of the skin

3. A place in the body where two bones come together

4. A strong connective tissue that attaches muscle to bone

5. A group of similar cells that perform the same function

6. A soft connective tissue found in the spaces in bone

7. The process by which the body's internal environment is kept in equilibrium.

8. A connective tissue that makes up the skeleton that is more flexible than bone

9. Muscles attached to the bones of the skeleton are ____ muscles.

Key Terms

1. c e l l

2. p o r e

3. j o i n t

4. t e n d o n

5. t i s s u e

6. m a r r o w

7. h o m e o s t a s i s

8. c a r t i l a g e

9. s k e l e t a l

Name _____ Date _____ Class _____

CHAPTER 11

Food and Digestion

SECTION 11–1 Food and Energy (pages 370–380)

This section tells about the six nutrients needed by the body. It also describes the Food Guide Pyramid and how to read labels on foods.

▶ Why You Need Food (pages 370–371)

1. What two things does food give to your body?
   a. The materials for growing and for repairing tissues
   b. The energy for everything you do
2. Is the following sentence true or false? Food is required for the body to maintain homeostasis, keeping a steady internal state. true
3. The substances in food that give the raw materials and the energy needed by the body are called nutrients.
4. List the six kinds of nutrients that people need to stay healthy.
   a. carbohydrates b. fats c. proteins
   d. vitamins e. minerals f. water
5. The amount of energy released by nutrients in the body is measured in units called calories.
6. Is the following sentence true or false? The more active you are, the more Calories you need. true

▶ Carbohydrates (pages 371–372)

7. Carbohydrates are a major source of energy.

8. Is the following sentence true or false? Carbohydrates are not needed for making new body cells. false

Match the foods with the kinds of carbohydrates. Each kind of carbohydrate may be used more than once.

Foods	Kinds of Carbohydrates
b **9.** fiber	**a.** Simple carbohydrate
a **10.** glucose	**b.** Complex carbohydrate
b **11.** starch	
a **12.** sugar	

▶ Fats (page 373)

13. What are fats? Fats are high-energy nutrients that are made up of carbon, oxygen, and hydrogen.

14. Circle the letter of the nutrient that provides the most energy.

a. glucose **b.** fats **c.** carbohydrates **d.** vitamins

15. List three jobs that fats have in the body.

a. Form part of the structure of cells

b. Protect and support internal organs

c. Insulate the body to keep in heat

16. Complete the following table to compare the two kinds of fats.

Kinds of Fats		
Characteristics	**Unsaturated Fats**	**Saturated Fats**
Liquid or Solid	Liquid	Solid
Foods Found In	Most oils, such as olive and canola oils, and some seafood	Meat, dairy products, egg yolks, coconut and palm oils

Name _____ Date _____ Class _____

17. Is the following sentence true or false? Cholesterol, a waxy, fatlike substance found only in animal products, is required in a balanced diet.

false

18. Circle the letter of the maximum amount of your daily Calorie intake that should come from fats.

a. 12 percent **b.** 30 percent **c.** 50 percent **d.** 60 percent

▶ Proteins (page 374)

19. Nutrients that contain nitrogen, as well as carbon, hydrogen, and oxygen are called proteins.

20. List three ways in which proteins are used by the body.

a. Needed for tissue growth and repair

b. Play a part in chemical reactions within cells

c. Can serve as a source of energy

21. Is the following sentence true or false? The body can make all of the amino acids it needs to make proteins. false

Match the kind of protein with its characteristics. Each kind of characteristic may be used more than once.

Characteristics	Kinds of Proteins
b **22.** Missing one or more essential amino acids	**a.** complete protein
a **23.** Contains all the essential amino acids	**b.** incomplete protein
a **24.** Comes from animal sources, such as meat and eggs	
b **25.** Comes from plant sources, such as grains and nuts	

▶ Vitamins (pages 374–376)

26. What are vitamins? Vitamins are helper molecules in a variety of chemical reactions within the body.

CHAPTER 11, Food and Digestion *(continued)*

27. Circle the letter of each sentence that is true about vitamins.

a. The body needs large amounts of vitamins.

b. Most people get the vitamins they need from foods.

c. If you eat a variety of foods, you will get enough of each vitamin.

d. Fat-soluble vitamins are stored in fatty tissues in the body.

▶ Minerals (page 376)

28. Nutrients that are not made by living things are called minerals.

29. How do you get minerals into your diet? Your body gets minerals by eating plant foods or animals that have eaten plants.

Match the mineral with its function. See Figure 6 on page 512.

	Minerals	Functions
c	**30.** iron	**a.** Needed for normal muscle and nerve function
d	**31.** fluorine	**b.** Helps maintain water balance
a	**32.** magnesium	**c.** Forms an important part of red blood cells
b	**33.** potassium	**d.** Helps form bones and teeth

▶ Water (page 377)

34. The most abundant substance in the body is water.

35. Why is water the body's most important nutrient? The body's vital processes—including chemical reactions such as the breakdown of nutrients—take place in water.

▶ The Food Guide Pyramid (pages 377–379)

36. How does the Food Guide Pyramid help you plan a healthy diet?

The Food Guide Pyramid classifies foods into six groups. It also tells how many foods to eat from each group every day.

Name _____ Date _____ Class _____

37. Which foods in the pyramid should make up the largest part of the diet?

The foods in the bottom level of the pyramid—foods from grains, such as bread, cereals, rice, and pasta—should make up the largest part of the diet.

38. The intake of foods in the Fats, Oils, and Sweets group should be limited.

▶ Food Labels (pages 379–380)

39. Is the following sentence true or false? All foods except meat, poultry, fresh vegetables, and fresh fruit must be labeled with nutrition information. true

40. How are food labels useful? Food labels allow you to evaluate a single food and compare the nutritional value of two foods.

41. The information on the food label, such as the number of Calories and the nutrient content, is based on the serving size.

42. What does it mean when a food label shows that Calories is equal to 110?

A single serving of this food supplies the body with 110 Calories of energy.

43. What is the Percent Daily Value on a food label? The Percent Daily Value shows how the nutritional content of one serving fits into the diet of a person who consumes 2,000 Calories each day.

44. The food label lists the ingredients in the food in order by weight, starting with the main ingredient.

45. Why is it helpful to read the list of ingredients? It can alert you to substances that have been added to the food.

SECTION 11–2 The Digestive Process Begins (pages 382-387)

This section explains what the digestive system does and describes the functions of the mouth, the throat, and the stomach.

▶ Functions of the Digestive System (pages 382–383)

1. Complete the flowchart to show the role of the digestive system.

Digestive System

The digestive system breaks down ___food___ into molecules the body can use.

↓

Then, molecules are absorbed into the ___blood___ and carried throughout the body.

↓

Finally, the digestive system eliminates ___wastes___ from the body.

2. What is digestion? Digestion is the process by which the body breaks down food into small nutrient molecules.

3. Is the following sentence true or false? In chemical digestion, foods are physically broken down into smaller pieces by chewing.

false

4. The process by which nutrient molecules pass through the wall of the digestive system and into the blood is called ___absorption___.

5. What happens to materials that are not absorbed? These materials are eliminated from the body as wastes.

Name _____ Date _____ Class _____

▶ The Mouth (page 384)

6. The fluid released when your mouth waters is called saliva.

7. Circle the letter of the object that begins the process of mechanical digestion in the mouth.

   a. saliva **b.** teeth

   c. enzymes **d.** mucus

8. What occurs during chemical digestion in the mouth? An enzyme in saliva breaks down starch into sugar molecules.

▶ The Esophagus (page 385)

Match each term with its definition.

	Terms	Definitions
b	9. epiglottis	**a.** A thick, slippery substance that makes food easier to swallow
c	10. esophagus	**b.** A flap of tissue that seals off the windpipe, preventing food from entering it
a	11. mucus	**c.** A muscular tube that connects the mouth to the stomach
d	12. peristalsis	**d.** Involuntary waves of muscle contraction that push food through the digestive system

13. Vomiting is a response that can remove harmful materials or disease-causing organisms from the body.

▶ The Stomach (pages 386–387)

14. Circle the letter of each sentence that is true about the stomach.

   a. The stomach is a J-shaped muscular pouch in the abdomen.

   b. Mechanical digestion does not occur in the stomach.

   c. Digestive juice in the stomach contains an enzyme that breaks down proteins.

   d. Hydrochloric acid in the stomach kills many bacteria that are swallowed with food.

15. Give two reasons why the hydrochloric acid in the digestive juice does not damage the stomach.

a. Mucus coats and protects the stomach lining.

b. Cells in the stomach lining are quickly replaced.

Reading Skill Practice

Using the glossary is a quick way to look up the meanings of key terms in the textbook. The glossary is located in the back of your textbook, beginning on page 681. Make a list of the key terms in this section. Then use the glossary to write the definition for each. Do your work on a separate sheet of paper.

Students' definitions of the key terms from this section should come from the glossary on pages 681–693.

SECTION 11–3

Final Digestion and Absorption

(pages 390–393)

This section describes the functions of the small and large intestines in digestion.

▶ The Small Intestine (pages 390–392)

1. What takes place in the small intestine? Almost all chemical digestion and absorption of nutrients takes place in the small intestine.

2. List the three organs that produce the enzymes and secretions used in the small intestine.

a. small intestine b. liver c. pancreas

3. The largest and heaviest organ inside the body that is located in the upper part of the abdomen is the liver.

4. The liver produces a substance called bile, which breaks up fat particles.

Name _____ Date _____ Class _____

5. Enzymes produced by the pancreas help break down starches, proteins, and fats.

6. What is the role of fiber? Fiber thickens the liquid material in the intestine so that it is easier for peristalsis to push the material forward.

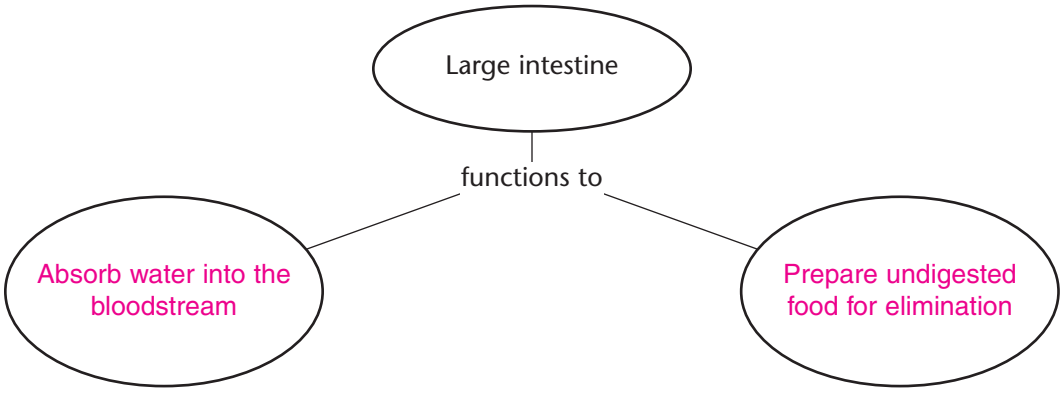
7. The tiny finger-shaped structures that cover the inner surface of the small intestine are called villi.

8. Is the following sentence true or false? Nutrient molecules pass from the small intestine into the bloodstream through the villi.
true

▶ The Large Intestine (page 393)

9. Is the following sentence true or false? The bacteria in the large intestine feed on the material passing through and make certain vitamins for the body. true

10. Complete the concept map to show the role of the large intestine.



11. The short tube at the end of the large intestine where waste material is compressed is called the rectum.

12. Circle the letter of the muscular opening through which wastes are removed from the body.

a. rectum **b.** anus **c.** pancreas **d.** villi

WordWise

Answer the questions by writing the correct key term in the blanks. Use the circled letter in each term to find the hidden key term. Then write a definition for the hidden key term.

1. What is the triangular organ that lies between the stomach and the first part of the small intestine and produces enzymes that help break down starches, proteins, and fats?
   p a (n) c r e a s

2. What is a thick, slippery substance produced by the body that makes food move more easily through the digestive system?
   m u c (u) s

3. What nutrient acts as a helper molecule in many different chemical reactions within the body?
   v i (t) a m i n s

4. What is the process by which nutrient molecules pass through the wall of the digestive system into the blood?
   a b s o (r) p t i o n

5. What fluid is released when your mouth waters?
   s a l (i) v a

6. What is the organ that stores bile until it is needed in the small intestine?
   g a l l b l a d d (e) r

7. What is a protein that speeds up chemical reactions in the body?
   e (n) z y m e

8. What is a fat that is usually solid at room temperature and is found in meat, dairy products, and egg yolks?
   s a (t) u r a t e d f a t

Key Term: n u t r i e n t

Definition: A nutrient is a substance in food that provides the raw materials and energy the body needs to carry out all the essential processes.

Name _____ Date _____ Class _____

CHAPTER 12

CIRCULATION

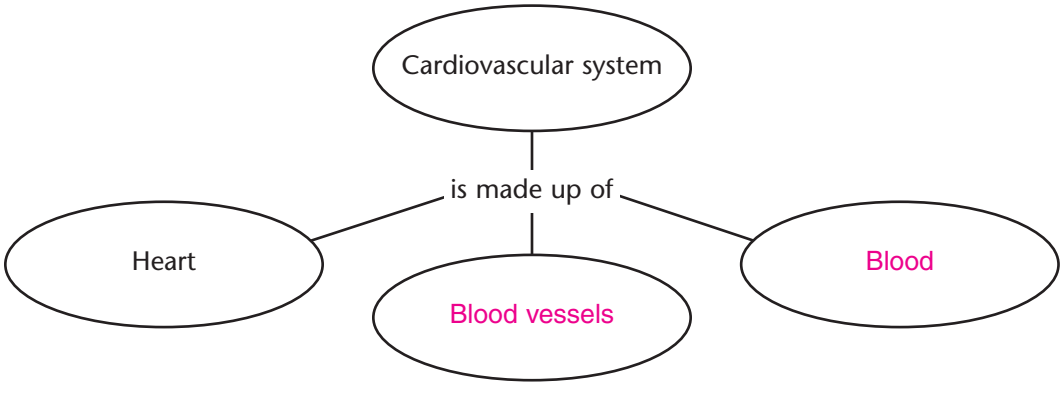
SECTION 12–1 The Body's Transportation System (pages 400–406)

This section describes how the heart, blood vessels, and blood work together to carry materials throughout the body.

▶ Movement of Materials (pages 400–401)

1. Another name for the cardiovascular system is the circulatory system.

2. Complete this concept map to show what makes up the cardiovascular system.



3. What three things are carried throughout the body by the cardiovascular system? Needed materials, waste products, cells that fight disease

▶ Structure and Function of the Heart (pages 402–403)

4. Each time the heart beats, what does it do to blood? Each time the heart beats, it pushes blood through the blood vessels of the cardiovascular system.

5. Complete the table about the chambers of the heart.

Chambers of the Heart		
Questions	**Upper Chambers**	**Lower Chambers**
What are these chambers called?	atria	ventricles
How many are there?	two	two
What is the function, or job, of these chambers?	to receive blood that comes into the heart	to pump blood out of the heart

6. A flap of tissue that prevents blood from flowing backward is a(n) valve.

▶ Regulation of Heartbeat (page 404)

7. The group of cells that adjusts the speed of heart beat is called the pacemaker. The heart rate depends on how much oxygen the body needs.

