Study Guide and Reinforcement

Student Edition

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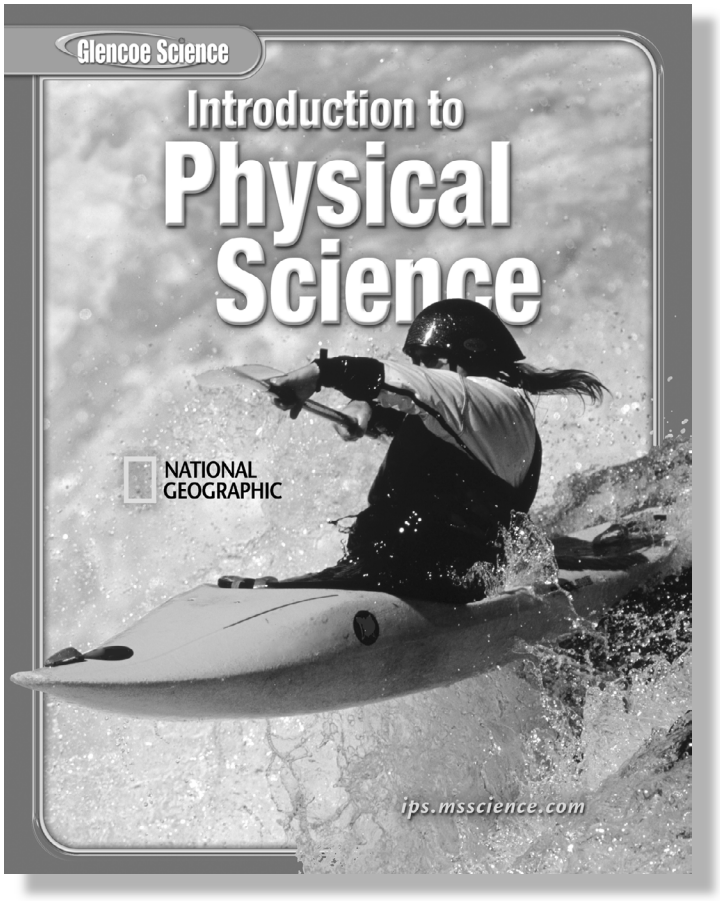

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SECTION 1 Study Guide

Minerals—Earth's Jewels

Chapter 1

Directions: *Match the terms from the word bank with the phrases below.*

Earth science	**health science**	**physical science**	**scientific theory**
chemistry	**life science**	**physics**	**technology**
climate	**mountain gorillas**	**science**	

_____ **1.** the study of matter and energy

_____ **2.** something a meteorologist might study

_____ **3.** an explanation of a pattern in nature that is supported by observations and results from many investigations

_____ **4.** an endangered species that was studied by Dian Fossey in Rwanda

_____ **5.** study of living systems and their interactions

_____ **6.** the study of energy and its ability to change matter

_____ **7.** a field that is part of life science and includes careers such as dietitians, nurses, and physiotherapists

_____ **8.** study of nonliving things and systems on Earth and in space

_____ **9.** a way of learning more about the world, that starts with making observations and asking questions

_____ **10.** applications of theoretical science. It's what engineers develop.

_____ **11.** the study of matter

Directions: *Use **Figure 2** to list four possible outcomes when new information is found about a scientific explanation.*

12. _____ **13.** _____

14. _____ **15.** _____

Directions: *Fill in the chart with the three interacting parts of a system, and <u>two</u> examples of each of these parts from your school.*

	Three Parts of a System	First Example	Second Example
16.			
17.			
18.			

Name Date Class

SECTION 2 Study Guide

Science in Action

Chapter 1

Directions: *Circle the term in the puzzle that fits each clue. Then write the term on the line. In the puzzle, terms read across or down.*

P E O B S E R V A T I O N
M Q R D Y B X K H E T P I
E K G X I E J N L S B Y H
P Y A F W Z S H A T R M Y
N R N C M J A H T L N J P
F Q I R R W O J I V A D O
U S Z D F V Z B L G C O T
P R E D I C T I O N F M H
L H G K D W C G U S X O E
V T C O N C L U S I O N S
Y Q W A O M U C T U P N I
P G I E Q V S X K Z B E S

1. Using your senses to gather information is called _____.
2. A reasonable and educated guess based on what you know and observe is called a(n) _____.
3. Making an educated guess on the results of an experiment based on observations and the hypothesis is called making a(n) _____.
4. In any good experiment, the scientist needs to _____ the hypothesis.
5. You can use a table or a graph to _____ your findings.
6. After your investigation, you can use the results of your experiments to draw _____.

Directions: *Answer the following question on the lines provided.*

7. What is a controlled experiment? Give an example.

_____

_____

_____

_____

_____

Name Date Class

SECTION 3 Study Guide

Models in Science

Chapter 1

Directions: *Complete the following sentences using the correct terms.*

1. A model built using software that you can see on a computer screen is a _____ model.
2. $E = mc^2$ is Einstein's _____ model of the theory of relativity.
3. A mobile that shows our solar system is a _____ model.
4. Some models are used to communicate _____ to other people.
5. Some models are used because testing with a model is _____ and less expensive than the real thing.

Directions: *Answer the following questions on the lines provided.*

6. List one example of a model used to test a prediction.

7. List one way a computer model could help a scientist studying plants.

8. What are the limitations of models?

9. Ancient scientists thought that Earth was the center of the universe, and imagined the sky as a blanket that covered the planet. Why did this early model change?

Name Date Class

SECTION 4 Study Guide

Evaluating Scientific Explanation

Chapter 1

Directions: *Fill in the blanks with the following terms.*

repeatable explanations laboratory changing evaluate inferences data critical thinking conclusions

Scientists often have to evaluate scientific explanations in two parts. Scientists evaluate the observations that are made, and evaluate the **1.** _____ made from those observations. To make a decision, scientists use their **2.** _____ skills to evaluate the evidence. Scientists have to be careful whenever they are collecting any type of **3.** _____. Measurements must be accurate and instruments must be properly calibrated, as scientists cannot afford to be careless in their data collection.

Valid scientific explanations must be **4.** _____ by other scientists. If a scientist's experiment cannot be recreated accurately by other scientists, it might mean that the experiment is invalid. Once the experiments and evidence have been tested and examined, the scientist might draw **5.** _____ based on the observations. However, when drawing conclusions, scientists should ask themselves if they considered all of the possible **6.** _____. It is important to keep an open mind when drawing conclusions from scientific information. It is also important to remember that scientific information is constantly **7.** _____, and that all scientific models are subject to change.

It is important to know that scientific reasoning is used not only in the **8.** _____. Scientific reasoning and critical thinking skills are used every day. These skills will help you **9.** _____ claims and make good decisions about the world around you.

Directions: *Answer the following questions on the lines provided.*

10. Why is it important for a scientist to write down every observation, including unexpected observations? _____

_____

11. How is evaluating an advertising claim a use of the scientific process?

_____

12. Does an advertiser's claim that its results have been verified by an independent laboratory impress you?

_____

Name Date Class

SECTION 1 Study Guide

Description and Measurement

Chapter 2

Directions: *Use the word bank to fill in the blanks in the summary statements.*

accuracy	**far**	**much**	
decimal places	**long**	**measurement**	**precision**

(**1**)_____ is a way to describe the world with numbers. It can tell you how (**2**)_____, how (**3**)_____, or how (**4**)_____, by measuring time, distance, and mass.

(**5**)_____ is a description of how close measurements are to each other. It can also be used to describe the number of (**6**)_____ a number has.

(**7**)_____ is a description of how close a measurement is to the true value.

Directions: *Decide whether the number in column A or column B answers each question below and write the letter in the blank provided.*

		A	B	Answer
8.	the more accurate number, if the actual value is 10.21 g	10.201	10.19	
9.	the more precise number, if the actual value is 10.21 g	10.201	10.19	
10.	the more accurate number, if the actual value is 750 m	740.3	747	
11.	the more precise number, if the actual value is 750 m	740.3	747	
12.	the number 11.289, rounded to the tenths place	11.2	11.3	
13.	the number 12.4446, rounded to the hundredths place	12.45	12.44	
14.	the number 879,642 rounded to the hundreds place	879,600	879,000	
15.	the number of significant digits in 1280003	4	7	
16.	the number of significant digits in 454.00	5	3	
17.	the number of significant digits in 0.00002405	8	4	

Name Date Class

SECTION 2 Study Guide

SI Units

Chapter 2

Directions: *Complete the chart by filling in the SI unit and the tool you would use for each measurement.*

Measurement	Unit	Tool
1. mass of rock		
2. your body temperature		
3. volume of a plastic block		
4. length of your classroom		
5. how much water a tablespoon holds		
6. how long between blinks of your eyes		

Directions: *Convert each of the following SI measures.*

7. 64 km = _____ m

8. 373 g = _____ kg

9. 897 mm = _____ cm

10. 0.25 L = _____ mL

Directions: *Use the following information to answer the questions below.*
A train travels at the rate of 120 km per hour.

11. What is its speed in meters per second?

_____

12. What is its speed in meters per minute? Show your work in the space below.

_____

SECTION 3 Study Guide

Drawings, Tables, and Graphs

Chapter 2

Directions: *Match the information in Column I with the best way to display it from Column II. Write the letter of the correct term in the blank at the left. A letter may be used more than once.*

Column I	Column II
_____ **1.** view of Earth from space	**a.** bar graph
_____ **2.** amount of rainfall in an area each month for a year	**b.** circle graph
_____ **3.** how the constellations change position over several hours	**c.** drawing
_____ **4.** percents of the most abundant metals in Earth's crust	**d.** line graph
_____ **5.** percents of the different gases in the atmosphere on Mars	**e.** movie
_____ **6.** how far a hurricane moves each hour	**f.** photograph
_____ **7.** structure of the human ear	**g.** table
_____ **8.** daily high and low tide times for a week	
_____ **9.** how a sound wave travels through the air	

Directions: *Use the paragraph below to complete question 10.*

Some animals can live much longer than others. For example, both the golden eagle and the blue whale have a maximum life span of more than 80 years, while a guppy's maximum life span is only 5 years. A giant spider may live 20 years, a lobster 50 years, and a crocodile may live 60 years.