8. What does an artificial pacemaker do? It makes the heart contract at a normal rate.

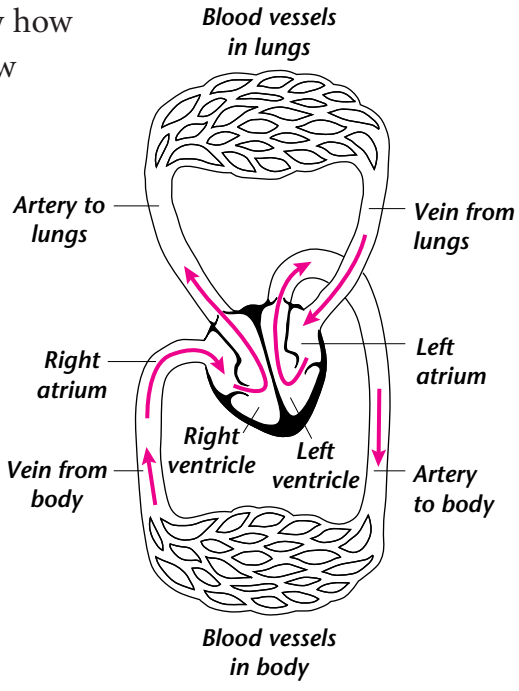
▶ Two Loops (pages 404–406)

9. Name the three kinds of blood vessels. arteries, capillaries, veins

10. Describe the loop in which the blood picks up oxygen. Blood is pumped from the right ventricle to the lungs. In the lungs, blood picks up oxygen. Blood then flows to the left atrium.

Name _____ Date _____ Class _____

11. Draw arrows on the diagram at the right to show how blood circulates through the body. The first arrow should start in the right ventricle.



12. The largest artery in the body is call the aorta.

▶ The Force of the Ventricles (page 406)

13. What causes the force that pushes blood throughout your body? The contraction of the left ventricle pumps blood throughout the body.

SECTION 12–2 A Closer Look at Blood Vessels (pages 407–411)

This section describes three kinds of blood vessels that are found in your body.

▶ Arteries (pages 407–409)

1. Arteries carry blood away from the heart.

2. Is the following sentence true or false? The coronary arteries provide the stomach with its blood supply. false

3. Circle the letter of each sentence that is true about pulse.

a. The faster your heart beats, the slower your pulse will be.

b. Pulse is caused by the expanding and narrowing of artery walls.

c. When you count pulse beats, you are also counting heartbeats.

d. You can feel pulse in veins but not in arteries.

4. Is the following sentence true or false? Arteries control the amount of blood that different organs receive. true

Name _____ Date _____ Class _____

▶ Capillaries (page 409)

5. What important thing happens in the capillaries? In the capillaries, materials are exchanged between the blood and the body's cells.

6. One process in which materials are exchanged between the blood and the body cells is diffusion.

▶ Veins (page 410)

7. What job do veins carry out? Veins carry blood back to the heart.

8. What three things help push blood through veins?
   a. Contraction of nearby skeletal muscles
   b. Valves that prevent blood from flowing backward
   c. Breathing movements exerting a squeezing pressure against veins

▶ Blood Pressure (pages 410–411)

9. What is blood pressure? Blood pressure is the pressure that blood exerts against the walls of blood vessels.

10. Is the following sentence true or false? Blood flowing through arteries exerts the highest pressure. true

Reading Skill Practice

By looking carefully at photographs and illustrations in textbooks, you can help yourself understand what you have read. Look carefully at Figure 9 on page 410. What important idea does this photograph communicate?

The photograph shows that the walls of arteries are much thicker than the walls of veins.

Name _____ Date _____ Class _____

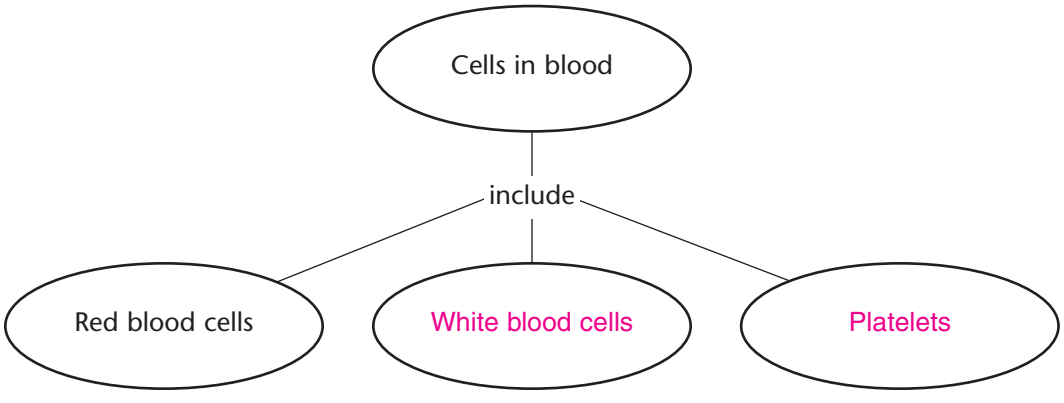
SECTION 12–3 Blood and Lymph
(pages 413–418)

This section explains what blood is made of and describes the jobs performed by the different parts of blood. This section also describes the lymphatic system.

▶ Introduction (page 413)

1. What is the name for the liquid part of blood? plasma

2. Complete the concept map below by naming the types of cells that are found in blood.



▶ Plasma (page 413)

3. What is plasma mostly made up of? water

4. List four kinds of materials that are carried in plasma.

   a. digested food molecules

   b. vitamins and minerals

   c. chemical messengers

   d. wastes

▶ Red Blood Cells (pages 414–415)

5. What job do red blood cells perform in the body? Red blood cells pick up oxygen in the lungs and carry it to cells in the body.

6. What is hemoglobin, and where is it found? Hemoglobin is an iron-containing protein that binds chemically to oxygen molecules. It is found in red blood cells.

▶ White Blood Cells (page 415)

7. What is the job of white blood cells? They fight disease.

8. List four ways in which white blood cells are different from red blood cells.

   a. There are fewer of them.

   b. They are bigger.

   c. They have nuclei.

   d. Most live for months or even years.

▶ Platelets (page 416)

9. Is the following sentence true or false? Platelets are pieces of cells.

   true

10. Describe how a blood clot forms. Fibrin weaves a net of tiny fibers across a cut, which traps blood cells and platelets that form a clot.

▶ Blood Types (pages 416–417)

Match the blood type with the kinds of clumping proteins in its plasma.

	Blood Type	Clumping Proteins in Its Plasma
b	11. A	**a.** no clumping proteins
d	12. B	**b.** anti-B proteins
a	13. AB	**c.** both anti-A and anti-B proteins
c	14. O	**d.** anti-A proteins

Name _____ Date _____ Class _____

15. What is a blood transfusion? A blood transfusion is the transfer of blood from one person to another.

16. Why can't a person with blood type A safely receive a transfusion of blood type B? Type A blood has clumping proteins that act against the marker molecules on type B blood cells.

▶ The Lymphatic System (page 418)

17. What is the lymphatic system? The lymphatic system is a network of veinlike vessels that returns fluid to the bloodstream.

18. The fluid inside the lymphatic system is called lymph.

19. How do lymph nodes help fight disease? Lymph nodes filter the lymph, trapping microorganisms that cause disease.

SECTION 12–4 Cardiovascular Health (pages 420–424)

This section describes diseases of the cardiovascular system. The section also identifies steps that people can take to help prevent these diseases.

▶ Cardiovascular Disease (page 421)

1. What is atherosclerosis? Atherosclerosis is a condition in which an artery wall thickens as a result of the buildup of fatty materials.

2. What is cholesterol? Cholesterol is a waxy, fatlike substance.

3. Complete the flowchart below, which describes what can happen when atherosclerosis develops in the coronary arteries.

Atherosclerosis

Atherosclerosis develops in coronary arteries.

↓

Heart muscle receives less blood, and therefore its cells receive less oxygen.

↓

A(n) heart attack occurs, which means that blood flow to part of the heart is blocked.

▶ Hypertension (pages 421–423)

4. What is hypertension? Hypertension is a disorder in which a person's blood pressure is consistently higher than normal.

5. Give two reasons why hypertension is a serious problem. Hypertension makes the heart work harder and also may damage the walls of the blood vessels.

6. What is done to treat hypertension? Treatment includes regular exercise, careful food choices, limited sodium intake, and medication.

Name _____ Date _____ Class _____

▶ Keeping Your Cardiovascular System Healthy (page 424)

7. To help maintain cardiovascular health, people should eat a diet that is low in these substances.

a. fat

b. cholesterol

c. sodium

8. Is the following sentence true or false? Even if smokers quit, they cannot decrease their risk of death from cardiovascular disease. false

9. In the table below, explain why each behavior is important for cardiovascular health.

Cardiovascular Health	
Behavior	**Why It Is Important**
Getting a lot of exercise	Exercise strengthens heart muscles.
Eating healthy foods	High-fat foods can lead to atherosclerosis; weight gain can strain the cardiovascular system.
Not smoking	Smoking increases the risk of heart attack.

Reading Skill Practice

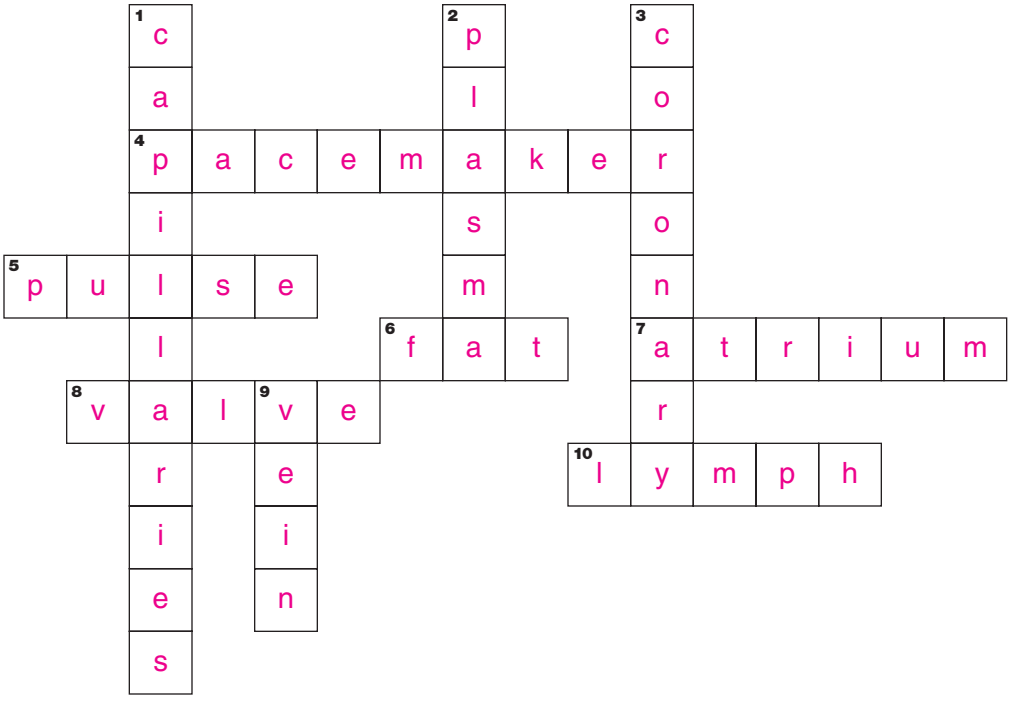
Outlining is a way to help yourself understand and remember what you have read. Write an outline of this section on cardiovascular health. In an outline, copy the headings in the textbook. Under each heading, write the main idea of that part of the lesson. Then list the details that support that main idea.

Outlines should be organized under the headings *Cardiovascular Disease, Hypertension,* and *Keeping Your Cardiovascular System Healthy* and include information from pages 421–424.

Name _____ Date _____ Class _____

Word Wise

See how fast you can solve this crossword puzzle. You'll need to use what you've learned about the cardiovasculary system. Go!



Clues down

1. Tiny blood vessels in which substances are exchanged between the blood and body cells
2. The liquid part of blood
3. The kind of artery that supplies blood to the heart itself
9. A blood vessel that carries blood back to the heart

Clues across

4. A group of cells located in the right atrium that regulates heartbeat rate
5. The alternating expansion and contraction of artery walls caused by the contraction and relaxation of the ventricles; can be felt if you touch your wrist
6. To keep your heart healthy, you should limit this in the food you eat.
7. A chamber of the heart that receives blood that comes into the heart
8. A flap of tissue that prevents blood from flowing backward
10. The fluid that the lymphatic system collects and returns to the bloodstream

Name _____ Date _____ Class _____

CHAPTER 13

RESPIRATION AND EXCRETION

SECTION 13–1 The Respiratory System (pages 430–438)

This section describes the parts of the respiratory system and how they work to help you breathe and speak.

▶ Introduction (page 430)

1. What are two functions of the respiratory system?

   a. Move oxygen from the outside environment into the body

   b. Remove carbon dioxide and water from the body

▶ Why the Body Needs Oxygen (pages 430–431)

2. The chemical reactions to release energy that take place inside your cells must have oxygen.

3. What is respiration? Respiration is the process in which oxygen and glucose undergo a series of chemical reactions inside cells to release energy.

4. List three products of respiration.

   a. energy b. carbon dioxide c. water

5. Is the following sentence true or false? To a scientist, *breathing* and *respiration* mean the same thing. false

6. Circle the letter of each organ system that the respiratory system depends on.

   (a.) circulatory system b. reproductive system

   c. excretory system (d.) digestive system

▶ The Air You Breathe (page 431)

7. Circle the letter of each sentence that is true about oxygen.

a. The air you breathe is part of the atmosphere, the blanket of gases that surrounds Earth.

b. Oxygen makes up about 78 percent of the gases in the atmosphere.

c. Your body uses all of the air that you breathe into your lungs.

d. Most of the air you breathe in goes back into the atmosphere when you exhale.

▶ The Path of Air (pages 432–434)

8. Is the following sentence true or false? When you breathe in air, you also breathe in dust, pollen, and microorganisms. true

9. Complete the flowchart to show the path of air as it travels to the lungs.

The Path of Air

Air enters the body through two nostrils, or openings, in the nose.

↓

Air moves through the pharynx, which is also a part of the digestive system.

↓

Air moves into the trachea, or windpipe.

↓

Air moves through the bronchi, passages that direct air into the lungs.

10. What does a sneeze do? A sneeze shoots particles and bacteria out of the nose and into the air.

11. Another name for the pharynx is the throat.

Name _____ Date _____ Class _____

Match the parts of the nose with their functions.

Parts	Functions
b **12.** nostrils	**a.** Moistens the air and traps particles in the air
d **13.** nasal cavities	**b.** Openings in the nose through which air enters
a **14.** mucus	**c.** Tiny hairlike extensions that sweep mucus into the throat
c **15.** cilia	**d.** Contain blood vessels that heat the air you breathe in

16. Circle the letter of each body part that is connected to the pharynx.

a. stomach **b.** nose **c.** mouth **d.** ears

17. The walls of the trachea are made up of rings of cartilage that strengthen the trachea and keep it open.

18. Is the following sentence true or false? The cilia and mucus in the trachea sweep upward, moving the mucus toward the nose where it is sneezed out. false

19. If food enters the trachea, a person can choke.

20. Circle the letter of the main organs of the respiratory system.

a. trachea **b.** bronchi **c.** lungs **d.** alveoli

21. Is the following sentence true or false? Inside the lungs, each bronchus divides into smaller and smaller tubes. true

22. What happens in the alveoli? The blood picks up oxygen from the air inside the alveoli.

▶ Structure and Function in Gas Exchange (page 435)

23. What occurs during the process of gas exchange? Oxygen passes through the wall of the alveolus and through the capillary wall into the blood. Carbon dioxide and water pass from the blood into the alveoli.

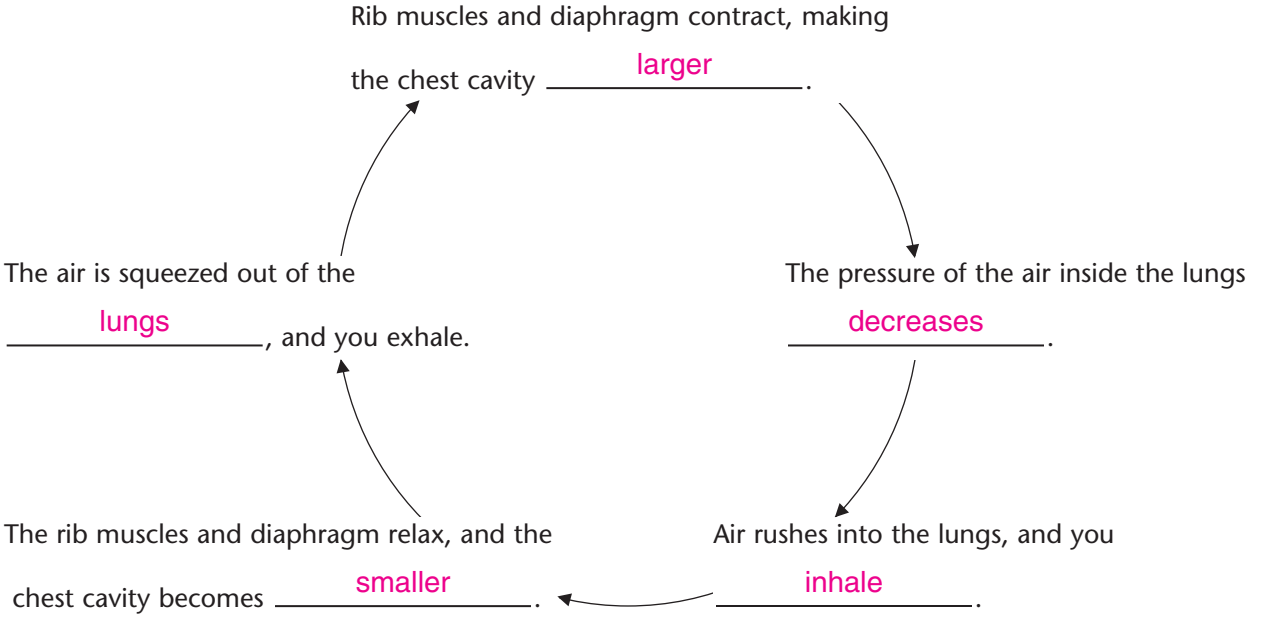
24. Why can the lungs absorb a large amount of oxygen? The alveoli provide a large surface area in a relatively small space.

▶ How You Breathe (pages 436–437)

25. Is the following sentence true or false? The more oxygen you need, the more slowly you breathe. false

26. What is the diaphragm? The diaphragm is a large, dome-shaped muscle that plays an important role in breathing.

27. Complete the cycle diagram to show the process of breathing.



▶ How You Speak (pages 437–438)

28. Another name for the voice box is the larynx.

29. What are vocal cords? Vocal cords are folds of connective tissue stretching across the opening of the larynx that produce the voice.

Name _____ Date _____ Class _____

30. How do vocal cords create your voice? Muscles make the vocal cords contract. Air from the lungs rushes through the opening between them. The movement of the vocal cords makes the air molecules vibrate to create a sound.

Reading Skill Practice

Taking notes while you read is a very helpful way to remember what you have read. To take notes, write down the headings in the section. Under each heading, write the main idea and important details that you read about. You should also include the key terms and their definitions in your notes. Reread this section. As you read, take notes about what you are reading. Do your work on a separate sheet of paper.

Notes should be organized under the headings in this section and include information from pages 430–438.

SECTION 13–2

Smoking and Your Health

(pages 440-444)

This section explains what harmful chemicals are in tobacco smoke and how these chemicals harm the body.

▶ Chemicals in Tobacco Smoke (pages 440–441)

1. Complete the table to show the harmful chemicals in tobacco smoke.

Harmful Chemicals in Tobacco Smoke		
Chemical	**What It Is**	**How It Harms the Body**
Tar	Dark, sticky substance that forms when tobacco burns	Clumps cilia together so they can't keep harmful materials out of the lungs
Carbon monoxide	Colorless, odorless gas produced when things are burned	Binds to hemoglobin in red blood cells in place of oxygen
Nicotine	A drug that produces an addiction, or physical dependence	Speeds up the nervous system, heart, and other organs

▶ Respiratory System Problems (pages 441–442)

2. Circle the letter of each sentence that is true about the effects of tobacco smoke.

   a. Tobacco smoke does not harm the respiratory system.

   b. Smokers cough frequently because their cilia cannot sweep away mucus.

   c. Smokers do not get as much oxygen because mucus buildup blocks air flow into the lungs.

   d. Heavy smokers can easily take part in vigorous sports.

3. List three respiratory problems that result from long-term smoking.

   a. bronchitis **b.** emphysema **c.** lung cancer

4. Is the following sentence true or false? Long-term bronchitis has no effect on the breathing passages. false

5. A serious disease that destroys lung tissue and causes difficulty in breathing is emphysema.

6. What causes emphysema? Emphysema is caused when chemicals in tobacco smoke damage lung tissue and breathing passages.

7. Is the following sentence true or false? Cigarette smoke has over 40 different chemicals that cause cancer. true

▶ Circulatory System Problems (page 443)

8. How do the chemicals in tobacco smoke affect blood vessels?

   Chemicals from tobacco smoke enter the blood and are absorbed by blood vessels. The chemicals irritate the blood vessels, which causes a buildup of fatty material in the vessels.

Name _____ Date _____ Class _____

9. Is the following sentence true or false? Smokers are more likely to have heart attacks than nonsmokers. true

▶ Passive Smoking (page 443)

10. What is passive smoking? In passive smoking, people involuntarily inhale the smoke from other people's cigarettes, cigars, or pipes.

11. Is the following sentence true or false? Passive smoking causes respiratory problems and increases the risk of heart disease and lung cancer in nonsmokers. true

▶ Choosing Not to Smoke (page 444)

12. Most smokers began smoking when they were teenagers.

13. List two reasons why people are tempted to start smoking.

a. Friends may pressure them.

b. Advertisements about smoking may appeal to them.

14. Is the following sentence true or false? It is very easy to stop smoking once you have started. false

SECTION 13–3 The Excretory System (pages 445-450)

This section explains how the parts of the excretory system work.

▶ Introduction (page 445)

1. What is the function of the excretory system? The excretory system collects wastes produced by cells and removes the wastes from the body.

Name _____ Date _____ Class _____

2. The process of removing wastes from the body is excretion.

▶ The Organs of the Excretory System (pages 445–446)

3. What are three wastes that the body must get rid of? carbon dioxide, excess water, and urea

Match the term with its definition.

Terms	Definitions
c **4.** urea	**a.** The major organs of the excretory system
a **5.** kidneys	**b.** A watery fluid produced by the kidneys
b **6.** urine	**c.** A chemical that comes from the breakdown of proteins

7. Complete the flowchart to show how wastes are removed from the body.

Removing Wastes

Blood flows through the kidneys.

↓

Kidneys filter the blood, removing the wastes.

↓

Urine flows from the kidneys through two narrow tubes called ureters to a sacklike muscular organ called the urinary bladder, which stores urine.

↓

When the bladder is full, urine flows out of the body through a tube called the urethra.

▶ The Filtering Process (pages 446–448)

8. What are nephrons? Nephrons are tiny structures that remove wastes from blood and produce urine.

Name _____ Date _____ Class _____

9. What are the stages of urine formation?

a. Wastes and needed materials are removed from the blood.

b. Much of the needed material is returned to the blood.

10. Is the following sentence true or false? Urea and glucose stay in the capillaries while blood cells and protein molecules move into the capsule of a nephron. false

11. List the substances that are returned to the blood and those that stay in the kidneys after the kidneys filter the blood.

Returned to blood: glucose and water

Stay in kidneys: urea and other wastes

12. Why is a chemical analysis of urine useful to doctors? Analyzing the contents of urine can detect some medical problems, such as diabetes or kidney malfunction.

▶ Water Balance in the Body (pages 449–450)

13. The kidneys help maintain homeostasis by regulating the amount of water in the body.

14. Is the following sentence true or false? If you've been sweating a lot and haven't had much to drink, your body will absorb less water and produce a larger volume of urine. false

▶ Other Organs of Excretion (page 450)

15. What are three other organs of excretion, not including the kidneys?

a. lungs **b.** skin **c.** liver

16. What is the function of the liver? The liver breaks down proteins into urea, and it produces bile.

Name _____ Date _____ Class _____

WordWise

Use the clues to help you unscramble the key terms from Chapter 13. Then put the numbered letters in order to find the answer to the riddle.

Clues	Key Terms	
It's the result of proteins breaking down.	euar	u r e a (1)
It's tiny sacs of lung tissue.	vlelioa	a l v e o l i (2)
It's an irritation of the breathing passages.	crtoibnsih	b r o n c h i t i s (3)
It's a tiny filtering factory in the kidneys.	renhnop	n e p h r o n (4)
It's a large muscle that helps you breathe.	gahmdairp	d i a p h r a g m (5)
It's a small tube through which urine leaves the body.	reahrut	u r e t h r a (6)
It's the voice box.	yranxl	l a r y n x (7)
It's a dark substance and makes cilia clump together.	rta	t a r (8)
They're tiny, hairlike, and sweep mucus around.	alici	c i l i a (9)
It's a dangerous chemical in tobacco smoke.	tnocinei	n i c o t i n e (10)
It's the major organ of the excretory system.	ydnkie	k i d n e y (11)

Riddle: What process releases energy from oxygen and glucose?

Answer: r (1) e (2) s (3) p (4) i (5) r (6) a (7) t (8) i (9) o (10) n (11)

Name _____ Date _____ Class _____

CHAPTER 14

Fighting Disease

SECTION 14–1 Infectious Disease (pages 456-457)

This section explains how infectious diseases are caused and what kinds of organisms cause disease.

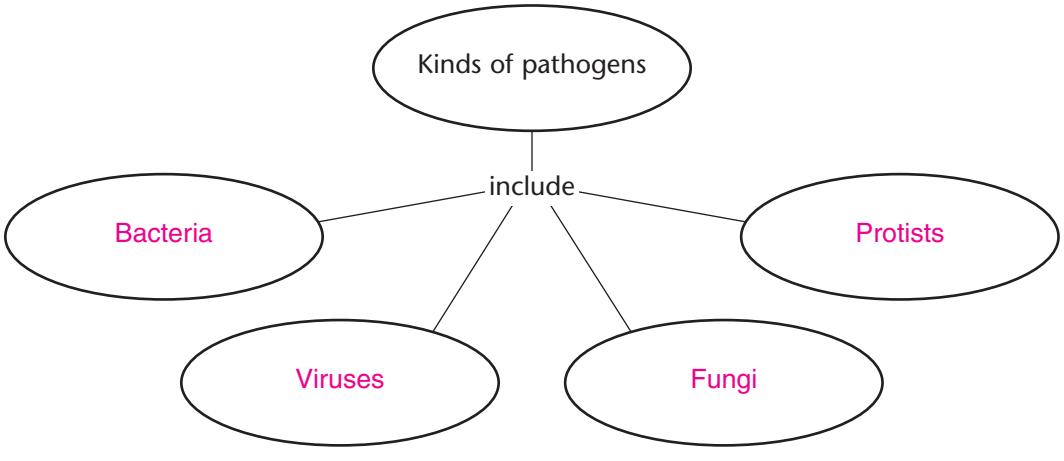
▶ Disease and Pathogens (page 457)

1. Organisms that cause disease are called pathogens.

2. What is an infectious disease? An infectious disease is a disease that can pass from one organism to another.

3. Is the following sentence true or false? Pathogens make you sick by damaging individual cells. true

4. Complete the concept map to show the different kinds of pathogens.



5. Circle the letter of the kind of pathogen that causes malaria.

a. bacteria **b.** viruses **c.** fungi **(d.)** protists

6. Louis Pasteur's work led to the process of pasteurization, in which heat is used to kill microorganisms.

▶ How Diseases Are Spread (pages 458–459)

7. List four sources of pathogens.

   a. another person b. a contaminated object

   c. an animal bite d. the environment

8. Circle each sentence that is true about how diseases are spread.

   a. People cannot get pathogens by drinking water.

   (b.) People can get pathogens by using a towel that was handled by an infected person.

   c. Animals cannot spread pathogens to people.

   (d.) Some pathogens live in soil or water.

SECTION 14–2 The Body's Defenses (pages 460-468)

This section describes how the body protects itself from pathogens.

▶ Barriers That Keep Pathogens Out (page 461)

1. Complete the table to show the three different ways the body keeps out pathogens.

Barriers Against Pathogens	
Barrier	**How It Works**
Skin	Harmful chemicals are in oil and sweat; pathogens fall off with dead skin cells; tightly packed layer of dead skin cells forms a barrier.
Breathing passages	Mucus and cilia trap pathogens. Coughing and sneezing force pathogens out of body.
Mouth and stomach	Saliva and stomach acid destroy pathogens.

Name _____ Date _____ Class _____

2. What is the body's first line of defense against pathogens? The first line of defense is barriers, such as the skin, breathing passages, mouth, and stomach, that keep pathogens from getting into the body.

▶ General Defenses (page 464)

3. The second line of defense in the body is the inflammatory response, which occurs when body cells are damaged.

4. What happens in the inflammatory response? Fluid and certain types of white blood cells leak from blood vessels into nearby tissues. The white blood cells then fight the pathogens.

5. The kinds of white blood cells that take part in the inflammatory response are called phagocytes, which engulf pathogens and destroy them.

6. Why is the affected area red and swollen during the inflammatory response? Blood vessels in the area widen to increase the flow of blood to the area.

7. How does a fever help your body? A fever helps the body fight infection because some pathogens may not grow and reproduce well at higher temperatures.

▶ Function of the Immune System (pages 465–466)

8. The third line of defense against pathogens in the body is the immune response.

9. List the two major kinds of lymphocytes.

a. T cells b. B cells

10. Complete the flowchart to show what occurs during the immune response.

Immune Response

A(n) T cell recognizes a pathogen.

↓

Some T cells attack and kill infected cells and the pathogen. Others alert B cells to produce antibodies.

↓

The pathogens are destroyed by antibodies that bind to the antigens on the pathogens.

11. What can lymphocytes do? Lymphocytes can distinguish between different kinds of pathogens and react to each pathogen with a defense targeted specifically to it.

12. What are antigens? Antigens are molecules on cells that the immune system recognizes either as part of the body or as coming from outside the body.

13. List three ways that antibodies help destroy pathogens.

a. Clump pathogens together

b. Keep pathogens from attaching to body cells

c. Make it easier for phagocytes to destroy the pathogens

▶ AIDS, a Disease of the Immune System (pages 467–468)

14. What causes acquired immunodeficiency syndrome, or AIDS?

AIDS is caused by HIV, a virus that attacks the immune system.

Name _____ Date _____ Class _____

15. Once HIV enters the body, it enters T cells and reproduces inside them.

16. Is the following sentence true or false? Over time, HIV damages the immune system, and the body loses its ability to fight disease.

true

17. Circle the letter of each sentence that is true about how HIV is spread.

(a.) HIV may spread from an infected woman to her baby through breast milk.

b. HIV is not spread by sexual contact.

c. HIV is spread by shaking hands.

(d.) HIV is not spread by using a toilet seat after it has been used by someone with HIV.

SECTION 14–3 Preventing Infectious Disease (pages 469-473)

This section describes two different kinds of immunity and some ways to stay healthy.

▶ Introduction (page 469)

1. The body's ability to destroy pathogens before they can cause disease is called immunity.

2. What are the two types of immunity?

a. active immunity b. passive immunity

▶ Active Immunity (pages 469–472)

3. When does active immunity occur? Active immunity occurs when a person's own immune system produces antibodies in response to the presence of a pathogen.