10. Make a chart and draw a graph to display the data given in the paragraph.

Name Date Class

SECTION 1 Study Guide

Structure of Matter

Chapter 3

Directions: *List five things that are matter and five things that are not matter.*

Matter	Not Matter
1.	
2.	
3.	
4.	
5.	

Directions: *List the five main points of Democritus' atom theory.*

6. _____

7. _____

8. _____

9. _____

10. _____

Directions: *Use the word bank to fill in the blanks to match the phrases below.*

atom	Chadwick	electron cloud	orbits	Rutherford
atomic model	electron	neutron	proton	Thomson

_____ **11.** a neutral particle that is located in the nucleus

_____ **12.** a negative particle that orbits the nucleus

_____ **13.** a positive particle that is located in the nucleus

_____ **14.** the area where modern scientists think electrons are likely to be found

_____ **15.** scientist who discovered that atoms contained electric charge

_____ **16.** a student of Niels Bohr who discovered neutrons in the nucleus

_____ **17.** the place where Bohr thought electrons would be found

_____ **18.** the smallest piece of matter that keeps the properties of the element to which it belongs

_____ **19.** scientist who proposed the idea of a nucleus

_____ **20.** a way of thinking about the structure of the atom

Name Date Class

SECTION 2 Study Guide

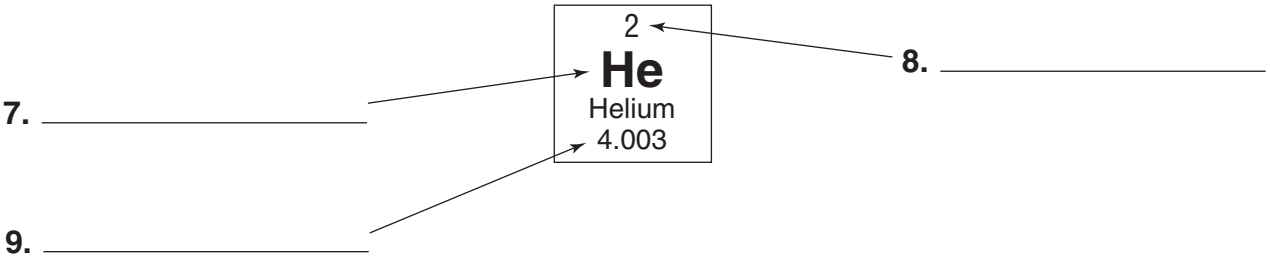
The Simplest Matter

Chapter 3

Directions: *Complete the table by writing in the appropriate characteristics for metals, metalloids, and nonmetals.*

Characteristics	Metals	Metalloids	Nonmetals
1. State of matter at room temperature			
2. Shininess			
3. Conductor of heat or electricity			
4. Malleability			
5. Ductility			
6. Location on periodic table			

Directions: *The square below represents one element from the periodic table. Identify and describe the numbered items. Then answer the questions below.*



10. What is the atom's mass number?

_____

11. What are isotopes?

_____

_____

Name Date Class

SECTION 3 Study Guide

Compounds and Mixtures

Chapter 3

Directions: *Select the term below that best describes each food listed.*

homogeneous mixture **compound** **heterogeneous mixture**

1. milk _____ **6.** popsicle _____

2. salt _____ **7.** chili _____

3. sugar _____ **8.** taco _____

4. soda pop _____ **9.** pizza _____

5. ice cream _____ **10.** water _____

Directions: *Answer the following questions on the lines provided.*

11. Describe what a compound's formula tells us about the compound.

_____

_____

_____

12. Both compounds and mixtures contain more than one kind of atom. Explain how a compound is different from a mixture.

_____

_____

_____

Directions: *Draw a line from the term on the right to its definition or description on the left.*

13. a sample of matter that has the same composition and properties throughout

14. a pure substance whose smallest unit is made up of atoms of more than one element

15. two or more substances that are together but do not combine to form a new, pure substance

16. a mixture that is the same throughout

17. a mixture with visible components

heterogeneous mixture

homogeneous mixture

compound

substance

mixture

Name Date Class

SECTION 1 Study Guide

Matter

Chapter 4

Directions: *Unscramble the words in parentheses to fill in this section summary.*

(1)_____ (tramet) is anything that takes up space and has mass. The four states of matter are **(2)**_____ (dlois), **(3)**_____ (quildi), **(4)**_____ (sga), and **(5)**_____ (slampa). All matter is made of **(6)**_____. (sartpicle). In a liquid, the particles are moving **(7)**_____ (strafe) than they do in a solid, but **(8)**_____. (lowsre) than they do in a gas. Particles in a gas have more **(9)**_____ (ygreen) than particles in a solid or liquid. Honey and tar have higher **(10)**_____ (sssiecitivo) than water because they are slower to flow. The attractive forces of water molecules for each other creates **(11)**_____ (rufaces) _____ (stenino) that allows needles to float and water striders to walk on water. Because of surface tension, water droplets are **(12)**_____ (dorun). A liquid takes the **(13)**_____ (heaps) of its container, but a gas **(14)**_____ (lifsl) its container completely.

Directions: *Explain what is needed for plasma to exist, and where it can be found.*

15. _____

_____

Directions: *List three amorphous solids*

16. _____

_____

Directions: *List five crystalline solids.*

17. _____

_____

_____

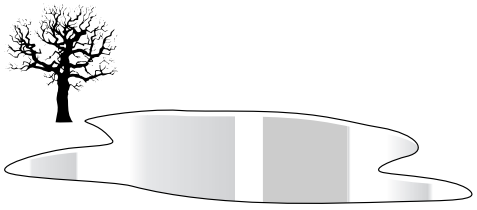
Name Date Class

SECTION 2 Study Guide

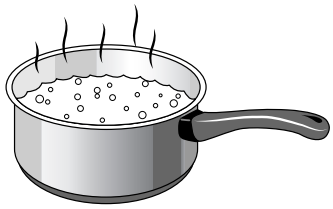
Changes of State

Chapter 4

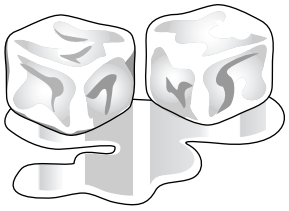
Directions: *Write the word that best describes each process illustrated below.*



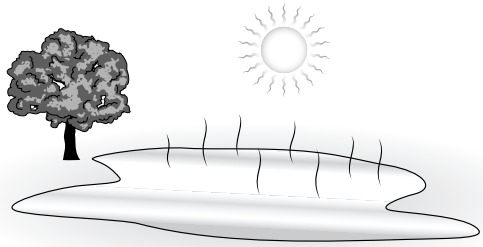
1. _____



2. _____

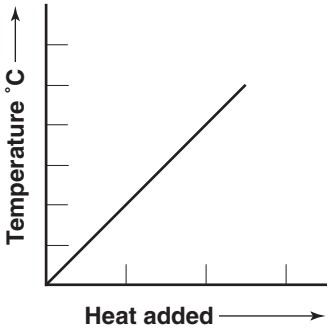


3. _____

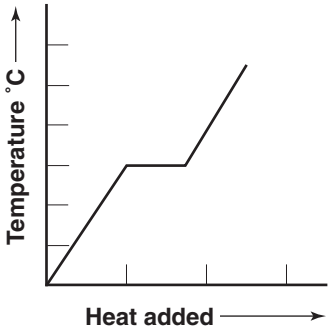


4. _____

Directions: *Use the graphs below to answer the questions that follow.*



Graph A



Graph B

5. Which graph shows the melting of a crystalline solid? Explain your reasoning.

_____

_____

6. What type of solid does the other graph show? Explain.

_____

_____

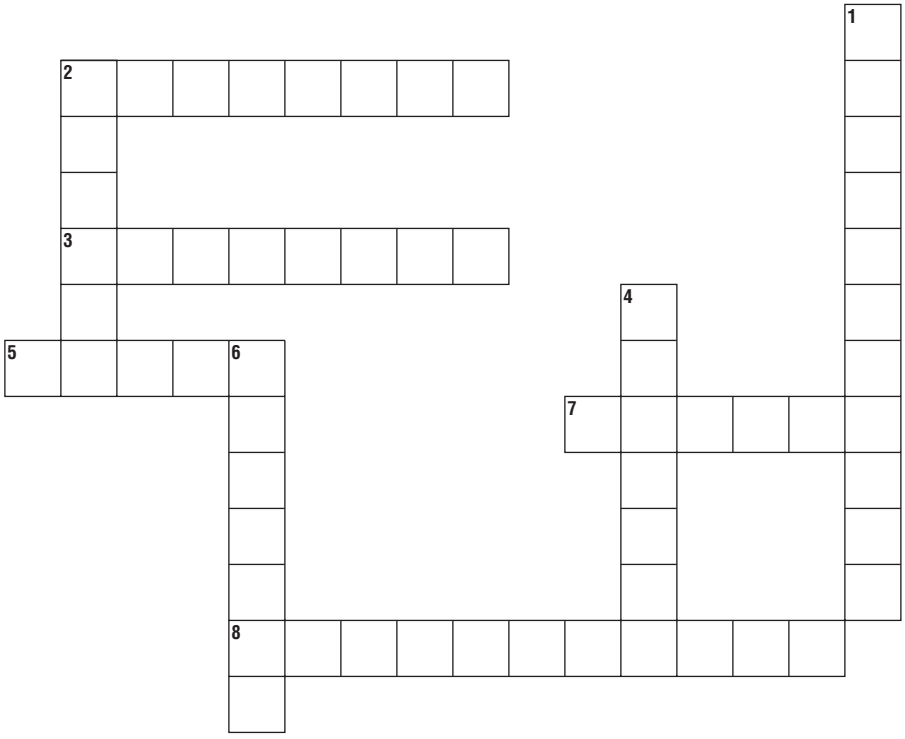
Name Date Class

SECTION 3 Study Guide

Behavior of Fluids

Chapter 4

Directions: *Use the clues below to complete the crossword puzzle.*



Across

2. The amount of force applied per unit of area

3. It is nearly impossible to _____ solids and liquids.

5. Pascal's principal says that pressure applied to a confined _____ transmits unchanged throughout the _____.

7. One of the factors affecting density

8. An increase in _____ results in an increase in pressure.

Down

1. As _____ pressure decreases, boiling points of liquids becomes lower.

2. The pressure produced by a force of one Newton per square meter of surface area is one _____.

4. The _____ force determines whether or not an object will float.

6. Mass divided by volume

Name Date Class

SECTION 1 Study Guide

Physical Properties

Chapter 5

Directions: *List nine physical properties, an example of each one, and how each is measured or observed. Include units if they apply.*