4. Is the following sentence true or false? Activity immunity is produced by the cells of the immune system as part of the immune response.

true

CHAPTER 14, Fighting Disease *(continued)*

5. How do memory cells keep a person from getting sick? Memory cells recognize a pathogen's antigen and start the immune response quickly.

6. The process by which harmless antigens are introduced into a person's body to produce active immunity is called vaccination, or immunization.

7. What does a vaccine consist of? Vaccines usually consist of pathogens that have been weakened or killed but can trigger the immune system to go into action.

▶ Passive Immunity (page 472)

8. When antibodies are given to a person and are not made by the person's immune system, the person is protected by passive immunity.

9. Is the following sentence true or false? Passive immunity can last a lifetime. false

10. How does a baby get passive immunity? Antibodies from the mother's body pass into the baby's body.

▶ Staying Healthy (page 473)

11. Circle the letter of each action that helps prevent infectious diseases.

a. Share toothbrushes and silverware.

b. Wash hands before eating and after using the bathroom.

c. Cover your mouth when sneezing or coughing.

d. Stay up late every night.

Name _____ Date _____ Class _____

12. What three things can you do to help your body recover when you are sick?

a. Get plenty of rest.

b. Eat well-balanced meals.

c. Drink plenty of fluids.

13. A chemical that kills bacteria or slows their growth without harming body cells is a(n) antibiotic.

14. Is the following sentence true or false? Some medicines don't kill pathogens, but help you to feel more comfortable while you get better.

true

Reading Skill Practice

Venn diagrams compare and contrast the features of two different things. Make a Venn diagram to show the similarities and differences between active immunity and passive immunity. For more information about Venn diagrams, see page 661 in the Skills Handbook of your textbook. Do your work on a separate sheet of paper.

Venn diagrams should be set up as shown on page 661. Both active and passive immunity destroy pathogens in the body before they can cause disease, but each occurs differently. See the information on pages 469–473.

SECTION 14–4

Noninfectious Disease

(pages 476-480)

This section describes three different diseases that are not spread from person to person.

▶ Introduction (page 476)

1. Diseases that are not spread from person to person are called noninfectious diseases.

2. Is the following sentence true or false? Over the years, infectious diseases have grown more prevalent. false

Name _____ Date _____ Class _____

▶ Allergies (pages 476–477)

3. What is an allergy? An allergy is a disorder in which the immune system is overly sensitive to a substance that is not normally found in the body.

4. Any substance that causes an allergy is a(n) allergen.

5. Circle the letter of each item that people may be allergic to.

   (a.) pollen (b.) some foods (c.) some medicines (d.) molds

6. Antibodies produced during the allergy response signal the body to release histamine, a chemical that causes sneezing and watery eyes.

7. Is the following sentence true or false? If you have an allergy, the best thing to do is avoid the substance to which you are allergic.

   true

8. What is asthma? Asthma is a disorder in which the respiratory passages narrow, causing a person to wheeze and become short of breath.

▶ Diabetes (page 478)

9. Circle the letter of the chemical that enables body cells to take in glucose from the blood and use it for energy.

   a. diabetes **b.** allergen (c.) insulin **d.** histamine

10. The pancreas fails to produce enough insulin or the body cells aren't using glucose properly in diabetes.

11. Is the following sentence true or false? A person with diabetes has low levels of glucose in the blood and more than enough glucose in the body cells. false

12. Circle the letter of each effect of diabetes.

    a. Never feel hungry (b.) Lose weight

    (c.) Feel thirsty **d.** Rarely urinate.

Name _____ Date _____ Class _____

13. Complete the table to compare the two types of diabetes.

Forms of Diabetes		
Questions	**Type I**	**Type II**
When does it begin?	Childhood or early adulthood	Adulthood
What is wrong?	The pancreas produces little or no insulin.	Either the pancreas doesn't make enough insulin or body cells do not respond normally to insulin.
How is it treated?	Injections of insulin	Possibly get insulin injections; control symptoms through diet, weight control, and exercise.

▶ Cancer (pages 478–480)

14. What is cancer? Cancer is a disease in which cells multiply over and over, destroying healthy tissue in the process.

15. As cancerous cells divide over and over, they form abnormal tissue masses called tumors.

16. What are two causes of cancer?

a. Inherited characteristics

b. Factors in the environment called carcinogens

17. Is the following sentence true or false? Surgery, drugs, and radiation are all used to treat cancer. true

18. Circle the letter of each sentence that is true about preventing cancer.

a. Avoid tobacco.

b. Expose your skin to sunlight frequently.

c. Eat plenty of fatty foods.

d. Visit the doctor regularly for medical checkups.

WordWise

Match each definition on the left with the correct term on the right. Then write the number of each term in the appropriate box below. When you have filled in all the boxes, add up the numbers in each column, row, and two diagonals. The sums should be the same. Some terms may not be used.

A. A chemical that kills bacteria or slows their growth without harming body cells
B. Consists of pathogens that have been weakened or killed but can trigger the immune system
C. The body's ability to destroy pathogens before they can cause disease
D. A chemical that destroys a pathogen by locking onto its antigen
E. A lymphocyte that identifies pathogens and activates B cells
F. A heating process that is used to kill microorganisms in food
G. An organism that causes disease
H. A white blood cell that engulfs pathogens in the inflammatory response
I. A disorder in which the immune system is overly sensitive to substances not normally found in the body

1. histamine
2. carcinogen
3. phagocyte
4. active immunity
5. antibiotic
6. immunity
7. pasteurization
8. T cell
9. antibody
10. pathogen
11. allergy
12. lymphocyte
13. vaccine

A 5	B 13	C 6	= 24
D 9	E 8	F 7	= 24
G 10	H 3	I 11	= 24
= 24	= 24	= 24	= 24

Name _____ Date _____ Class _____

CHAPTER 15

The Nervous System

SECTION 15–1 How the Nervous System Works (pages 486–490)

This section describes what the nervous system does in the body. It also tells how nerve impulses travel.

▶ Functions of the Nervous System (page 487)

1. List three functions of the nervous system.
   a. Receives information from inside and outside the body
   b. Directs how the body responds to information
   c. Maintains stable internal conditions

2. Is the following sentence true or false? You can move without your nervous system. false

3. From what two places does the nervous system receive information?
   a. the environment b. inside the body

4. Circle the letter of a change in the environment that can make an organism react.
   a. response **(b.)** stimulus **c.** homeostasis **d.** nerve impulse

5. Is the following true or false? All nervous system responses are voluntary, or under your control. false

6. How does the nervous system help maintain homeostasis? The nervous system directs the body to respond appropriately to the information it receives.

▶ The Neuron—A Message-Carrying Cell (pages 487–489)

Match each term with its definition.

Terms	Definitions
c 7. axon	**a.** The message that a nerve cell carries
b 8. dendrite	**b.** An extension from a nerve cell that carries impulses toward the nerve cell
d 9. neuron	**c.** An extension from a nerve cell that carries impulses away from the nerve cell
a 10. nerve impulse	**d.** A cell that carries information through the nervous system

11. Is the following sentence true or false? A neuron can have only one axon. true

12. A bundle of nerve fibers is called a(n) nerve.

13. Complete the flowchart to show the path of a nerve impulse.

Path of a Nerve Impulse

The telephone rings. Nerve impulses begin when a(n) sensory neuron in the ear picks up the stimulus of the telephone ringing.

↓

The nerve impulse moves to interneurons in the brain. The brain interprets the impulses and decides to answer the phone.

↓

Nerve impulses from the brain move to motor neurons. The muscles contract in response, and you pick up the telephone.

▶ How a Nerve Impulse Travels (page 490)

14. The tiny space between each axon tip and the next dendrite or muscle is called a(n) synapse.

Name _____ Date _____ Class _____

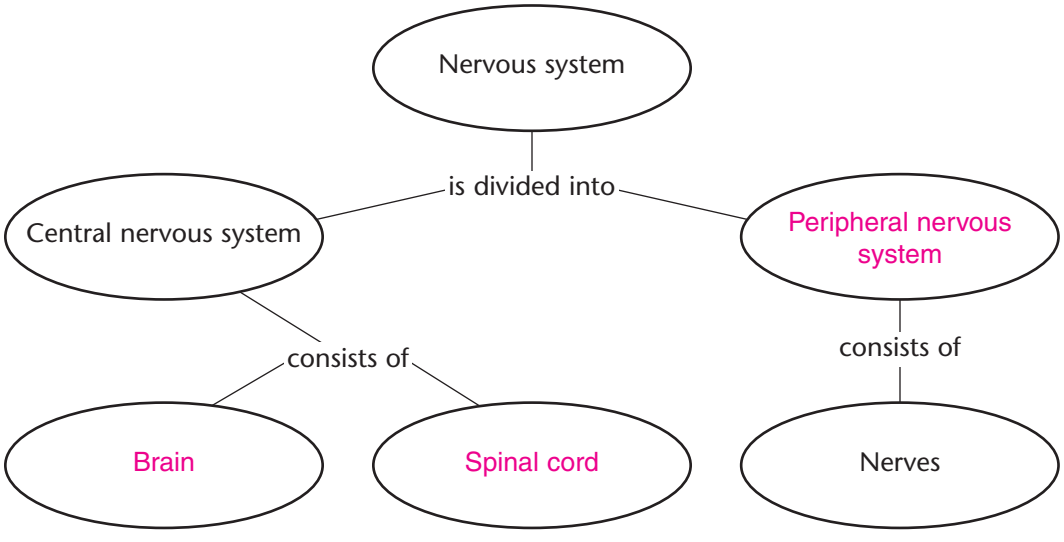
15. How does a nerve impulse cross the gap between the axon and the next structure? The axon tips release chemicals that enable the impulse to cross the synapse.

SECTION 15–2 Divisions of the Nervous System (pages 492–498)

This section explains the two major parts of the nervous system. It also describes what a reflex is.

▶ Introduction (page 492)

1. Complete the concept map to show the divisions of the nervous system.



▶ Central Nervous System Functions (page 493)

2. Is the following sentence true or false? The central nervous system is the control center of the body. true

3. The part of the central nervous system that controls most functions in the body is the brain.

4. The thick column of nerve tissue that links the brain to most of the nerves is the spinal cord.

▶ Structure and Functions of the Brain (pages 493–495)

5. Is the following sentence true or false? Neurons in the brain are only interneurons. true

6. What helps protect the brain from injury?
   a. The skull
   b. Layers of connective tissue
   c. Fluid between layers of connective tissue

Match the parts of the brain with their functions. Each part of the brain may be used more than once.

Functions		Parts of the Brain
b	7. Coordinates the actions of the muscles	a. cerebrum
c	8. Controls involuntary body actions, such as breathing	b. cerebellum
a	9. Interprets input from the senses	c. brainstem
b	10. Gives the body its sense of balance	
a	11. Carries out learning, remembering, and making judgements	

12. Is the following sentence true or false? The right half of the cerebrum controls the right side of the body. false

13. Creativity and artistic ability are usually associated with the right side of the cerebrum.

▶ The Spinal Cord (page 495)

14. The spinal cord is the link between the brain and the peripheral nervous system.

Name _____ Date _____ Class _____

15. What protects the spinal cord?

a. Vertebral column

b. Layers of connective tissue

c. A watery fluid

▶ Function of the Peripheral Nervous System (page 496)

16. What does the peripheral nervous system consist of? It consists of a network of nerves that branch out from the central nervous system and connect it to the rest of the body.

17. What is the function of the two groups of nerves making up the peripheral nervous system?

Somatic nervous system: controls voluntary actions

Autonomic nervous system: controls involuntary actions

▶ Reflexes (pages 497–498)

18. What is a reflex? A reflex is an automatic response that occurs very rapidly and without conscious control.

19. Circle the letter of each sentence that is true about reflexes.

a. In some reflex actions, the spinal cord, rather than the brain, directs the muscles to contract.

b. Reflexes protect you from getting hurt badly.

c. Nerve impulses move to the brain sooner than they do to the spinal cord.

d. The reflex action takes longer than it does for you to feel pain.

▶ Safety and the Nervous System (page 498)

20. A bruiselike injury of the brain is called a(n) concussion.

21. What can decrease your chances of getting a brain injury? Wearing a helmet during some activities will help protect your head.

22. What happens when the spinal cord is cut or crushed? All the nerve axons in that region are split, so impulses cannot pass through them, causing loss of movement in some part of the body.

SECTION 15–3 The Senses (pages 500–507)

This section describes the senses and how they work to tell you about your environment.

▶ Introduction (page 500)

1. What are the major senses? Vision, hearing, balance, smell, taste, and touch

2. The sense organs change information about the environment into nerve impulses and send them to the brain.

▶ Vision (pages 501–502)

Match the parts of the eye with their function.

	Parts	Functions
b	**3.** iris	**a.** The layer of receptor cells that lines the back of the eye where nerve impulses begin
e	**4.** lens	**b.** Regulates the amount of light entering the eye and gives the eye its color
d	**5.** cornea	**c.** The opening through which light enters the eye
c	**6.** pupil	**d.** The clear tissue that covers the front of the eye
a	**7.** retina	**e.** Focuses light

Name _____ Date _____ Class _____

8. Is the following sentence true or false? Cone cells work best in dim light and enable you to see black, white, and shades of gray.

false

9. What two things happen to the image in the cerebrum?

a. The image is turned right-side up.

b. The images from each eye are combined to form a single image.

▶ Correcting Vision Problems (pages 502–503)

10. Complete the table to show the two kinds of vision problems.

Vision Problems		
Questions	**Nearsightedness**	**Farsightedness**
What is wrong?	Cannot see objects that are far away.	Objects nearby look blurry.
What causes it?	The eyeball is too long.	The eyeball is too short.
How is it corrected?	Wear eyeglasses with concave lenses.	Wear eyeglasses with convex lenses.

▶ Hearing (pages 504–505)

11. Ears convert sound, a stimulus, to nerve impulses that your brain interprets.

12. How are sounds made? Sounds are made by a material that is vibrating, or moving back and forth.

13. Is the following sentence true or false? Sound waves can travel only through air. false

14. The outer ear is shaped like a(n) funnel to gather sound waves.

15. Circle the letter of the membrane that vibrates when sound waves strike it.

a. outer ear **b.** hammer **c.** anvil **(d.)** eardrum

16. What is the cochlea? The cochlea is a snail-shaped tube that is lined with receptors that respond to sound.

▶ Internal Stimuli and Balance (pages 505–506)

17. The structures in the ear that control your sense of balance are the semicircular canals.

18. Is the following sentence true or false? The cerebellum analyzes the impulses to determine if you are losing your balance. true

▶ Smell and Taste (pages 506–507)

19. Is the following sentence true or false? The flavor of food is determined only by taste. false

▶ Touch (page 507)

20. The largest sense organ is the skin.

21. Why is pain an important feeling? Pain alerts the body to possible danger.

Reading Skill Practice

Photographs and illustrations in textbooks can help you understand what you have read. Look carefully at Figure 14 on page 502. What idea does this photograph communicate? Do your work on a separate sheet of paper. The photograph shows that the image focused on the retina by the lens is upside down and reversed.

SECTION 15–4 Alcohol and Other Drugs (pages 508–516)

This section explains how drug abuse can affect the nervous system. It also describes how alcohol harms the body.

▶ Introduction (page 508)

1. Any chemical that causes changes in a person's body or behavior is a(n) drug.

Name _____ Date _____ Class _____

▶ Medicines (page 508)

2. What are medicines? Medicines are legal drugs that help the body fight disease and injury.

3. Is the following sentence true or false? It is not necessary to follow the directions when taking medicines. false

▶ Drug Abuse (pages 509–510)

4. The deliberate misuse of drugs for purposes other than medical ones is called drug abuse.

5. Circle the letter of each sentence that is true about drug abuse.
   a. Medicines can never be abused.
   b. Many abused drugs are illegal.
   c. The use of illegal drugs is not dangerous to the body.
   d. Abused drugs affect the body very shortly after they are taken.

6. The state in which a drug user needs larger and larger amounts of drugs to produce the same effect on the body is called tolerance.

7. Circle the letter of the period of adjustment that occurs when a person stops taking a drug.
   a. addiction **b.** tolerance **c.** withdrawal **d.** depressant

8. Is the following sentence true or false? When a person is emotionally dependent on a drug, the person is used to the feelings and moods produced by the drug. true

▶ Other Effects of Drug Abuse (page 510)

9. What legal and social effects do drug abuse have? Drug users may pay a fine or go to jail. Drug abusers have a hard time doing well in school or keeping a job.

10. Is the following sentence true or false? If a person uses needles to inject a drug, that person has a chance of being infected with HIV.

true

▶ Kinds of Drugs (pages 510–513)

Match the kind of drug with its characteristics.

Kinds of Drug	Characteristics
c **11.** depressant	**a.** Produces mood-altering effects when breathed in
e **12.** stimulant	**b.** Synthetic chemical similar to hormones used by athletes to improve performance
a **13.** inhalant	**c.** Slows down the activity of the central nervous system
d **14.** hallucinogen	**d.** Can make people see or hear things that do not exist
b **15.** anabolic steroid	**e.** Speeds up body processes

16. Look at Figure 22 on page 511. Which drugs do NOT cause emotional dependence? All the drugs listed cause emotional dependence.

▶ Alcohol (pages 513–516)

17. Circle the letter of the kind of drug that alcohol is.

a. stimulant **b.** depressant **c.** anabolic steroid **d.** inhalant

18. Is the following sentence true or false? Alcohol is the most commonly abused drug in people aged 12 to 17. true

19. Alcohol is quickly absorbed by the digestive system.

20. Is the following sentence true or false? If alcohol is drunk with a meal, it takes longer for the alcohol to get into the blood. true

Name _____ Date _____ Class _____

21. Complete the table to show the effects of alcohol on the body.

The Effects of Alcohol	
Body System	**Effects**
Nervous System	Vision becomes blurred; speech is unclear; control of behavior is reduced; judgement becomes poor.
Cardiovascular System	Heart rate and blood pressure increase at first; large amounts of alcohol decrease heart rate and blood pressure.
Excretory System	Kidneys produce more urine, and the body loses more water than usual.

22. How does the abuse of alcohol affect the body? The abuse of alcohol can cause the destruction of cells in the brain and liver, and it can also lead to addiction and emotional dependence.

23. A disease in which a person is both physically addicted to and emotionally dependent on alcohol is called alcoholism.

24. Is the following sentence true or false? Alcoholics must go through withdrawal to give up alcohol. true

▶ Avoiding Drugs and Alcohol (page 516)

25. What is the best way to avoid depending on drugs and alcohol?
The best way is not to start using them.

26. Many teenagers begin using drugs and alcohol because of peer pressure from people who are abusing drugs.

WordWise

Solve the clues by filling in the blanks with key terms from Chapter 15. Then write the numbered letters in the correct order to find the hidden question. Write the answer to the question.

Clues	Key Terms
A period of adjustment that occurs when a person stops taking a drug	w i t h d r a w a l (1, 2)
Controls your body's actions that occur automatically	b r a i n s t e m (3)
Carries impulses toward the cell body of a neuron	d e n d r i t e (4)
The layer of receptor cells that lines the back of the eye	r e t i n a (5)
Regulates the amount of light entering the eye	i r i s (6)
A drug that slows down the activity of the central nervous system	d e p r e s s a n t (7)
Another name for a nerve cell	n e u r o n (8)
The largest part of the brain	c e r e b r u m (9)
Describes a person to whom nearby objects look blurry	f a r s i g h t e d (10)
The opening through which light enters the eye	p u p i l (11)
The tiny space between each axon tip and the next structure	s y n a p s e (12)
Carries impulses away from the cell body of a neuron	a x o n (13)

Hidden Question: W h a t (1, 2, 3, 4) i s (5, 6) a (7) r e f l e x (8, 9, 10, 11, 12, 13)?

Answer: A reflex is an automatic response that occurs very rapidly and without conscious control.

Name _____ Date _____ Class _____

CHAPTER 16

The Endocrine System and Reproduction

SECTION 16–1 The Endocrine System (pages 522-526)

This section explains how the endocrine system works to control activities in the body.

▶ The Role of the Endocrine System (page 522)

1. What does the endocrine system control? The endocrine system controls many of the body's daily activities as well as long-term changes such as development.

2. The endocrine system is made up of glands, organs that produce chemicals.

3. Is the following sentence true or false? Endocrine glands release their chemical products through delivery tubes. false

▶ Hormones (pages 523-524)

4. The chemical product of an endocrine gland is a(n) hormone, or chemical messenger.

5. How do hormones affect the body? Hormones turn on, turn off, speed up, or slow down the activities of different organs and tissues.

6. Circle the letter of each sentence that is true about hormones.

   a. Hormones can regulate only the tissues and organs near the glands that produce them.

   b. Nerve impulses from the brain can cause the release of hormones.

   c. Hormones cause a slower, but longer-lasting response.

   d. Any hormone can affect any organ in the body.

CHAPTER 16, The Endocrine System and Reproduction *(continued)*

7. A hormone interacts only with certain target cells, cells that recognize the hormone's chemical structure.

Match the endocrine gland with the function of the hormone it produces. See *Exploring the Endocrine System* on pages 524–525.

Glands	Functions of the Hormones
d **8.** thyroid gland	**a.** Control the changes that take place in the body of a teenage boy
b **9.** adrenal glands	**b.** Trigger the body to respond to emergencies
e **10.** ovaries	**c.** Produces insulin and glucagon
a **11.** testes	**d.** Controls the release of energy from food molecules during respiration
c **12.** pancreas	**e.** Control the changes in a teenage girl's body

▶ The Hypothalamus (page 524)

13. Circle the letter of each sentence that is true about the hypothalamus.

a. The hypothalamus links the nervous system and the excretory system.

b. The hypothalamus is located on the kidneys.

c. The hypothalamus sends nerve messages and produces hormones.

d. The hypothalamus plays a major role in maintaining homeostasis.

▶ The Pituitary Gland (page 525)

14. What is the pituitary gland? It is a small endocrine gland that communicates with the hypothalamus to control many body activities.

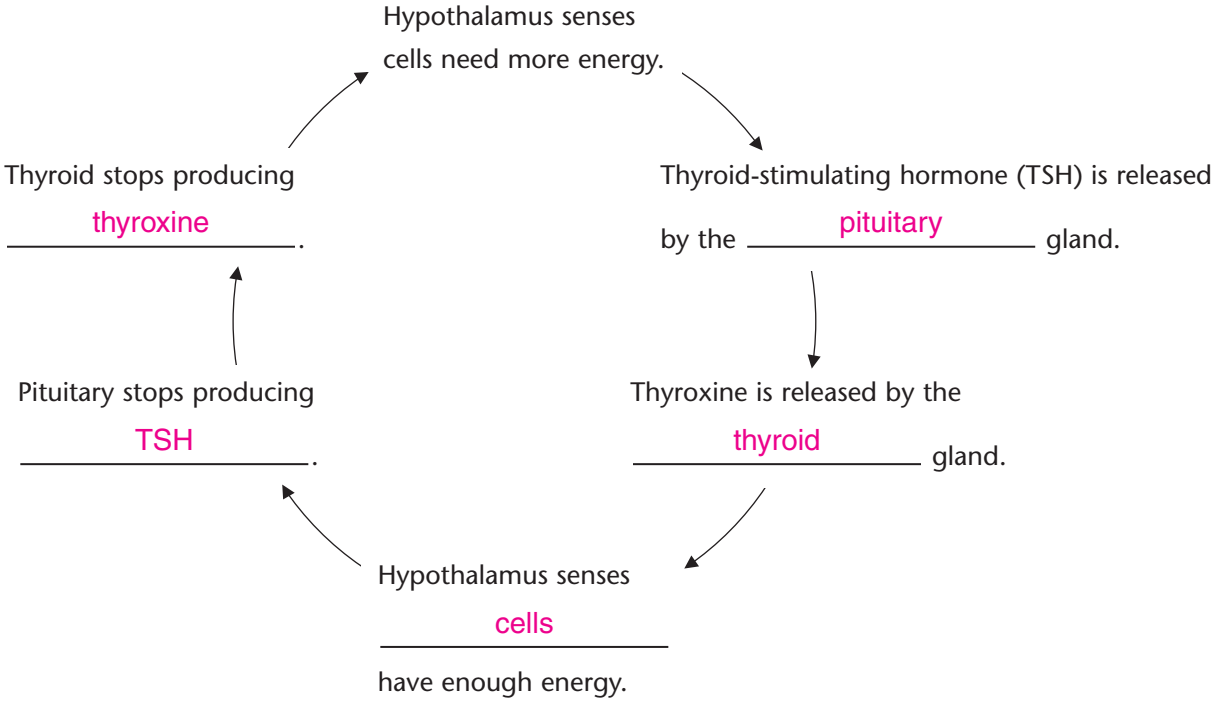
15. Is the following sentence true or false? The pituitary gland releases hormones in response to nerve impulses or hormone signals from the hypothalamus. true

Name _____ Date _____ Class _____

▶ Negative Feedback (page 526)

16. How does negative feedback work to control the amount of a hormone in the blood? When the amount of a particular hormone in the blood reaches a certain level, the endocrine system sends signals that stop the release of that hormone.

17. Complete the cycle diagram to show how thyroxine, a hormone produced by the thyroid gland, is regulated by negative feedback.



Reading Skill Practice

Knowing the meanings of the key terms in a section will help you to better understand what you are reading. Make a list of key terms in this section. Write the meanings of these terms using your own words. In this way, the key terms become a natural part of your vocabulary. Do your work on a separate sheet of paper.

Definitions for the six key terms should be written in the students' own words, but be based on the information on pages 522–526.

SECTION 16–2 The Male and Female Reproductive Systems (pages 527–532)

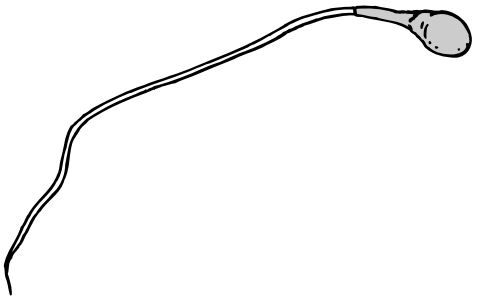
This section describes the structures and functions of the organs in the male and female reproductive systems. It also explains the events in the menstrual cycle.

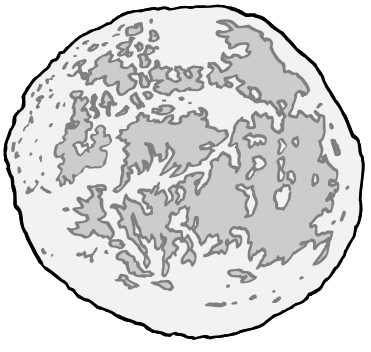
▶ Sex Cells (pages 527–528)

Match each key term with its definition.

	Terms	Definitions
e	1. egg	**a.** The male sex cell
a	2. sperm	**b.** A fertilized egg
c	3. fertilization	**c.** The joining of a sperm and an egg
f	4. reproduction	**d.** Carries the information that controls inherited characteristics
b	5. zygote	**e.** The female sex cell
d	6. chromosome	**f.** The process by which living things produce new individuals of the same type

7. Identify which is the egg and which is the sperm.





a. sperm **b.** egg

8. Is the following sentence true or false? A sex cell has the same number of chromosomes as a body cell. false

Name _____ Date _____ Class _____

▶ The Male Reproductive System (pages 528–529)

9. What is the male reproductive system specialized to produce?

a. sperm **b.** the hormone testosterone

10. Circle the letter of the organs in the male where sperm are produced.

a. testosterone **(b.)** testes **c.** scrotum **d.** penis

11. What does testosterone control? Testosterone controls the development of physical characteristics in men.

12. The testes are located in an external pouch of skin called the scrotum.

13. Is the following sentence true or false? Sperm can develop normally only in slightly cooler temperatures than normal body temperature.

true

14. What does semen provide to sperm?

a. An environment in which sperm can swim

b. Nutrients that give moving sperm a source of energy

15. Semen leaves the body through an organ called the penis.

▶ The Female Reproductive System (pages 530–531)

16. What is the role of the female reproductive system? The female reproductive system produces eggs, and if an egg is fertilized, nourishes a developing baby until birth.

17. What do ovaries produce?

a. egg cells

b. hormones such as estrogen

18. What does estrogen control? Estrogen triggers the development of some adult female characteristics and helps egg cells develop.

19. Complete the flowchart to show the path of an egg cell.

Path of an Egg

A(n) ovary produces an egg cell.

↓

The egg cell moves through the oviduct where it can be fertilized.

↓

The egg enters the uterus where it stays to develop if it's fertilized.

↓

An unfertilized egg begins to break down and enters the muscular passageway leading to the outside of the body called the vagina, or birth canal.

▶ The Menstrual Cycle (pages 531–532)

20. Circle the letter of how often an egg is released from the ovaries.

a. daily **b.** weekly **(c.)** monthly **d.** yearly

21. The monthly cycle of changes that occurs in the female reproductive system is called the menstrual cycle.

22. What occurs during the menstrual cycle? An egg develops in an ovary, and the uterus prepares for the arrival of a fertilized egg.

23. The menstrual cycle prepares the body for pregnancy, the condition that begins after fertilization has taken place.

24. Circle the letter of each sentence that is true about menstruation.

a. Menstruation lasts about 28 days.

(b.) Hormones of the endocrine system control the menstrual cycle.

c. All girls begin menstruation at the same age.

(d.) Women stop releasing eggs from their ovaries at about the age of 50.

Name _____ Date _____ Class _____

SECTION 16–3 The Human Life Cycle
(pages 533–541)

This section explains how babies develop before birth, what happens during birth, and what happens as babies develop into children. It also describes the changes that occur during adolescence.

▶ Introduction (page 533)

1. After fertilization, the zygote develops first into an embryo and then into a(n) fetus.

▶ The Zygote (page 533)

2. Is the following sentence true or false? The zygote begins to divide to make two, and then four cells before it enters the uterus.

true

3. The growing mass of cells forms a hollow ball and attaches to the lining of the uterus, at which time the developing human is called a(n) embryo.

▶ The Development of the Embryo (page 534)

4. The membrane that surrounds the embryo and develops into a fluid-filled sac is called the amniotic sac.

5. What is the placenta? The placenta is a membrane that becomes the link between the developing embryo and the mother.

6. What is the function of the umbilical cord? The umbilical cord contains blood vessels that link the embryo to the mother, but the two circulatory systems remain separated by a thin barrier.

7. Is the following sentence true or false? Substances, such as chemicals from tobacco smoke and alcohol, can pass from the mother to the embryo. true

▶ The Development of the Fetus (page 535)

8. Complete the table to show the development of the fetus.

The Development of the Fetus	
Time in Development	**What Is Happening**
Nine weeks	Embryo is called a fetus; many internal organs have developed; eyes are developing; fingers and toes.
From fourth to sixth month	Tissues develop into more recognizable shapes; bones are distinct; heartbeat can be heard with a stethoscope; fetus begins to kick.
Final three months	Brain surface develops grooves and ridges; lungs develop; eyelids can open; the fetus doubles in length.

▶ Birth (pages 535–536)

9. List the three stages of the birth of a baby.

a. labor **b.** delivery **c.** afterbirth

10. Circle the letter of each sentence that is true about birth.

a. Strong muscular contractions, called labor, enlarge the cervix so that the baby fits through it.

b. During delivery, the baby is pushed feet first out of the uterus, through the vagina, and out of the mother's body.

c. After delivery, the umbilical cord is clamped and cut.

d. After labor, contractions push out the placenta and other membranes into the vagina.