	Property	Example with Units	How It Is Measured or Observed
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Directions: *Name two edible acids.*

10. _____

Directions: *Write the pH range for each type of substance.*

11. acid: _____ pure water: _____ base: _____

Directions: *List two physical properties of bases.*

12. _____

Directions: *Name two ways you can tell an acid apart from a base.*

13. _____

Directions: *Determine if each of the following properties is size-dependent (SD) or size-independent (SI). Write the appropriate letters in the blank beside each property.*

_____ **14.** color

_____ **15.** density

_____ **16.** mass

_____ **17.** magnetism

_____ **18.** volume

_____ **19.** weight

_____ **20.** boiling point

_____ **21.** taste

_____ **22.** state

_____ **23.** length

Name Date Class

SECTION 2 Study Guide

Chemical Properties

Chapter 5

Directions: *Identify each statement as* **true** *or* **false.** *Rewrite false statements to make them correct.*

_____ **1.** A sliced apple turning brown is exhibiting the ability to react with oxygen, a physical property.

_____ **2.** Chlorine compounds change the chemical properties of pools, making them more acidic.

_____ **3.** Bases create a sour taste in your mouth.

_____ **4.** Acid rain is made from small amounts of acetic and carbonic acids.

_____ **5.** Gold and silver make a good choice for jewelry because they have low reactivity.

_____ **6.** A characteristic of matter that allows it to change to something new is called a physical property.

_____ **7.** Toxicity is a chemical property.

_____ **8.** Acids feel slippery between your fingers because they react with the skin cells on your fingers.

_____ **9.** When acids and bases react, they form compounds called salts, which are made of a metal and a nonmetal.

Directions: *Write* **Yes** *if the following characteristic is a chemical property, and* **No** *if it is not.*

_____ **10.** the ability to react with oxygen

_____ **11.** toxicity

_____ **12.** color

_____ **13.** shape

_____ **14.** reactivity

_____ **15.** ability to burn

Name Date Class

SECTION 3 Study Guide

Physical and Chemical Changes

Chapter 5

Directions: *Identify each change as* **chemical** *or* **physical.**

_____ **1.** a burning log

_____ **2.** food being digested

_____ **3.** rust

_____ **4.** a rotting pile of leaves

_____ **5.** a log chopped for firewood

_____ **6.** leaves falling from a tree

Directions: *Answer the following questions on the lines provided.*

7. What is the difference between a physical change and a chemical change?

8. How do chemical changes affect our everyday life?

9. What are the signs of a physical change?

10. What are signs of a chemical change?

11. What is the difference between physical and chemical weathering?

12. Explain the chemical change that takes place in tree leaves.

13. Why is chemical weathering a problem?

Name Date Class

SECTION 1 Study Guide

Why do atoms combine?

Chapter 6

Directions: *Match the term from the word bank with each phrase below.*

alkali metals	**electron cloud**	**fourth**	**nucleus**
charged	**electron dot diagram**	**halogens**	**proton**
chemical bond	**empty space**	**neutral**	**stable**
down	**first**	**noble gases**	**up**

_____ **1.** the energy level that can hold only 2 electrons

_____ **2.** what an atom will be if it has a different number of protons and electrons

_____ **3.** the energy level that can hold 32 electrons

_____ **4.** what an atom may be if it has a different number of protons and electrons

_____ **5.** the group that needs one more electron to fill its outer energy level

_____ **6.** an area of space around the nucleus where electrons are likely to be

_____ **7.** the group that has one electron in its outer level

_____ **8.** the area where protons and neutrons can be found

_____ **9.** the force that holds atoms together

_____ **10.** the most stable group on the periodic table

_____ **11.** what makes up most of an atom

_____ **12.** the particle that must be present in the same number as electrons in a neutral atom

_____ **13.** the reactivities of alkali metals increase as you go this direction in the group

_____ **14.** the reactivities of noble gases increase as you go this direction in the group

_____ **15.** a handy way to represent the outer electrons of an atom

_____ **16.** atoms join with each other to become more like this

Directions: *Explain why, even though electrons closer to the nucleus have a lower energy than electrons further away from the nucleus, it takes more energy to remove the electrons closer to the nucleus.*

17. _____

_____

Name Date Class

SECTION 2 Study Guide

How Elements Bond

Chapter 6

Directions: *Correctly complete the following paragraphs using terms from the list below. Some terms may not be used, and some terms may be used more than once.*

electrons	**losing**	**positive**	**covalent**
molecules	**protons**	**gaining**	**negative**
random	**gains**	**neutral**	**regular**	**ionic**
nonpolar	**ions**	**loses**	**polar**	**sharing**

Elements in Group 1 become more stable by **1.** _____ an electron. These elements form **2.** _____ ions because they have more **3.** _____ than **4.** _____. Chlorine readily **5.** _____ an electron, forming a **6.** _____ ion. The attraction between sodium ions and chlorine ions forms **7.** _____ bonds. In sodium chloride, the ions are lined up in a **8.** _____ pattern.

Unlike sodium and chlorine, some atoms become more stable by sharing **9.** _____, forming **10.** _____ rather than charged **11.** _____. The bonds in a molecule of oxygen are **12.** _____ **13.** _____ bonds, while the bonds in a molecule of water are **14.** _____ **15.** _____ bonds.

Directions: *Next to each formula, write the number of atoms of each element found in one unit of the compound.*

16. potassium iodide, KI _____

17. sodium sulfide, Na_2S _____

18. silicon dioxide, SiO_2 _____

19. carbonic acid, H_2CO_3 _____

Directions: *Complete the following activity.*

20. Hydrogen combines with sulfur much like hydrogen combines with oxygen. Draw an electron dot diagram showing hydrogen combined with sulfur and write the chemical formula below.

Name Date Class

SECTION 1 Study Guide

Chemical Formulas and Equations

Chapter 7

Directions: *Use the terms from the word bank to fill in the blanks in front of the correct phrases below.*

balanced	**endothermic**	**products**
bubbles	**exothermic**	**reactants**
chemical reaction	**iron oxide**	**silver sulfide**
conservation of mass	**precipitate**	**subscripts**

_____ **1.** substances that are about to take part in a chemical reaction

_____ **2.** the numbers in a chemical formula that tell you the ratio of atoms in a compound

_____ **3.** the law Lavoisier devised, that says that matter is neither created nor destroyed during a reaction

_____ **4.** tarnish on silver

_____ **5.** what you call a chemical equation when it is written with the same number of each type of atom on both sides