Name _____ Date _____ Class _____

11. How does the baby's body adjust to the stress of the birth process?

The baby's endocrine system releases adrenaline, which increases the baby's heart rate. The baby cries or coughs to clear its lungs and fill them with air.

▶ Multiple Births (page 537)

12. What is a multiple birth? The delivery of more than one baby from a single pregnancy is a multiple birth.

Match the type of twins with its characteristics. Each type of twins may be used more than once.

	Characteristics	Types of Twins
a	**13.** Develop from a single fertilized egg	**a.** identical twins
b	**14.** Develop when two eggs are released from the ovary and fertilized by two different sperm	**b.** fraternal twins
b	**15.** Are no more alike than any brothers or sisters	
a	**16.** Have identical inherited traits and are the same sex	

▶ Infancy (pages 537–538)

17. Is the following sentence true or false? As a baby grows, its head grows more slowly, and its body, legs, and arms grow quickly to catch up.

true

18. Circle the letter of the physical skill that babies develop first.

a. crawl **b.** grasp objects **c.** walk **d.** hold up their heads

19. Is the following sentence true or false? Babies can communicate only by crying. false

▶ Childhood (page 538)

20. Circle the letter of each sentence that is true about childhood.

a. Childhood begins at about the age of 13 years.

b. Children become taller and heavier and become more coordinated.

c. As they develop, children become less curious.

d. Children learn to think about and care for others as they grow.

21. What does an increased appetite toward the end of childhood signal?

It signals that the body needs more nutrients for its next stage of growth and development.

▶ Adolescence (pages 539–540)

22. What is adolescence? Adolescence is the stage of development when children become adults physically and mentally.

23. The physical changes that occur during adolescence are controlled by hormones produced by the endocrine system.

24. What is puberty? Puberty is the period of sexual development in which the body becomes able to reproduce.

25. Circle the letter of each physical change of puberty that occurs in girls.

a. voice deepens

b. ovulation starts

c. body odor increases

d. hips widen

26. Circle the letter of each physical change of puberty that occurs in boys.

a. hips widen

b. sperm are produced

c. hair grows on face

d. body odor increases

27. During adolescence, girls tend to have their growth spurt at a younger age than boys do.

Name _____ Date _____ Class _____

28. Is the following sentence true or false? All adolescents grow and develop at the same rate. false

29. Is the following sentence true or false? Adolescence includes only the physical changes of puberty. false

30. Circle the letter of each sentence that is true about changes in the way teenagers feel.

a. Teenagers always have the same feelings about the changes they are experiencing.

b. Teenagers can think about the consequences of their actions.

c. During adolescence, memory and problem-solving skills improve.

d. Teens are not able to develop mental abilities through their interests outside of school.

31. What is peer pressure? Peer pressure is pressure from friends and classmates to behave in certain ways.

32. Peer pressure that is negative can lead teens to do things that go against their values.

▶ Life as an Adult (page 541)

33. Is the following sentence true or false? Adulthood definitely begins at the age of 18 years. false

34. Circle the letter of the age when the process of aging begins.

a. 20 years **b.** 30 years **c.** 40 years **d.** 50 years

35. What changes occur to the body during aging? The skin becomes wrinkled, eyes lose ability to focus on close objects, the hair loses its coloring, and muscle strength decreases.

36. Is the following sentence true or false? The effects of aging can be slowed if people follow sensible diets and exercise regularly. true

SECTION 16–4 Reproduction and Genetics (pages 543–547)

This section describes how genes are passed from one generation to the next through sexual reproduction and asexual reproduction. It also describes what causes different traits.

▶ Introduction (page 543)

1. The process in which characteristics pass from parents to offspring is called heredity.
2. The scientific study of heredity is called genetics.

▶ DNA and Genes (page 544)

3. The shape of a person's nose and the length of a kitten's hair are examples of traits.
4. What is a gene? A gene is a segment of a DNA molecule that contains information that governs a specific trait.

▶ Sexual Reproduction (pages 544–545)

5. Is the following sentence true or false? Sexual reproduction is the kind of reproduction that involves two parents who combine their genetic material to produce a new organism. true

▶ Asexual Reproduction (page 545)

6. A bacterium dividing in two and a hydra budding are examples of asexual reproduction.

Name _____ Date _____ Class _____

7. Complete the table to show the differences between sexual reproduction and asexual reproduction.

Two Kinds of Reproduction		
Type of Reproduction	**Number of Parents**	**Similarity of Offspring**
Sexual	2	Offspring are varied.
Asexual	1	All offspring are the same.

▶ Alleles (page 546)

8. What are alleles? Alleles are different forms of a gene.

▶ Dominant and Recessive (pages 546–547)

9. Is the following sentence true or false? If an individual has one dominant allele and one recessive allele, the trait that is caused by the recessive allele will show up. false

10. In pea plants, what are the two alleles for color?

a. purple **b.** white

11. The purple allele is dominant. What alleles must a pea plant have in order to have white flowers? Two alleles for white flowers

12. What alleles must a pea plant have in order to have purple flowers?

One allele for purple flowers and one allele for white flowers or two alleles for purple flowers

13. Is the following sentence true or false? The inherited characteristics of any organism are controlled by the alleles that make up its genes.

true

WordWise

Use the clues to identify key terms from Chapter 16. Write the terms on the lines. Then find the words hidden in the puzzle and circle them. Words are across or up-and-down.

Clues	Key Terms
The chemical product of an endocrine gland	hormone
The stage of development in which the developing human attaches to the lining of the uterus	embryo
The stage of development from the ninth week of development until birth	fetus
The period of sexual development in which the body becomes able to reproduce	puberty
A fertilized egg	zygote
The mixture of sperm cells and fluids	semen
The female organ that produces egg cells and hormones like estrogen	ovary
The hormone in females that triggers the development of some adult female characteristics	estrogen
A physical characteristic of an organism	trait
Different forms of a gene	alleles

p	g	e	s	t	r	o	g	e	n	m	z
u	o	t	s	e	m	e	n	p	j	t	y
b	v	h	d	e	u	a	i	s	z	r	g
e	a	f	e	t	u	s	p	h	u	a	o
r	r	i	o	e	m	b	r	y	o	i	t
t	y	a	l	l	e	l	e	s	o	t	e
y	c	p	h	o	r	m	o	n	e	w	t

Name _____ Date _____ Class _____

CHAPTER 17

Ecosystems and Biomes

SECTION 17–1 Energy Flow in Ecosystems (pages 558–565)

This section explains the different roles that organisms play in the movement of energy through an ecosystem. The section also describes how organisms in the different roles interact to form food chains and food webs.

▶ What are the Components of an Ecosystem? (pages 558–559)

1. The components of an ecosystem are all the living and nonliving things that interact in a particular area.
2. Is the following sentence true or false? The organisms in an ecosystem are called abiotic factors. false
3. Sunlight and temperature are examples of abiotic factors in an ecosystem.

▶ Habitat and Niche (page 559)

Match the element of an ecosystem with its definition.

c 4. habitat
a 5. species
b 6. niche

a. A group of similar organisms that can mate with one another an produce fertile offspring
b. An organism's role in an ecosystem
c. The specific environment that provides the things an organism needs

7. The food a bird eats and the organisms that feed on the bird are parts of the bird's niche.

▶ Energy Roles (pages 560–562)

Match the energy role with its definition.

Energy Role	Definition
c 8. producer	a. Organism that breaks down wastes and dead organisms
b 9. consumer	b. Organism that obtains energy by feeding on other organisms
a 10. decomposer	c. Organism that can make its own food

11. What types of organisms are producers? Producers include plants, algae, and certain microorganisms.

12. Is the following sentence true or false? Energy enters all ecosystems as sunlight. false

13. Is the following sentence true or false? Producers are the source of all the food in an ecosystem. true

14. List two major groups of decomposers.

a. bacteria b. fungi

15. Complete the compare/contrast table.

Types of Consumers	
Type of Consumer	**Type of Food**
Herbivore	Only plants
Carnivore	Only animals
Omnivore	Both plants and animals
Scavenger	Dead organisms

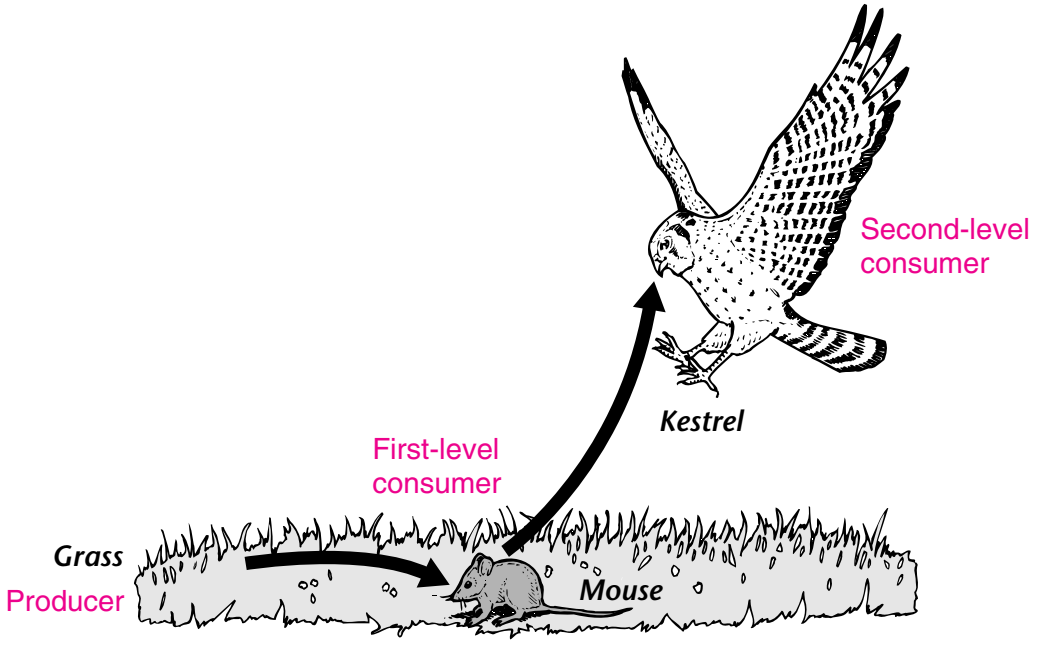
Name _____ Date _____ Class _____

16. Is the following sentence true or false? Decomposers return raw materials to the environment. true

▶ Food Chains and Food Webs (pages 562–564)

17. What is a food chain? A food chain is a series of events in which one organism eats another and obtains energy.

18. Label the producer and the first-level and second-level consumers in the food chain.



19. The many overlapping food chains in an ecosystem make up a(n) food web.

20. Circle the letter of each sentence that is true about a food web.

a. Producers are at the top of the food web.

b. All first-level consumers are carnivores.

(**c.**) Second-level consumers may be carnivores or omnivores.

(**d.**) An organism may play more than one role in a food web.

▶ Energy Pyramids (pages 564–565)

21. What does an energy pyramid show? It shows the amount of energy that moves from one feeding level to another in a food web.

22. Circle the letter of each sentence that is true about an energy pyramid.

a. The greatest amount of energy is available at the producer level.

b. At each level of the pyramid, there is more energy available.

c. About half the energy at one level is transferred to the next.

d. Most food webs have only three or four feeding levels.

23. Name the levels in an energy pyramid, starting with the base of the pyramid.

a. Producers

b. First-level consumers

c. Second-level consumers

d. Third-level consumers

24. Why are there usually few organisms at the top of a food web?

There are usually few organisms at the top because there is a limited amount of energy available at that level of a food web.

Reading Skill Practice

Outlining is a way to help yourself understand and remember what you have read. Write an outline of this section on energy flow in ecosystems. In an outline, copy the headings in the textbook. Under each heading, write the main idea of that part of the lesson. Then list the details that support each main idea.

Outlines should be organized under the headings *What Are the Components of an Ecosystem?, Habitat and Niche, Energy Roles, Food Chains and Food Webs,* and *Energy Pyramids* and include information from pages 558–565.

Name _____ Date _____ Class _____

SECTION 17–3 Biogeography
(pages 566–567)

This section describes why organisms are found where they are and how organisms can move from one place to another. The section also describes factors that limit the movement of organisms from place to place.

▶ Introduction (page 566)

1. The study of where organisms live is called biogeography.

▶ Continental Drift (pages 566–567)

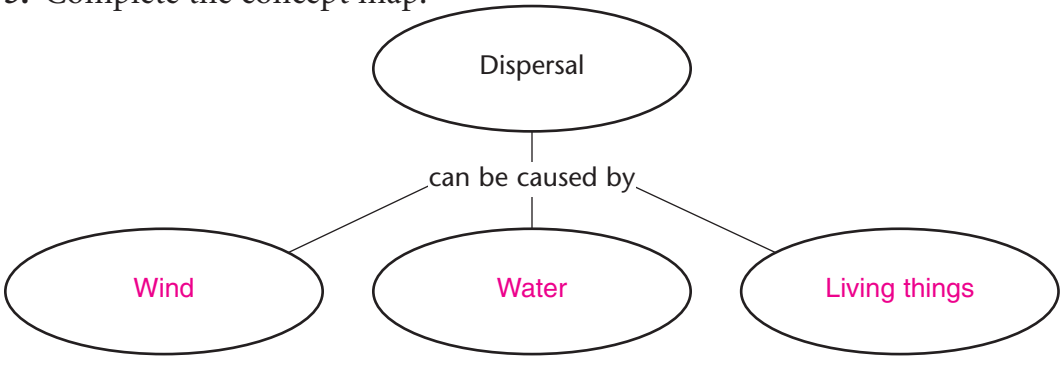
2. What is continental drift? It is the very slow movement of the continents on a layer of hot, dense liquid.

3. Is the following sentence true or false? Scientists hypothesize that the movement of the continents has had little impact on the distribution of species. false

▶ Means of Dispersal (pages 567–568)

4. The movement of organisms from one place to another is called dispersal.

5. Complete the concept map.



6. What organisms are dispersed by the wind? Wind disperses the seeds of plants, the spores of fungi, tiny spiders, and many other small, light organisms.

7. Give examples of ways organisms may be dispersed by other living things.

A bird may eat seeds and deposit them in its waste in another location. A duck may carry algae or fish eggs on its feet from pond to pond. A dog may carry sticky plant seeds on its fur.

8. Is the following sentence true or false? Humans are not important to the dispersal of other species. false

9. Species that have naturally evolved in an area are called native species. Species that have been carried into a new locale by people are called exotic species.

▶ Limits to Dispersal (pages 568–569)

10. List three factors that limit dispersal of a species.

a. physical barriers b. competition c. climate

11. What are some examples of physical barriers that limit dispersal?

Examples include water, mountains, and deserts.

12. How can competition act as a barrier to dispersal? If species already in the area are thriving, they may outcompete a new species and act as a barrier to its dispersal.

13. The typical weather pattern in an area over a long period of time is the area's climate.

14. Is the following sentence true or false? Places with similar climates tend to have species that occupy similar niches. true

Name _____ Date _____ Class _____

SECTION 17–3 Earth's Biomes (pages 572-583)

This section describes several different biomes, or groups of similar ecosystems, that are found on planet Earth. The section also tells where the different biomes are located.

▶ Introduction (page 572)

1. A group of ecosystems with similar climates and organisms is called a(n) biome.

2. Is the following sentence true or false? Different environments support different types of organisms. true

▶ Rain Forest Biomes (pages 573–574)

3. Circle the letter of each sentence that is true about tropical rain forests.
   - **a.** They are found only in Africa and South America.
   - **b.** They receive a lot of rainfall and sunlight year-round.
   - **c.** They contain a limited number of species.
   - **d.** They are much warmer in some seasons than in others.