_____ **6.** the process of changing some substances into other substances

_____ **7.** a reaction that releases heat to its surroundings. Energy appears on the products side of the equation.

_____ **8.** a sign that a gas has been produced

_____ **9.** rust

_____ **10.** the substances that are formed by a chemical reaction

_____ **11.** a reaction that absorbs heat. Energy appears on the left side of the equation.

_____ **12.** a solid formed in a reaction by mixing two solutions

Directions: *List four ways you can detect a chemical reaction.*

13. _____

14. _____

15. _____

16. _____

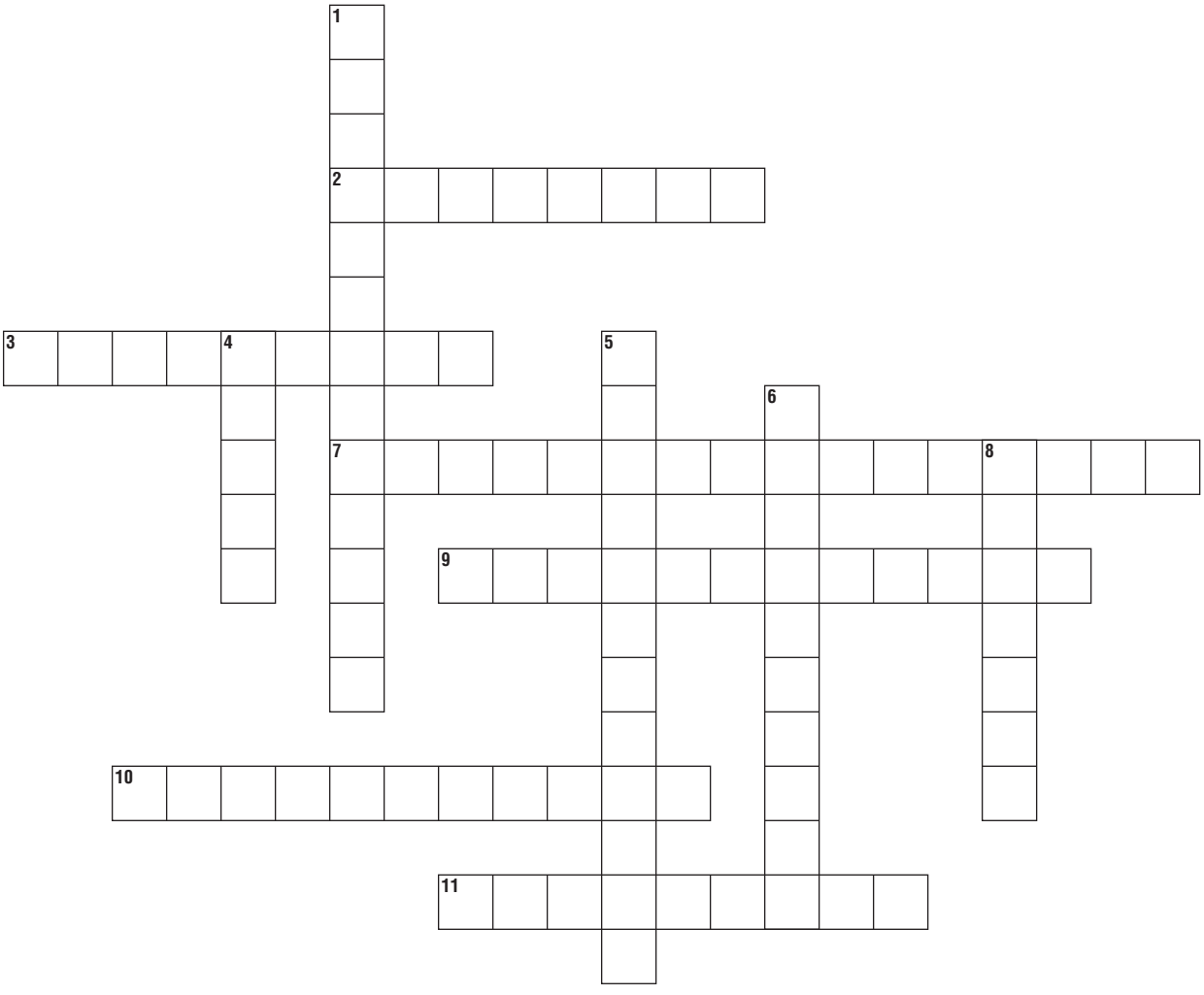
Name Date Class

SECTION 2 Study Guide

Rates of Chemical Reactions

Chapter 7

Directions: *Use the clues to complete the puzzle.*



Across

2. It speeds up a reaction but is not permanently changed

3. It slows down a chemical reaction

7. The minimum amount of energy needed to start any reaction (2 words)

9. By decreasing this, you can speed up a chemical reaction (2 words)

10. Increasing this speeds up most chemical reactions

11. Enzymes that break down proteins

Down

1. Amount of substance present in a certain volume

4. They are broken before a chemical reaction takes place

5. Measure of how fast a reaction occurs (two words)

6. These must be strong in order to cause a chemical change to take place

8. Catalysts at work in the body

Name Date Class

SECTION 1 Study Guide

What is a solution?

Chapter 8

Directions: *Match the terms in the word bank with the phrases below by writing the word in the blank. You must use all the words and may use each word only once.*

alloy	**homogeneous mixture**	**stalactite**
compound	**precipitate**	**solute**
heterogeneous mixture	**stalagmite**	**solvent**

_____ **1.** for example, sugar in cola

_____ **2.** a hanging icicle of rock formed by dripping water in a cave

_____ **3.** a solid-solid solution, such as brass

_____ **4.** for example, mixed fruit salad

_____ **5.** a solid formed when two solutions mix, such as soap scum

_____ **6.** a column of rock that forms upward from the floor of a cave as water with dissolved rock drips on it

_____ **7.** something that dissolves a solute, such as the water in the ocean

_____ **8.** two or more substances that are evenly mixed on a molecular level but are not bonded

_____ **9.** for example, water, which always has the same ratio of hydrogen and oxygen atoms

Directions: *Decide if each process is a physical or chemical process and write your answer in the column. Decide what kind of mixture is described in each case and name it in the second column. Identify the parts of the mixture.*

		Physical or Chemical?	Kind of Mixture	Parts of Mixture
10.	a chef caramelizing sugar and butter for a sauce			
11.	a carpenter pounding nails into a house frame			
12.	a painter mixing two colors of paint together			
13.	a clown blowing up balloons			
14.	a cleaner using bleach to clean stains from clothes			

Name Date Class

SECTION 2 Study Guide

Solubility

Chapter 8

Directions: *Write* **true** *in the blank if the statement is true. If the statement is false, replace the italicized word with a word or term that makes the statement true. Write this new word in the blank.*

_____ **1.** In the water molecule, electrons are *equally* shared by hydrogen atoms and oxygen atoms.

_____ **2.** Solutions for which water is the solvent are called *aqueous* solutions.

_____ **3.** If electrons are shared *equally* between atoms that compose a molecule, that molecule is said to be polar.

_____ **4.** Water readily dissolves most *polar* compounds.

_____ **5.** Table salt, NaCl, is a *molecular* compound.

_____ **6.** In an *ionic* compound, one or more atoms loses electrons, and one or more atoms gains electrons.

_____ **7.** In solution, the charged regions of water molecules can pull a(n) *ionic* compound apart.

_____ **8.** Chemists say, "Like dissolves like." This means that dissolution tends to occur when the *solid* and the solute are similar in nature.

_____ **9.** Most oils tend to dissolve best in *nonpolar* solvents.

_____ **10.** Solubility tells you how *fast* a solute will dissolve.

Directions: *Answer the following questions on the lines provided.*

11. How is the solubility of a substance usually described?

_____

12. What is an unsaturated solution?

_____

13. How can a solution become supersaturated?

_____

14. What happens if you continue to add solute to a saturated solution?

_____

15. Can pressure affect the solubility of a substance in solution? Explain.

_____

16. How does temperature affect the solubility of a solute in solvent?

_____

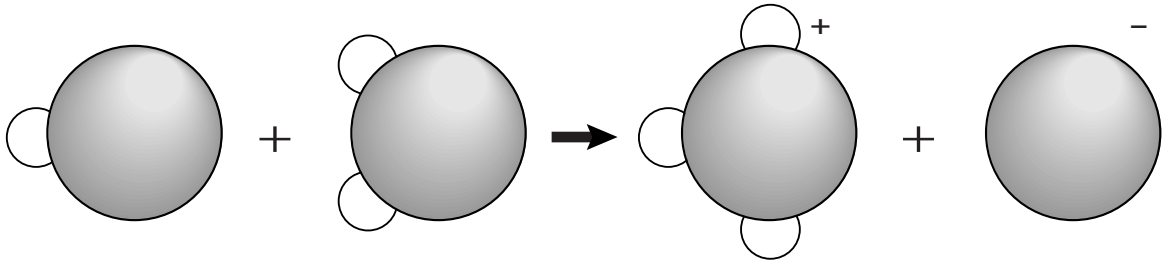
Name Date Class

SECTION 3 Study Guide

Acidic and Basic Solutions

Chapter 8

Directions: *Use the diagram below to answer questions 1 through 5.*



Directions: *Look at the left side of the diagram.*

1. What common substance is a three-atom molecule like the one in this illustration?

Directions: *Look at the right side of the diagram.*

2. Explain what has happened to the two-atom molecule.

3. Identify the four-atom ion formed if the ion from the two-atom molecule is a hydrogen ion.

4. What kind of solution—acid or basic—has been produced?

5. Will this solution conduct electricity? Why or why not?

Directions: *Answer the following questions on the lines provided.*

6. List three properties of acidic solutions.

7. List three properties of basic solutions.

8. Which ion increases in concentration when a strong acid is added to water?

9. Which ion increases in concentration when a strong base is added to water?

10. How are the relative strengths of acids and bases compared?

11. Name the process that occurs when you drop an antacid tablet into a glass of lemonade.

Name Date Class

SECTION 1 Study Guide

Simple Organic Compounds

Chapter 9

Directions: *Unscramble the terms to fill in the summary paragraph.*

Carbon can form **(1)**_____ (urof) **(2)**_____ (votenlac) bonds. This is the basis of **(3)**_____ (fiel) on Earth. One of carbon's most frequent bonding partners is **(4)**_____ (drohenyg). In the past, it was thought that **(5)**_____ (vigiln) organisms were required to make **(6)**_____(rogican) compounds, but in **(7)**_____(1288) scientists learned that they could make organic compounds in the laboratory.

Directions: *Explain what a saturated hydrocarbon is and give an example.*

8. _____

Directions: *Explain what an unsaturated hydrocarbon is and give an example.*

9. _____

Directions: *Explain what isomers are and draw an example of a pair.*

10. _____

Directions: *Fill in the table about naming organic compounds. Use* ***Figure 8*** *to help you.*

	Naming Strategy	Meaning of Strategy	Example
11.	**suffix *-ane***		
12.	**suffix *-ene***		
13.	**suffix *-yne***		
14.	**prefix *cyclo-***		
15.	**root *meth-***		
16.	**root *prop-***		
17.	**root *hex-***		
18.	**root *dec-***		
19.	**root *pent-***		
20.	**root *eth-***		
21.	**root *but-***		

Name Date Class

SECTION 2 Study Guide

Other Organic Compounds

Chapter 9

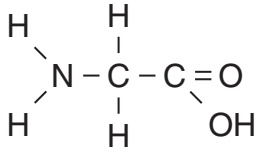
Directions: *Match each organic compound in the left column with the appropriate substitution group or groups in the right column. Some groups may be used more than once.*

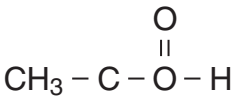
Organic Compound	Substitution Group
_____ **1.** carboxylic acid	hydroxyl group
_____ **2.** amine	carboxyl group
_____ **3.** alcohol	amino group
_____ **4.** amino acid	

Directions: *Complete the table below by placing an* **X** *in the appropriate box of the group of substituted hydrocarbons each compound belongs to.*

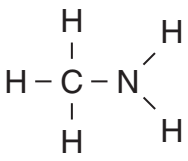
Compound	Alcohol	Carboxylic Acid	Amine	Amino Acid
5. vinegar (acetic acid)				
6. caffeine				
7. methanol				
8. formic acid				
9. glycine				
10. ethanol				

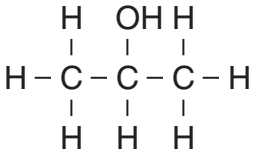
Directions: *Study the chemical formulas for the different compounds. Identify the substitute group in each compound, then name the type of group on the lines provided.*





11. _____ **12.** _____





13. _____ **14.** _____

Name Date Class

SECTION 3 Study Guide

Biological Compounds

Chapter 9

Directions: *Identify whether each statement describes a* **protein**, **carbohydrate**, **sugar**, **starch**, *or* **lipid**.

_____ **1.** In the body, these are broken down into simple sugars that the body can use for energy.

_____ **2.** These are more concentrated sources of energy than carbohydrates are.

_____ **3.** These substances are found in fresh fruit and sweet candy.

_____ **4.** Amino acids bond with each other to form these polymers.

_____ **5.** Hundreds or thousands of sugar molecules may join together to form these compounds.

_____ **6.** These polymers are found in butter, ice cream, and beeswax.

Directions: *Determine whether the italicized term makes each statement true or false. If the statement is true, write* **true**. *If the statement is false, write in the blank the term that makes the statement true.*

_____ **7.** Individual amino acids link together to form *carbohydrates.*

_____ **8.** There are *twenty* amino acids that bond in different combinations to form the proteins in a human body.

_____ **9.** People who eat a diet high in *saturated* fats have a higher rate of cardiovascular problems such as heart disease.

_____ **10.** *Lipids* contain sugars and starches which make them good pre-race choices for marathon runners.

Directions: *Answer the following questions on the lines provided.*

11. Give examples of foods that contain the three groups of biological compounds that are part of a balanced diet.

12. How do saturated lipids differ from unsaturated lipids?

Name Date Class

SECTION 1 Study Guide

What is motion?

Chapter 10

Directions: *Fill in the chart using information from the chapter.*

	Term	Definition	Includes Direction?
1.	distance		
2.	displacement		
3.	average speed		
4.	instantaneous speed		
5.	velocity		

Directions: *List three ways the velocity of a car can change.*

6. _____

7. _____

8. _____

Directions: *Explain how the speed of an object is changing if the line representing the object's motion on a distance-time graph becomes steeper.*

9. _____

_____

_____

Directions: *Explain how the displacement of an object could be zero while the distance the object travels is 150 m.*

10. _____

_____

_____

Name Date Class

SECTION 2 Study Guide

Acceleration

Chapter 10

Directions: *In the space provided, substitute a word for the word in italics to make the statement correct.*

_____ **1.** *Velocity* is a change in an object's motion.

_____ **2.** Acceleration is the rate of change of velocity with *distance*.

_____ **3.** When an object slows down, it has *no* acceleration.

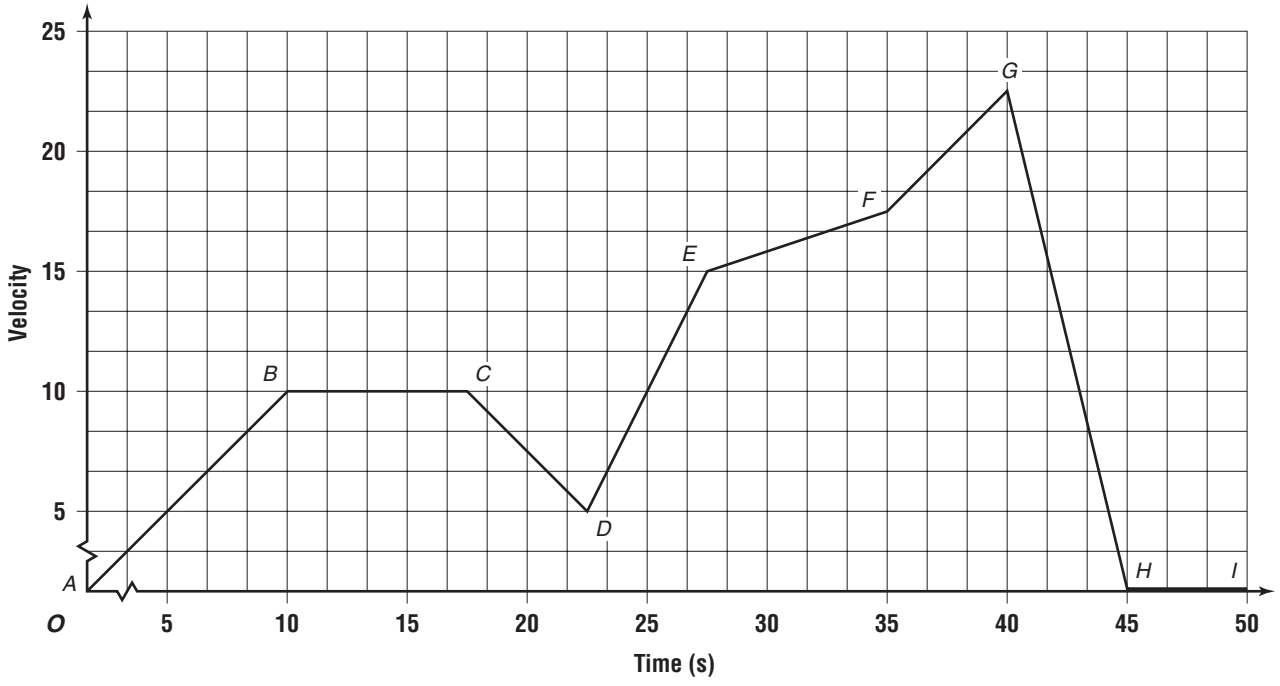
Directions: *Answer the following questions on the lines provided.*

4. A merry-go-round horse travels at a constant speed. Is it accelerating? Explain.

5. What is the unit for speed? For acceleration?

6. If an object has an acceleration of $-3\ m/s^2$, describe its motion.

Directions: *Study the velocity-time graph for an object in motion. Then answer the following questions.*



7. In what interval does the object have the fastest acceleration?

8. Over what interval(s) does the object have a negative acceleration?

9. Over what interval is the object stopped?

Name Date Class

SECTION 3 Study Guide

Momentum

Chapter 10

Directions: *In question 1, below, a code letter has been substituted for every letter of the alphabet. To find out what the sentence says, use the following key to decode it. In the key, the code letters are shown directly below the letters they stand for. Write the correct letter above each code letter, then read the sentence.*

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L V Y Q G Z M O B P F S R J D T E N I H X C K M A U

1.

H O G	H D H L S	R D R G J H X R	D Z	D V P G Y H I	H O L H	
Y D S S B Q G	K B H O	G L Y O	D H O G N	Q D G I	J D H	Y O L J M G

2. What is the law that is stated above?

_____

Directions: *Correctly complete each sentence by underlining the best of the three choices in parentheses.*

3. A feather floating in the air has (more, less, the same) momentum as a bowling ball on a shelf.

4. The momentum of an object depends on its mass and (velocity, acceleration, inertia).

5. The tendency for an object to resist change in its motion, is its (momentum, inertia, weight).

6. We say that momentum is conserved, yet objects slow down after collisions. This is because of (inertia, friction, mass).

Directions: *Answer the following questions on the lines provided.*

7. A 500 g model train car traveling at 0.8 m/s collides with a 300 g stationary car. The cars hook up and move off down the track together. How fast are they going?

_____

_____

8. Which has a greater momentum, a car or a bike moving at the same speed?

_____

9. What happens when two objects with the same mass collide?

_____

_____

Name Date Class

SECTION 1 Study Guide

Newton's First Law

Chapter 11

Directions: *Use the terms from the word bank to fill in the blanks in front of the correct phrases below.*

balanced	**net force**	**static**
force	**Newton's first**	**sliding**
friction	**rolling**	**unbalanced**

_____ **1.** the force that brings nearly everything to a stop, also useful for mountain climbers and baseball players

_____ **2.** the type of friction that acts on a rolling wheel, easier to overcome than static friction

_____ **3.** the combination of all forces acting on an object

_____ **4.** the law that describes the motion of objects that experience balanced forces

_____ **5.** the forces acting on an object whose motion is not

_____ **6.** the type of friction that you have to overcome to push a stationary object

_____ **7.** the type of friction acting on surfaces sliding on each other

_____ **8.** a push or pull

_____ **9.** the forces that cause the motion of an object to change

Directions: *Unscramble the words to fill in the blanks in this paragraph that explains how Galileo Galilei's ideas helped Isaac Newton to understand the nature of motion.*

Galileo realized that an object could be in motion even if the **(10)**_____ (ecsfro) acting on it were **(11)**_____ (aaebcdln). In real life, **(12)**_____ (cinotfri) is the force that **(13)**_____ (lswso) objects down and causes them to **(14)**_____ (sptso). Newton's **(15)**_____ (srift) law of motion described how forces cause the motion of objects to **(16)**_____ (aehncg): An object at rest remains at rest and an object in motion continues to move in a **(17)**_____ (gsahitr) line with constant **(18)**_____ (pedes) if the net force acting on it is **(19)**_____ (ozer).

Name Date Class

SECTION 2 Study Guide

Newton's Second Law

Chapter 11

Directions: *Select the term from the following list that matches each description. Some terms will not be used.*

a. 16 N
b. –16 N
c. gravity
d. $F = ma$
e. $a = \frac{F}{m}$
f. normal forces
g. air resistance
h. $F = m\left(\frac{9.8\ \text{m}}{\text{s}^2}\right)$
i. 600 N
j. Newton's second law of motion
k. terminal velocity
l. Newton's first law of motion

_____ **1.** acts against the direction of motion and gets larger as an object moves faster

_____ **2.** Force is equal to mass times acceleration.

_____ **3.** An object acted upon by a net force will accelerate in the direction of that force.

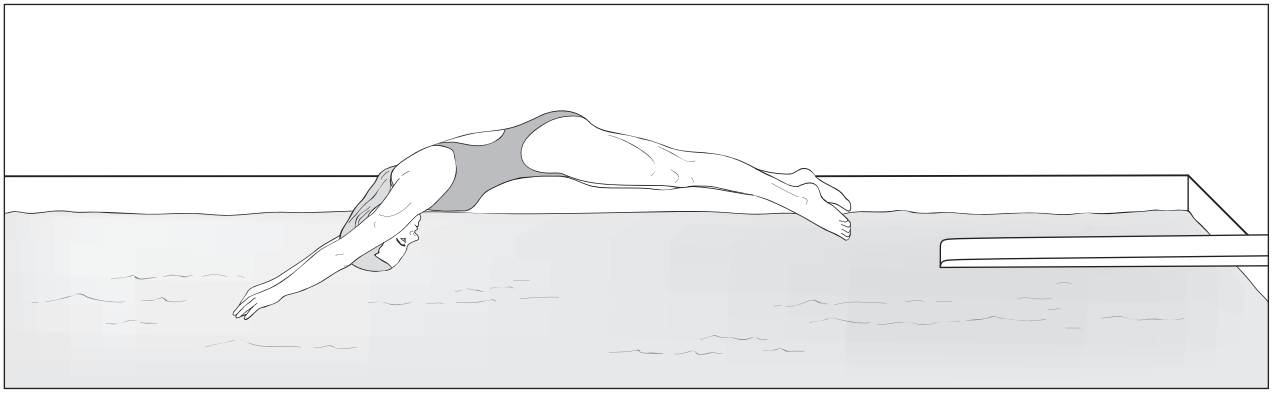
_____ **4.** the gravitational force on any object near Earth's surface

_____ **5.** the outward forces exerted by a surface

_____ **6.** the speed an object reaches when the force of gravity is balanced by the force of air resistance

_____ **7.** What force must be applied to a 60-kg object to make it accelerate at 10 m/s^2?

Directions: *Study the illustration of the diver. Then identify each statement as* **true** *or* **false**. *If the statement is false, change the word(s) in italics to make it true.*



_____ **8.** After the diver jumps forward from the diving board, the force of gravity will accelerate the diver *parallel* to the direction of motion.