4. The tall trees in a tropical rain forest form a leafy roof called the canopy.

5. Where are temperate rain forests located? They are located along the northwestern coast of the United States.

▶ Desert Biomes (pages 574–575)

6. Circle the letter of each sentence that is true about deserts.
   - **a.** They receive less than 10 centimeters of rain per year.
   - **b.** They have more evaporation than precipitation.
   - **c.** They are always hot.
   - **d.** They have extreme temperatures.

▶ Grassland Biomes (pages 575–576)

7. Circle the letter of each sentence that is true about grasslands.

a. They have many trees.

b. They have rich soil.

c. They receive more than 75 centimeters of rain each year.

d. They are home to many of the largest animals on Earth.

8. Grasslands that are located closer to the equator than prairies are called savannas.

▶ Deciduous Forest Biomes (pages 576–577)

9. Trees that shed their leaves and grow new ones each year are called deciduous trees.

10. Circle the letter of the sentence that is true about deciduous forests.

a. They receive at least 50 centimeters of rain each year.

b. Their temperatures are constant throughout the year.

c. Their growing season usually lasts for 10 months.

d. They contain very few habitats.

▶ Boreal Forest Biomes (pages 577–578)

11. What type of trees are found in a boreal forest? Coniferous trees are found in a boreal forest.

12. Circle the letter of each sentence that is true about boreal forests.

a. They are farther north than deciduous forests.

b. They have very cold winters.

c. They receive little snow.

d. Their most common species of trees are fir, spruce, and hemlock.

▶ Tundra Biomes (pages 578–579)

13. An extremely cold, dry, land biome is the tundra.

Name _____ Date _____ Class _____

14. Plants in the tundra include dwarf forms of trees.

▶ Mountains and Ice (page 579)

15. Is the following sentence true or false? If you hiked to the top of a tall mountain, you would pass through a series of biomes. true

16. What are some organisms adapted to life on the ice? Organisms adapted to life on the ice include penguins, polar bears, and seals.

▶ Freshwater Biomes (pages 580–581)

17. Circle the letter of each sentence that is true about water biomes.
    a. They cover about one quarter of Earth's surface.
    b. They include both freshwater and saltwater biomes.
    c. They are affected by temperature, sunlight, oxygen, and salt content.
    d. Their most common producers are plants.

18. Is the following sentence true or false? Lakes are generally larger and deeper than ponds. true

19. Streams and rivers are examples of running water.

▶ Marine Biomes (pages 581–583)

20. Complete the compare/contrast table.

Types of Marine Biomes	
Type of Biome	**Where It Is Located**
Estuary	Where fresh river water and salty ocean water meet
Intertidal zone	Between the highest and lowest tide
Neritic zone	Below the low-tide line and out over the continental shelf
Surface zone	On the surface of the open ocean
Deep zone	Below the surface of the open ocean

21. Is the following sentence true or false? An estuary is a very poor habitat for living things. false

22. Why is the intertidal zone a difficult place to live? It is difficult because of the pounding of the waves, sudden changes in temperature, and being both covered with water and then exposed to the air.

23. Circle the letter of each sentence that is true about the neritic zone.

a. Its water is too deep for photosynthesis to occur.

b. It is particularly rich in living things.

c. Many large schools of fish feed there.

d. Coral reefs may form there.

24. Is the following sentence true or false? Algae form the basis of almost all open-ocean food webs. true

SECTION 17–4 Succession: Equilibrium in Ecosystems (pages 586–588)

This section describes a series of predictable changes that occur in a community over time.

▶ Introduction (page 586)

1. What is ecological succession? Ecological succession is the series of predictable changes that occur in a community over time.

2. A community in an ecosystem is in equilibrium when the numbers and species of organisms in it do not change suddenly.

▶ Primary Succession (page 587)

3. What is primary succession? Primary succession is the series of changes that occur in an area where no ecosystem previously existed.

Name _____ Date _____ Class _____

4. Circle the letter of each choice that describes an area where primary succession might occur.

   a. A new island formed by the eruption of an undersea volcano

   b. An area of bare rock uncovered by a melting ice sheet

   c. A clearing in a forest left by cutting down the trees

   d. An area without any trees or other plants following a forest fire

5. The first species to populate the area in primary succession are called pioneer species.

6. Pioneer species are often lichens and mosses.

7. Is the following sentence true or false? Primary succession may lead to a community of organisms in equilibrium, which does not change drastically unless the ecosystem is disturbed. true

▶ Secondary Succession (page 588)

8. The series of changes that occur after a disturbance in an existing ecosystem is called secondary succession.

9. What natural disturbances can result in secondary succession? Natural disturbances include fires, hurricanes, and tornadoes.

10. What human activities can result in secondary succession? Human activities include farming, logging, and mining.

11. Is the following sentence true or false? Secondary succession occurs more slowly than primary succession. false

12. Secondary succession restores the ecosystem to a state in which equilibrium can be maintained.

WordWise

Match each definition in the left column with the correct term in the right column. Then write the number of each term in the appropriate box below. When you have filled all the boxes, add up the numbers in each column, row, and two diagonals. All the sums should be the same.

Definitions

A. Consumer that eats both plants and animals

B. Carnivore that feeds on the bodies of dead organisms

C. A state of balance in an ecosystem

D. An area that receives less than 25 centimeters of rain a year

E. Movement of organisms from one place to another

F. Average conditions of temperature, precipitation, winds, and clouds in an area

G. Group of ecosystems with similar climates and organisms

H. Permanently frozen soil found in the tundra climate region

I. Series of predictable changes that occur in a community over time

Terms

1. scavenger

2. biome

3. climate

4. succession

5. dispersal

6. omnivore

7. desert

8. equilibrium

9. permafrost

A 6	B 1	C 8	= 15
D 7	E 5	F 3	= 15
G 2	H 9	I 4	= 15
= 15	= 15	= 15	= 15

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CHAPTER 18

Relating to the Environment

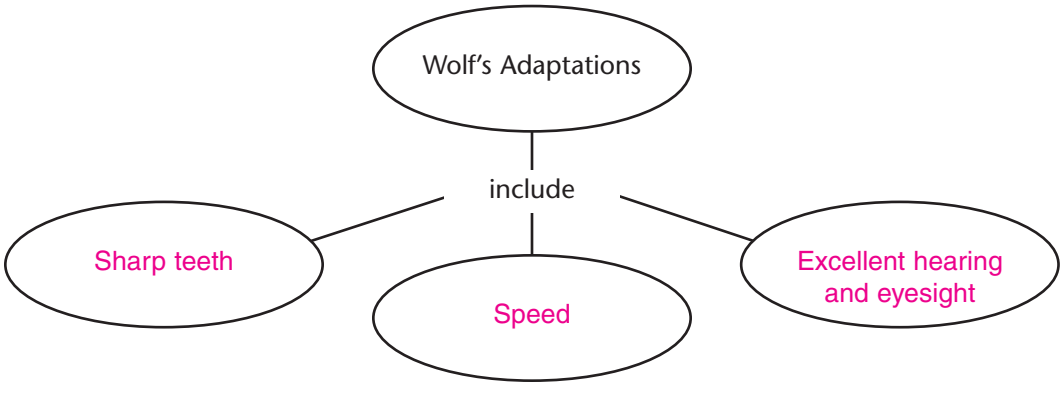
SECTION 18–1 Adaptations and the Environment (pages 594-599)

This section describes examples of adaptations. It also explains the importance of adaptations for survival.

▶ Adaptations (pages 594–595)

1. What is an adaptation? An adaptation is a trait that enables an organism to survive and reproduce in its environment.

2. Complete the concept map to show a wolf's adaptations to get food.



3. Is the following sentence true or false? A frog is a "sit and wait" predator. true

▶ Surviving in Different Environments (pages 595–597)

4. Is the following sentence true or false? Organisms need different adaptations to survive in different environments. true

5. How are flowers of the pasque plant an adaptation that keeps the plant warm? The petals of the flowers spread out and trap sunlight, which increases the temperature of the plant.

6. Describe the woodpecker's adaptations for getting food. The woodpecker's long, pointed bill can chisel holes in trees and then pull out insects to eat.

▶ Reproductive Adaptations (page 598)

7. Is the following sentence true or false? Organisms have very few adaptations that help ensure that reproduction will take place and that new organisms will survive. false

8. Circle the letter of each reproductive adaptation.
   - (a.) brightly colored flower petals
   - (b.) courtship behavior
   - c. excellent hearing
   - (d.) caring for young until they can survive on their own

▶ Inherited traits and survival (pages 598–599)

9. Most adaptations are traits or characteristics that offspring inherit from their parents.

10. Adaptations are determined by an organism's genes.

▶ Adaptation and Environmental Change (page 599)

11. What determines whether an organism can adapt to an environment that has changed? The characteristics it has inherited

Name _____ Date _____ Class _____

12. How does the ability to eat many different foods help an animal survive if one of its food sources disappears due to changes in the environment? The animal will survive by substituting other foods for the one that is lost.

SECTION 18–2 Animal Behavior (pages 600–606)

This section describes how the behavior of an animal helps it to survive. It also explains the difference between learned behavior and instinct.

▶ Introduction (pages 600–601)

1. All of the actions that an animal performs, such as the things it does to get food, avoid predators, or find a mate are part of the animal's behavior.

▶ Behavior—An Important Adaptation (page 601)

2. In what two ways do most behaviors help an animal? Most behaviors help an animal survive or reproduce.

3. An organism's reaction to a stimulus is a(n) response.

▶ Instinctive Behavior (page 602)

4. A behavior pattern that is inborn and that an animal performs correctly the first time is a(n) instinct.

5. Circle the letter of each behavior that is an instinct.

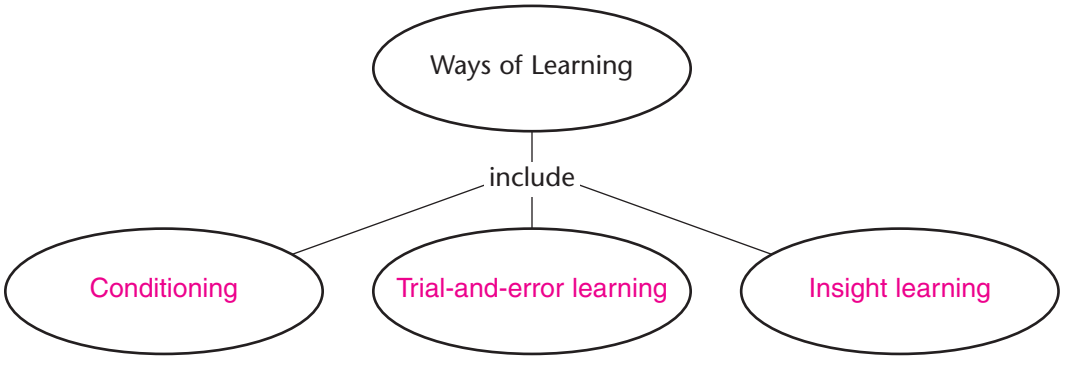
a. A lion hunting its prey.
b. A spider spinning a web.
c. A bird building a nest.
d. Earthworms crawling away from bright light.

▶ Learning (pages 602–605)

6. What is learning? Learning is the process that leads to changes in behavior based on practice or experience.

7. Circle the letter of each sentence that is true about learning.
   - **a.** The smaller an animal's brain is, the more the animal can learn.
   - **b.** Learned behaviors are usually done perfectly the first time.
   - **c.** All learned behaviors depend partly on inherited traits.
   - **d.** Animals must practice in order to develop the abilities they have inherited.

8. Complete the concept map to show three different kinds of learning.



9. How did Pavlov condition a dog to salivate when he rang a bell?

   Pavlov rang a bell every time he fed a dog.

10. Learning to ride a bike is an example of _____trial-and-error_____ learning.

11. Is the following sentence true or false? Insight learning is most common in certain animals, such as gorillas, chimpanzees, and humans. _____true_____

12. The capacity of a computer to perform complex tasks such as learning from experience and solving problems is called _____artificial_____ _____intelligence_____.

▶ Imprinting (pages 605–606)

13. Certain newly hatched birds and newborn mammals learn to recognize and follow the first moving object they see in a process called _____imprinting_____.

Name _____ Date _____ Class _____

14. In what two ways is imprinting valuable?

a. It keeps young animals close to their mothers.

b. It allows young animals to learn what other animals of their own species look like.

15. Is the following sentence true or false? Once imprinting takes place, it cannot be changed. true

Reading Skill Practice

The photographs and illustrations in a textbook can help you better understand what you are reading. Look at Figure 8 on page 605. What idea does this illustration communicate?

The illustration shows how a chimpanzee uses insight learning to respond to a stimulus.

SECTION 18–3

Patterns of Behavior (pages 608–615)

This section tells about different behaviors that help animals survive.

▶ Competition and Aggression (page 609)

1. Circle the letter of each resource that animals compete for.

(a.) food (b.) water (c.) space (d.) shelter

2. Threatening behavior that one animal uses to gain control over another is called aggression.

▶ Establishing a Territory (pages 609–610)

3. What is a territory? A territory is an area that is occupied and defended by an animal or group of animals.

4. Circle the letter of each sentence that is true about establishing territories.
   - **a.** An animal must compete with other animals for resources in its territory.
   - **b.** A territory gives an animal unlimited access to food and possible mates.
   - **c.** A territory provides a safe area in which animals can raise their young.
   - **d.** A male songbird without a territory can easily attract a female.

▶ Mating and Raising Young (pages 610–611)

5. The behavior in which males and females of the same species prepare for mating is called courtship behavior.

6. What is the importance of courtship behavior? Courtship behavior ensures that the males and females of the same species recognize each other, so that mating and reproduction can take place.

7. Is the following sentence true or false? Most fishes, amphibians, and reptiles feed and protect their young, and teach them how to survive.
   false

▶ Living in Groups (pages 611–612)

8. Look carefully at Figure 12 on page 611. Describe what the musk oxen are doing. The musk oxen have formed a circle to defend themselves and their young from a predator.

9. A group of closely related animals of the same species that work together for the benefit of the whole group is called a(n) society.

▶ Communication (page 612)

10. List four ways in which animals communicate with each other.
    - **a.** chemicals **b.** sounds
    - **c.** body positions **d.** movements

Name _____ Date _____ Class _____

Match how an animal communicates with the information it is communicating.

Kind of information	Way of communicating
b 11. courtship	a. Growling and snarling animal
a 12. defense and aggression	b. Chirping male crickets
d 13. warnings	c. Dancing honeybee
c 14. food	d. Yipping prairie dog

▶ Behavior Cycles (pages 613–614)

15. Behavior cycles that take place over a period of about one day are called circadian rhythms.

16. How does hibernation help an animal survive? Hibernation helps an animal live through severe cold and periods of time when food is scarce.