_____ **9.** When the diver hits the water, the force of the water against her body can stop it about *five times faster* than the pull of gravity that accelerated it.

_____ **10.** If the diver doesn't have the correct form when she enters the water, the force of the water can *accelerate* her speed.

_____ **11.** *Air resistance* prevents the diver from moving in a straight line once she jumps from the platform.

Name Date Class

SECTION 3 Study Guide

Newton's Third Law

Chapter 11

Directions: *Complete the table by naming the action and reaction forces in the following examples.*

Example	Action force	Reaction force
1. A flying bird		
2. Two bumper cars collide		
3. Holding your hand out the window of a moving car		
4. Walking		
5. Touching your finger to your nose		

Directions: *Complete the following sentences using the correct terms or phrases.*

6. Newton's third law states, "For every action, there is an equal but _____."

7. There is no _____ in time between the action and the reaction.

8. One reason it's often easy to miss an action-reaction pair is because of the _____ of one of the objects.

9. Action-reaction forces are always the same _____ but are in opposite _____.

10. When you swim in water, your arms push the water _____. The water reacts by pushing _____ on your arms, causing your body to accelerate _____.

Directions: *Answer the following question using complete sentences.*

11. How could the action force of a canoe moving through water be increased?

_____

_____

_____

_____

Name Date Class

SECTION 1 Study Guide

Pressure

Chapter 12

Directions: *Fill in this chart explaining pressure at different elevations.*

	Location	Elevation	Description and Cause of Pressure	Pressure in kPa or atm
1.		+ 8850 m		
2.	**an ocean beach**			
3.			weight of the atmosphere + 1 atm pressure for each 10 m of water depth	
4.				22 000 kPa (220 atm)

Directions: *Write the words from the list beside the proper phrase below.*

barometer	**newton**	**pressure**
fluid	**pascal**	**straw**
square meter	**plasma**	**weight**

_____ **5.** a unit of pressure

_____ **6.** a device that uses atmospheric pressure to help you drink

_____ **7.** a device that measures atmospheric pressure

_____ **8.** force per unit area

_____ **9.** a unit of area

_____ **10.** a fluid that is found in the stars

_____ **11.** a force exerted on a table by a book resting on a table

_____ **12.** a state of matter that always takes the shape of its container

_____ **13.** a unit of force

Directions: *Explain why the pressure exerted by the tip of a nail on a wooden board will be much greater than the pressure that is exerted on the head of the nail by a hammer.*

14. _____

_____

_____

_____

Name Date Class

SECTION 2 Study Guide

Why do objects float?

Chapter 12

Directions: *In question 1, a code letter has been substituted for every letter of the alphabet. To find what the sentence says, use the following key to decode it. In the key, the code letters are shown directly below the letters they stand for. Write the correct letter above each code letter, then read the sentence.*

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
L V Y Q G Z M O B P F S R J D T E N I H X C K M A U

1. _____ _____ _____ ___ ___ _____ ___ _____
H O G V X D A L J H Z D N Y G D J L J D V P G Y H B I G E X L S

___ _____ _____ ___ _____ _____ ___ _____.
H D H O G K G B M O H D Z H O G Z S X B Q B H Q B I T S L Y G I

2. The decoded sentence is a statement of what principle? _____

_____

Directions: *In the blank in front of the statement, write* **true** *if the statement is true. If the statement is false, change the underlined word or words to make the statement true.*

_____ **3.** The pressure exerted on an object by a fluid is always <u>parallel</u> to the surface of the object.

_____ **4.** The buoyant force <u>depends</u> on the shape of the object in the fluid.

_____ **5.** As an object sinks deeper into a fluid, the buoyant force on it <u>remains the same</u>.

_____ **6.** Density is <u>force/unit area</u>.

Directions: *Answer the following questions on the lines provided.*

7. Three different cubes, A, B, and C, are 2 cm along each side. Cube A has a mass of 3 g, cube B has a mass of 7 g, and cube C has a mass of 9 g. Which of these cubes will float in water? Explain.

_____

_____

_____

8. If you are floating motionless in a pool, how do you know that a buoyant force exists?

_____

_____

_____

Name Date Class

SECTION 3 Study Guide

Doing Work with Fluids

Chapter 12

Directions: *Answer the following questions on the lines provided.*

1. State Pascal's principle.

2. Why are liquids sometimes more practical to use in a hydraulic system than gases?

Directions: *Circle the term in parentheses that best completes the statement.*

3. If you press against the bottom of a bottle of shampoo, the pressure on the sides of the bottle (increases, decreases, remains the same).

4. Hydraulic systems in shock absorbers in cars use (steel, rubber, fluids) to make the ride smooth.

5. If you increase the force on a small piston connected to a larger piston in a hydraulic system, the pressure on the larger piston will be (greater than, less than, the same as) the pressure on the smaller piston.

6. In the hydraulic system in question 5, the force exerted by the larger piston will be (greater than, less than, the same as) the force on the smaller piston.

7. In the hydraulic system in question 5, the distance the larger piston moves upward will be (greater than, less than, the same as) the distance the smaller piston moves down.

8. According to Bernoulli's principle, as the speed of a fluid increases, the pressure it exerts (increases, decreases, remains the same).

9. Bernoulli's principle is responsible for the (thrust, drag, lift) created on the wing of an airplane.

Directions: *Answer the following question on the lines provided.*

10. The small piston in a hydraulic system has a cross-sectional area of 0.5 m^2, and the large piston has an area of 3 m^3. What is the force exerted by the large piston if a force of 500 N is exerted on the small piston?

Name Date Class

SECTION 1 Study Guide

What is energy?

Chapter 13

Directions: *Label each situation with the type of energy it describes. Some situations may have more than one answer.*

chemical **electrical** **kinetic** **nuclear**
potential **radiant** **thermal**

_____ **1.** sunshine

_____ **2.** a rolling ball gains more of this kind of energy when it moves faster

_____ **3.** the ocean affects climate because it has so much of this kind of energy

_____ **4.** a rock balanced on a ledge has this kind of energy

_____ **5.** energy in the nuclei of atoms

_____ **6.** energy stored in chemical bonds

_____ **7.** energy produced in your body's cells

_____ **8.** energy that operates a toaster

_____ **9.** energy emitted by a toaster

_____ **10.** energy emitted by a lightbulb

_____ **11.** as objects become hotter, they have more of this type of energy

_____ **12.** three kinds of energy a match can help you get from firewood

_____ **13.** energy of moving objects

_____ **14.** energy of position

_____ **15.** energy stored in gasoline

Directions: *List two types of energy that depend on the mass of an object.*

16. _____

17. _____

Directions: *State the type of energy that is carried by light.*

18. _____

Name Date Class

SECTION 2 Study Guide

Energy Transformations

Chapter 13

Directions: *Fill in the blanks with the terms that best complete the statements.*

1. In every energy transformation, some _____ is released.
2. When you climb a rope, you change _____ energy into _____ energy.
3. Energy can never be created or destroyed, just _____ or _____.
4. As temperature increases, _____ energy increases.
5. Fireworks change _____ into _____ and _____ energy.
6. When a pendulum swings, if it is not continuously pushed, it will stop eventually because some of its energy is changed into _____ energy.
7. In the muscle cells in your body, _____ energy is changed into _____ energy.

Directions: *Answer the following questions on the lines provided.*

8. Trace the energy transformations from a hamburger you eat to riding your bike.

_____

_____

_____

9. In most forms of generation of electrical energy in power plants, the last two steps are the same. What are they?

_____

_____

_____

10. Trace the energy transformations from a radio signal to the music you hear.

_____

_____

_____

Name Date Class

SECTION 3 Study Guide

Sources of Energy

Chapter 13

Directions: *Circle the term in parentheses that correctly completes the following statements.*

1. (Oil, Wind, Water) is a fossil fuel.
2. As you go deeper into Earth, the temperature (increases, decreases, stays the same).
3. (Coal, Oil, Water) is a renewable resource.
4. (Geothermal energy, Fossil fuels, Hydroelectric energy) cause acid rain.
5. A mountainous region would be a likely source for (nuclear, hydroelectric, wind) energy.

Directions: *Determine whether each of the following statements is true or false. If it is true, write* **true** *on the line. If it is false, change the underlined term to make it true.*

6. <u>Fossil fuels</u> cause air pollution.

_____

7. <u>Geothermal</u> energy is caused by falling water.

_____

8. A <u>thermal cell</u> produces electricity directly from sunlight.

_____

9. A <u>reflecting panel</u> uses the kinetic energy of moving air.

_____

10. About 68% of the electrical energy in the United States is produced by <u>nuclear fuel</u>.

_____

Directions: *Answer the following questions on the lines provided.*

11. Explain why it would be necessary for a home using solar energy to have some type of an energy storage device.

_____

_____

12. Explain how hydroelectric energy works.

_____

_____

13. Give two advantages and two disadvantages of using fossil fuels.

_____

_____

Name Date Class

SECTION 1 Study Guide

Work and Power

Chapter 14

Directions: *Give an example of how you could apply a force to do work. Describe the necessary condition for the force to do work.*

1. _____

_____

Directions: *Give an example of how you could apply a force and not do work. Explain why the applied force is not doing work.*

2. _____

_____

Directions: *Write formulas to fill in the following chart.*

	Write a Formula to Calculate	Data That Is Needed	Formula
3.	Work		
4.	Power		

Directions: *Decide what each situation describes and write the term in the blank. You may use terms from the bank more than once or not at all.*

distance	**force**	**kinetic energy**	**power**
energy	**heat**	**potential energy**	**work**

_____ **5.** what is done when a baseball is lifted 0.7 m

_____ **6.** the form of energy you give a chair by pushing it across the floor

_____ **7.** the form of energy a book has that decreases as it tumbles from a library shelf

_____ **8.** what a dog did as he pushed his food bowl across the room with his nose

_____ **9.** measured in newtons

_____ **10.** something that can not be created nor destroyed

_____ **11.** measured in watts

_____ **12.** the form of energy a baseball has that increases when it is lifted 0.7 m

_____ **13.** a baseball is carried 7 m

_____ **14.** the rate at which work is done

Name Date Class

SECTION 2 Study Guide

Using Machines

Chapter 14

Directions: *Use the formula,* efficiency $= (W_{out}/W_{in}) \times 100\%$, *to calculate the efficiency of each of the following machines.*

1. A 600-N box is pushed up a ramp that is 2 m high and 5 m long. The person pushing the box exerts a force of 300 N. What is the efficiency of the ramp?

_____

_____

_____

_____

2. A person uses a fixed pulley to raise a 75-N object 40 m. The force exerted on the object is 120 N. What is the efficiency of the pulley?

_____

_____

_____

_____

Directions: *Complete the following sentences using the correct terms.*

3. The work input is equal to the work _____ in an ideal machine.

4. Machines are useful because they can change the _____,

_____, or _____ of the force you need to exert.

5. The force you exert on an object is the effort, or _____ force.

6. The _____ of a machine compares the input force to the output force.

7. _____ can reduce a machine's efficiency.

8. The ability of a machine to convert input work to output work is called the machine's _____.

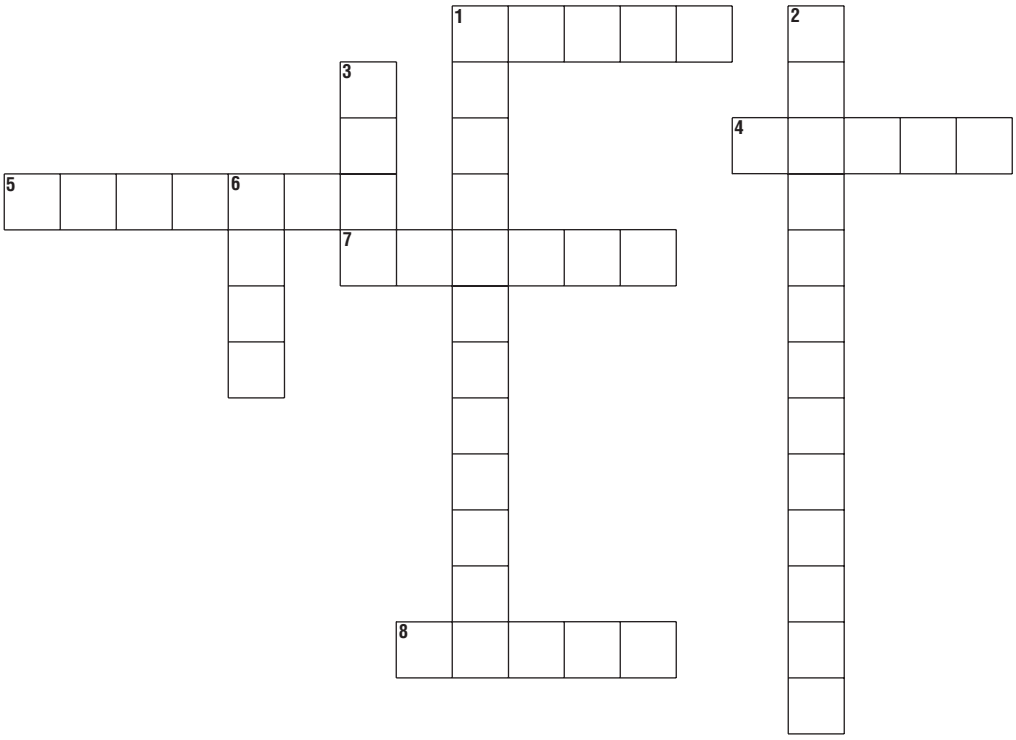
Name Date Class

SECTION 3 Study Guide

Simple Machines

Chapter 14

Directions: *Use the clues to complete the puzzle.*



Across

1. A moving inclined plane
4. An inclined plane wrapped around a post
5. The pivot point of a lever
7. A surface that re-directs force using a rope
8. A rod that pivots about a point

Down

1. Two rigidly attached wheels that rotate together
2. A sloped surface
3. An inclined plane
6. Used with a pulley to change the direction of a force

Name Date Class

SECTION 1 Study Guide

Temperature and Thermal Energy

Chapter 15

Directions: *Unscramble the words to fill in the blanks in the summary statements.*

(1)_____ (rateeputerm) is a measure of the average kinetic energy of the **(2)**_____ (oeeuscllm) in a substance. As the temperature increases, the molecules have more **(3)**_____ (tiencikt greeny), and are moving **(4)**_____ (reastf). For most materials, as the temperature increases, the molecules in the material move **(5)**_____ (feathrr) apart, causing the material to **(6)**_____ (pandex). When the material cools, its molecules move more **(7)**_____ (yowlls) and the material **(8)**_____ (strancoct). For the same temperature increase, **(9)**_____ (udsiqli) usually expand more than **(10)**_____ (dlsois). On the **(11)**_____ (iueslcs) temperature scale, the **(12)**_____ (bilingo) point of water is 100° C and the **(13)**_____ (zengerif) point of water is 0° C. The **(14)**_____ (metlahr ygeren) of an object is the sum of the **(15)**_____ (nkctei) and **(16)**_____ (lontpetia) energy of all the molecules in the object.

Directions: *Use the terms from the word bank to complete the section summary.*

greater	**increases**	**more**	**thermal energy**
height	**kelvin**	**temperature**	

A practical way to measure **(17)**_____ is to use a thermometer. One type of thermometer contains a liquid that expands as its temperature **(18)**_____, so that the **(19)**_____ of the liquid in the tube depends on the temperature. On the **(20)**_____ temperature scale, the lowest possible temperature is 0 K. If two glasses of water at the same temperature are poured into a container, the **(21)**_____ of the water in the container is **(22)**_____ than the thermal energy of the water in either glass, because there are **(23)**_____ molecules of water in the container.

Name Date Class

SECTION 2 Study Guide

Heat

Chapter 15

Directions: *Answer the following questions on the lines provided.*

1. How is heat related to thermal energy? Can an object contain heat?

_____

_____

2. Explain how convection could be used to heat a room with a hot radiator on one side of the room.

_____

_____

Directions: *Fill in the blanks with the terms that best complete the statements.*

3. Heat always moves from a(n) _____ object to a(n) _____ object.

4. When two objects are in contact, heat is best transferred by _____.

5. Heat is transferred by conduction when _____ moving molecules bump into _____ moving molecules and transfer _____ energy.

6. The heat from an electric space heater is transferred to you by _____.

7. Radiation transfers thermal energy by _____.

8. Heat is transferred in gases or liquids primarily by _____.

Directions: *Correctly complete each sentence by underlining the best of the three choices in parentheses.*

9. A small pan of water at 50°C is brought into contact with a larger pan of water at 50°C. Heat is transferred (from the large pan to the small pan, from the small pan to the large pan, not at all).

10. Convection involves (molecules moving, molecules colliding, electromagnetic waves).

11. Metals are good (reservoirs, insulators, conductors) because they transfer heat easily.

12. Cooking tools often have plastic handles because plastic is a good (conductor, insulator, reservoir) of heat.

13. A measure of how well a substance absorbs heat is its (equivalent heat, calorie content, specific heat).

14. Heat transfer by (convection, radiation, conduction) occurs when energy is transferred by electromagnetic waves.

Name Date Class

SECTION 3 Study Guide

Engines and Refrigerators

Chapter 15

Directions: *Answer the following questions on the lines provided.*

1. What is a heat engine?

2. In a car with a four-cycle engine, why is it an advantage to have at least four cylinders?

3. In nature heat only moves from a hotter object to a cooler object. How is it possible for a heat pump to remove heat from a cold object and add it to a hotter object?

Directions: *Identify each statement as* **true** *or* **false**. *If it is false, change the italicized term to make the statement true.*

_____ **4.** In an air conditioner heat from inside the house is *absorbed* by coolant within pipes.

_____ **5.** If you let the air out of a bicycle tire, the valve becomes cold. This is because when a gas under pressure expands, it *releases energy to* the environment.

_____ **6.** When a heat pump is used for heating, it *removes* heat from the cold air outside and *adds* heat to the warm air inside.

_____ **7.** A diesel engine *does not* use spark plugs.

_____ **8.** An engine that uses the process of burning fuel within the engine is called a(n) *internal combustion engine.*

_____ **9.** A heat engine is any device that converts thermal energy into *kinetic energy.*

_____ **10.** In internal combustion engines, fuel burns in a *combustion chamber* inside the engine.

Name Date Class

SECTION 1 Study Guide

What are waves?