17. Is the following sentence true or false? Animals that are active at night do not encounter predators that are active during the day.
true

▶ Migration (pages 614–615)

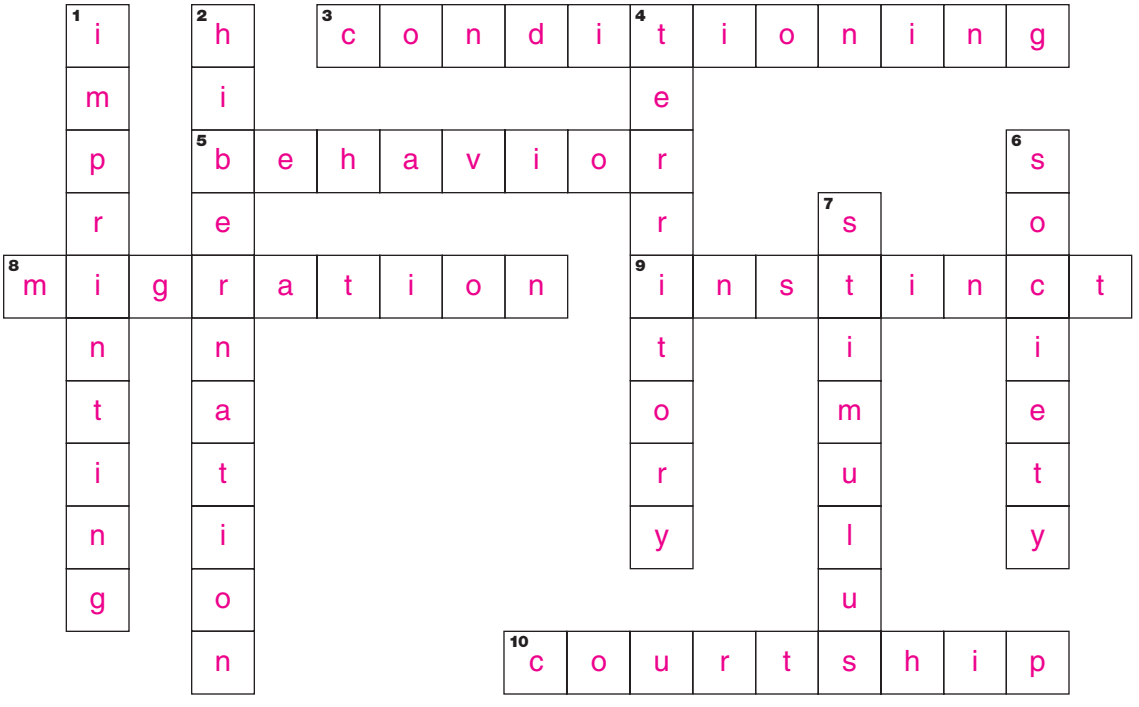
18. The regular, periodic journey of an animal from one place to another and then back again is called migration.

19. Why do animals migrate? Animals migrate to an area that provides food or a favorable environment for reproduction or both.

20. What senses do animals use to migrate? Animals use sight, scent, taste, magnetic sense, and the positions of the sun, moon, and stars.

WordWise

Answer the clues to solve the crossword puzzle.



Clues down

1. Process in which newly hatched birds learn to recognize and follow the first moving object they see
2. State of greatly reduced body activity during the winter
4. Area that is occupied and defended by an animal or group of animals
6. Group of closely related animals of the same species that work together to benefit the whole group
7. An internal or external signal that causes a living thing to react in some way

Clues across

3. Learning to connect some kind of stimulus with a good or bad event
5. Term used to describe all the actions an animal performs
8. Regular, periodic journey of an animal from one place to another and then back again
9. Inborn behavior that is performed correctly the first time
10. Behavior in which males and females of the same species prepare for mating

Name _____ Date _____ Class _____

CHAPTER 19

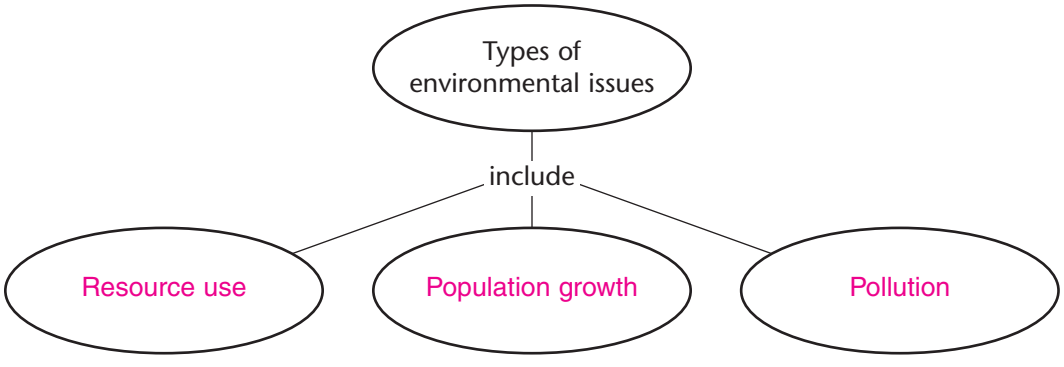
LIVING RESOURCES

SECTION 19–1 Environmental Issues (pages 622–626)

This section describes three main types of environmental issues and three different approaches to resolving them. The section also describes how lawmakers weigh the costs and benefits of proposals to deal with environmental issues.

▶ Effects of Human Activity (pages 622–623)

1. Complete the concept map.



Match the term with its definition.

	Term	Definition
c	**2.** natural resource	**a.** Resources that are not replaced as they are used
b	**3.** renewable resource	**b.** Resources that are naturally replaced in a relatively short time
a	**4.** nonrenewable resource	**c.** Anything in the environment that is used by people

5. Circle the letter of the sentence that is true about the human population.

a. It grew rapidly until A.D. 1650.
b. It grew slowly until A.D. 1950.
c. It was 6 billion by A.D. 2000.
d. It was 1 billion in A.D. 1000.

6. Why did the human population grow so rapidly in recent centuries?

The population grew so rapidly because of a decrease in the death rate, which fell due to improvements in medicine, agriculture, and sanitation.

7. Any change to the environment that has a negative effect on living things is called pollution.

8. What are some human activities that result in pollution? Human activities resulting in pollution include burning coal to generate electricity and using pesticides to kill insects on crops.

▶ Approaches to Environmental Issues (pages 624–625)

9. Complete the compare/contrast table.

Types of Environmental Choices	
Choice	**Example**
Personal	Whether to ride a car, bus, or bicycle
Local	Whether to build a landfill or incinerator
National	Whether to allow drilling for oil in a wildlife refuge
Global	How to protect Earth's atmosphere

10. The study of the natural processes that occur in the environment and how humans can affect them is called environmental science.

▶ Weighing Costs and Benefits (page 626)

11. Is the following sentence true or false? Costs and benefits are measured only in terms of money. false

Name _____ Date _____ Class _____

12. Circle the letter of each choice that would be a cost of drilling for oil in Antarctica.

(a.) Transporting the oil

(b.) Risk of oil spills

c. Many new jobs

(d.) Potential harm to sea animals

SECTION 19–2 Forests and Fisheries (pages 628–632)

This section describes resources that come from forests and from areas of the ocean called fisheries. The section also explains how forests and fisheries are managed to protect them for future use.

▶ Forest Resources (page 628)

1. What are some valuable materials or products provided by forests?

Examples include maple syrup, rubber, nuts, lumber for construction and furniture, and pulp for paper.

2. Circle the letter of each sentence that is a reason people benefit from trees.

a. Trees produce carbon dioxide.

(b.) Trees absorb pollutants.

(c.) Trees help prevent flooding.

(d.) Trees help control soil erosion.

▶ Managing Forests (pages 629–630)

3. Is the following sentence true or false? Nearly a third of the area of the United States is covered with forests. true

4. Is the following sentence true or false? Forests are a nonrenewable resource. false

5. Complete the compare/contrast table.

Advantages and Disadvantages of Different Logging Methods		
Logging Method	**Advantages**	**Disadvantages**
Clear-cutting	Quicker, cheaper, safer	Exposes soil to erosion
Selective cutting	Less damaging to habitat	Can be dangerous to loggers

6. A regular amount of a renewable resource that can be harvested without reducing the future supply is called a(n) sustainable yield.

7. How can forests provide a sustainable yield? Forests can provide a sustainable yield if new trees are planted to replace the trees that are cut down.

8. What is certified wood? Certified wood is wood that has been certified to come from a forest that is managed in a sustainable way.

▶ Fisheries (pages 631–632)

9. An area with a large population of valuable ocean organisms is called a(n) fishery.

Match the approach to managing fisheries with its example.

	Approach	Example
c	**10.** fishing limits	**a.** Requiring the use of nets that allow young fish to escape
a	**11.** fishing methods	**b.** Introducing unusual species of fish as food
d	**12.** aquaculture	**c.** Setting an upper limit on the amount of fish that can be caught
b	**13.** new resources	**d.** Raising fish in an artificial pond

Name _____ Date _____ Class _____

Reading Skill Practice

The illustrations in a textbook can help you better understand what you are reading. Look at figure 7 on page 630. What does this illustration compare and contrast?

The illustration compares and contrasts clear-cutting and selective cutting.

SECTION 19–3 Biodiversity (pages 634–642)

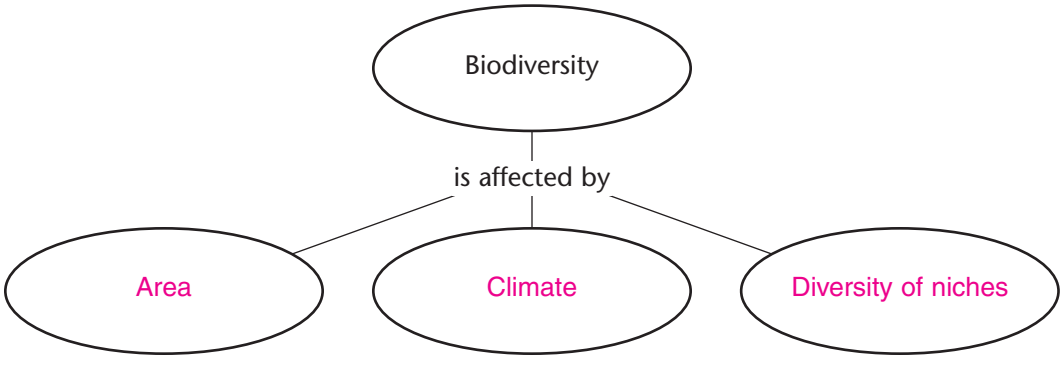
This section describes factors that affect biodiversity. The section also explains why biodiversity is valuable, how it is being threatened, and what is being done to protect it.

▶ Introduction (page 634)

1. The number of different species in an area is called its biodiversity.

▶ Factors Affecting Biodiversity (pages 634–635)

2. Complete the concept map.



3. Circle the letter of each sentence that is true about biodiversity.

a. Large areas contain more species than small areas.

b. The number of species decreases from the poles toward the equator.

c. Tropical rain forests are the most diverse ecosystems.

d. Coral reefs are the second most diverse ecosystems.

Name _____ Date _____ Class _____

▶ The Value of Biodiversity (pages 635–636)

4. Is the following sentence true or false? Biodiversity has no economic value. false

5. A species that influences the survival of many other species in an ecosystem is called a(n) keystone species.

6. Is the following sentence true or false? If a keystone species disappears, the entire ecosystem may change. true

▶ Gene Pool Diversity (page 637)

7. The individual differences in genes among members of a species make up the total gene pool of that species.

8. Circle the letter of each sentence that is true about species with diverse gene pools.

a. They are better able to resist parasites.

b. They are less able to adapt to drought.

c. They can better tolerate fungus attacks.

d. They are less able to survive disease.

▶ Extinction of Species (pages 637–638)

9. Circle the letter of each sentence that is true about extinction.

a. It is a natural process.

b. Many species are now extinct.

c. Extinctions have occurred only in the last few centuries.

d. The number of species becoming extinct has increased dramatically.

10. Is the following sentence true or false? Once a population drops below a certain level, the species may not be able to recover. true

11. A(n) endangered species is in danger of becoming extinct in the near future.

Name _____ Date _____ Class _____

▶ Causes of Extinction (pages 639–640)

12. What natural catastrophes might cause extinction? An earthquake or a volcano might cause extinction.

13. Is the following sentence true or false? The major cause of extinction is habitat fragmentation. false

Match the term with its definition.

Term	Definition
c **14.** habitat destruction	**a.** Breaking larger habitats into smaller, isolated pieces
a **15.** habitat fragmentation	**b.** Illegally killing or removing wildlife species
b **16.** poaching	**c.** Loss of a natural habitat

17. How does introducing an exotic species affect an ecosystem? The exotic species can threaten biodiversity. If there is no predator, the exotic species can multiply quickly and endanger other species.

18. How can pollutants affect organisms? Pollutants can kill or weaken organisms or cause birth defects.

▶ Protecting Biodiversity (pages 641–642)

19. The mating of animals in zoos or wildlife preserves to protect severely endangered species is called captive breeding.

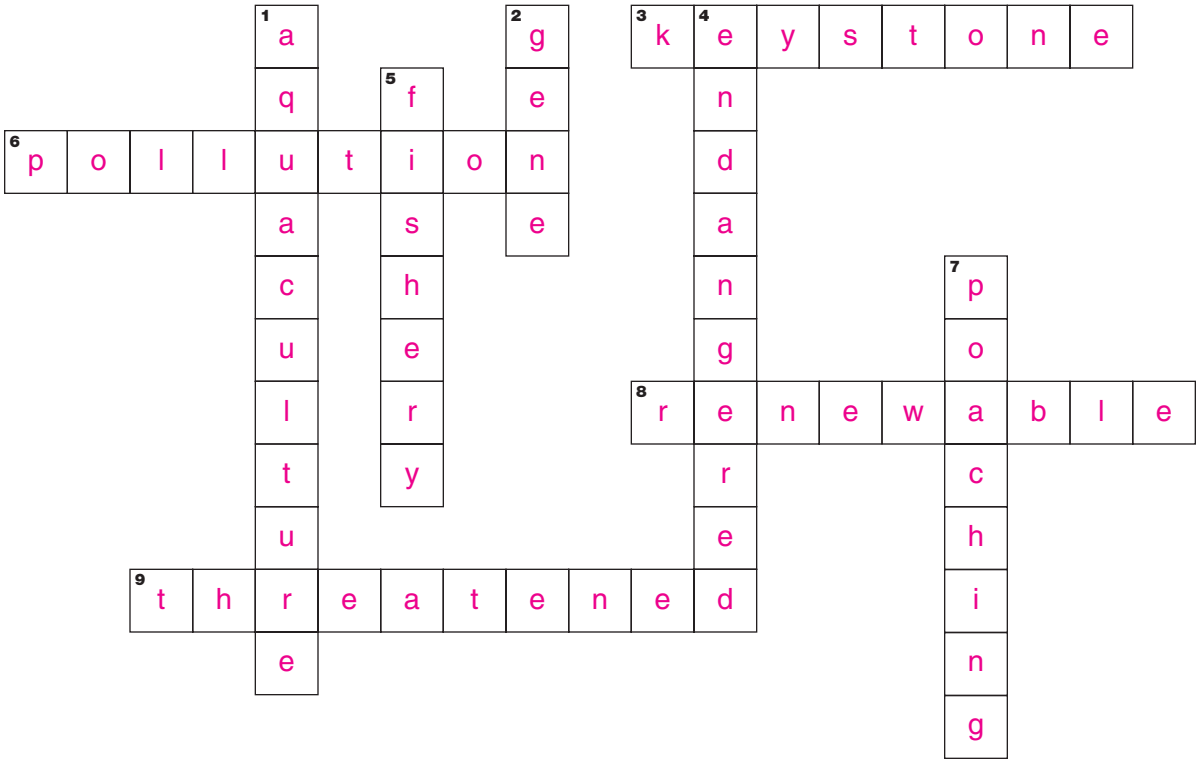
20. Is the following sentence true or false? Laws can help protect individual species. true

21. Is the following sentence true or false? The most effective way to preserve biodiversity is to protect individual species. false

Name _____ Date _____ Class _____

WordWise

Review key terms from Chapter 19 by solving the crossword puzzle.



Clues down

1. Practice of raising fish and other water organisms for food
2. Structure in an organism's cells that carries its hereditary information
4. Term used to describe a species that is in danger of becoming extinct
5. Area with a large population of valuable ocean organisms
7. Hunting wildlife illegally

Clues across

3. Term used to describe a species that influences the survival of many others in an ecosystem
6. Change to the environment that has a negative effect on living things
8. Term used to describe resources that are replaced naturally
9. Term used to describe a species that could become endangered