Chapter 16

Directions: *Use the words from the word bank to fill in the blanks in front of the correct phrases below.*

compression	**mechanical**	**sound**	**water**
compressional	**medium**	**transverse**	**waves**
crest	**radiant**	**trough**	**X-ray**
electromagnetic	**rarefactions**	**vibrating**	

_____ **1.** a type of wave that requires matter to transmit energy

_____ **2.** part of a compressional wave where molecules are farthest apart

_____ **3.** all waves are produced by something that is doing this

_____ **4.** a type of wave that can carry energy without matter

_____ **5.** rhythmic disturbances that carry energy without carrying matter

_____ **6.** a type of compressional wave made by a guitar

_____ **7.** a material in which a mechanical wave is traveling

_____ **8.** a type of transverse wave

_____ **9.** a type of wave in which matter moves at right angles to the direction the wave travels

_____ **10.** high point of a transverse wave

_____ **11.** the type of energy emitted by the Sun

_____ **12.** part of a compressional wave where molecules are closest together

_____ **13.** a type of wave where the matter moves back and forth along the same direction that the wave travels

_____ **14.** low point of a transverse wave

_____ **15.** a type of electromagnetic wave

Directions: *Explain how ocean water moves within a wave, and how a wave can carry energy without moving matter.*

16. _____

_____

_____

Name Date Class

SECTION 2 Study Guide

Wave Properties

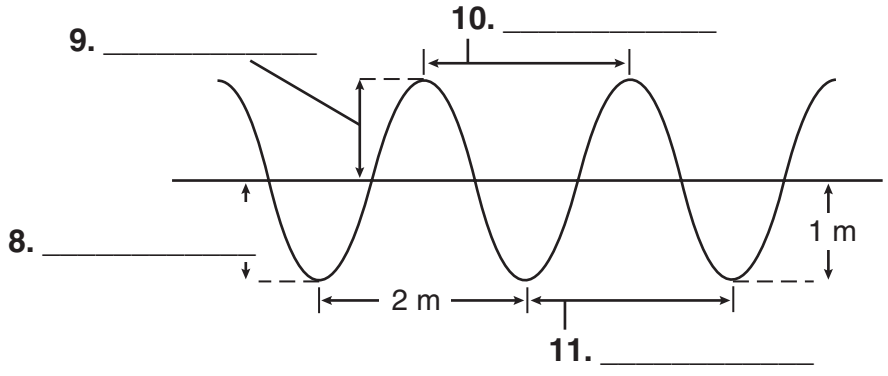
Chapter 16

Directions: *Circle the term that correctly completes each sentence.*

1. The wavelength of a transverse wave is often measured from (crest to crest, crest to trough).
2. Waves with greater amplitudes carry (more, less) energy than waves with smaller amplitudes.
3. The amplitude of a wave can be measured from the (medium, crest) or the (trough, wavelength) to the rest position of the wave's medium.
4. The number of waves that pass a point in one (second, minute) is the wave's (amplitude, frequency).
5. Waves with longer wavelengths have a (lower, higher) frequency and waves with shorter wavelengths have a (lower, higher) frequency.
6. A group of molecules that are squeezed together is called a (rarefaction, compression).
7. Electromagnetic waves travel faster in (gases, solids).

Directions: *Use the words below to label the diagram. You will use each term more than once. Then answer the questions.*

amplitude **wavelength**



12. What is the wavelength of the wave shown in the diagram?

_____

13. What is the amplitude of the wave shown in the diagram?

_____

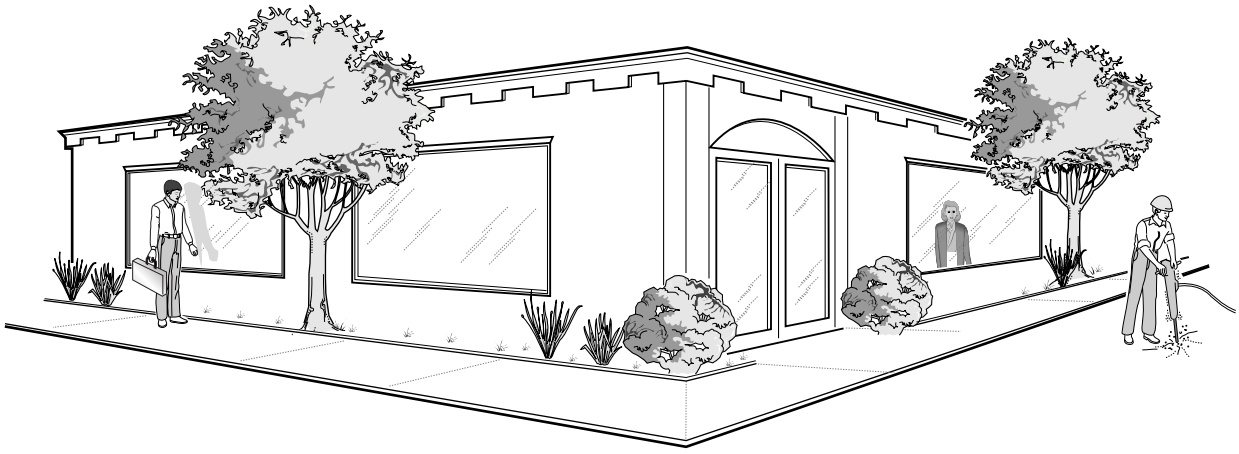
Name Date Class

SECTION 3 Study Guide

Wave Behavior

Chapter 16

Directions: *Study the following picture. Think about light waves and sound waves. Then answer each question.*



1. The woman in the building watches the worker through a window. What happens to the light waves as they pass though the window? _____

2. Why is the worker wearing ear protectors? How do ear protectors work to block harmful sound waves?

3. The man down the street hears the jackhammer around the corner, although he cannot see it. What behavior of waves is responsible for this? _____

4. The man down the street can see an image of himself in the window. What behavior of waves is responsible for this? _____

5. The man down the street can **NOT** see an image of himself in the wall of the building. What behavior of waves is responsible for this? _____

Name Date Class

SECTION 1 Study Guide

What is sound?

Chapter 17

Directions: *Use the terms from the word bank to fill in the summary sentence blanks.*

amplitude	**decibel**	**energy**	**slower**
collide	**Doppler**	**loudness**	**vibrates**
compressions	**echolocation**	**rarefactions**	**wavelength**

Sound waves are produced by something that (**1**)_____. Sound waves travel through a material as particles in the material (**2**)_____ with each other. Sound waves have regions called (**3**)_____, where particles are closer together, and (**4**)_____, where particles are farther apart. The distance from one compression to the next, or from one rarefaction to the next is the (**5**)_____ of the sound wave. Sound waves usually travel (**6**)_____ in gases than in solids or liquids. The more (**7**)_____ carried by a sound wave, the larger its (**8**)_____. The intensity of sound waves is measured on the (**9**)_____ scale. The (**10**)_____ of a sound is the human perception of the intensity of the sound waves.

Directions: *Decide whether the term that fills in the blank is in column A or column B and write the correct letter in the last column.*

	Sentence	A	B	Answer
11.	Louder sound waves carry _____ energy than soft sound waves.	more	less	
12.	Loud sounds travel _____ soft sounds.	faster than	at the same speed as	
13.	Sound waves in cold weather travel _____ than they do in hot weather.	faster	slower	
14.	This is because the molecules move faster when they are _____.	warmer	colder	
15.	An increase of 20 dB means there is _____ times more sound energy.	20	100	
16.	An object to be located by sonar can be assumed to be farther away when the echo takes a _____ time to return to the sensor.	longer	shorter	
17.	When a sound-emitting object moves toward a person, the pitch of the sound will seem _____.	lower	higher	

Name Date Class

SECTION 2 Study Guide

Music

Chapter 17

Directions: *Answer the following questions on the lines provided.*

1. What is the difference between music and noise?

_____

_____

_____

2. What vibrates in each of the following to produce the initial sound?

   a. your voice _____

   b. a piano _____

   c. a trumpet _____

3. What is resonance?

_____

_____

Directions: *Fill in the blanks with the terms that best complete the statements.*

4. A musical instrument will vibrate with its _____ when played.
5. The guitar body of an acoustic guitar resonates to _____ the sound when a string is plucked.
6. _____ are repeated echoes of sound.
7. The pitch of the lowest sound produced by an instrument is its _____.
8. The shorter the string of a violin, the _____ the pitch.
9. In a xylophone, the longer the bar, the _____ the pitch.
10. When two notes very close together in pitch interfere, they produce regular changes in loudness called _____.
11. The purpose of the _____ ear is to amplify sound.
12. _____ in the inner ear generate nerve impulses that are transmitted to the brain to be interpreted as sound.
13. As people age, their _____ frequency hearing tends to decrease.

Name Date Class

SECTION 1 Study Guide

The Nature of Electromagnetic Waves

Chapter 18

Directions: *Use the words from the word bank to complete the section summary.*

charged	**energy**	**magnetic**	**Earth**
force	**matter**	**electric**	**gravitational**
mechanical	**electromagnetic**		

A wave can transfer (**1**)_____ without transferring (**2**)_____. The type of wave that needs matter to transfer energy is a (**3**)_____ wave. An (**4**)_____ wave can transfer energy through empty space.

A force field enables one object to exert a (**5**)_____ on another object, without the two objects touching. (**6**)_____ is surrounded by a (**7**)_____ field that extends into space and pulls objects downward. Protons and electrons have (**8**)_____ charge. A moving (**9**)_____ particle is surrounded by an electric field and a (**10**)_____ field.

away	**light**	**trough**	**distance**
motion	**vibrating**	**frequency**	**move**
wave	**higher**	**radiant**	**wavelengths**

A charged particle that moves back and forth, or vibrates, produces (**11**)_____ electric and magnetic fields. These fields move (**12**)_____ from the vibrating charge in many directions, forming an electromagnetic (**13**)_____. The (**14**)_____ from one crest to the next or from one (**15**)_____ to the next is the wavelength. The number of vibrations the charge makes in one second is the (**16**)_____ of the wave, and is the same as the number of (**17**)_____ that pass any point in one second.

The energy carried by an electromagnetic wave is called (**18**)_____ energy. The (**19**)_____the frequency of an electromagnetic wave, the more energy it carries. If an electromagnetic wave strikes a charged particle, the wave causes the particle to (**20**)_____. Some of the energy carried by the wave is transferred into the particle's energy of (**21**)_____. All electromagnetic waves travel at the speed of (**22**)_____.

Name Date Class

SECTION 2 Study Guide

The Electromagnetic Spectrum

Chapter 18

Directions: *Answer the following questions on the lines provided.*

1. What is the electromagnetic spectrum?

2. Explain how radar helps air traffic controllers.

Directions: *Circle the term in parentheses that best completes the statement.*

3. The electromagnetic waves with the longest wavelengths are (radio waves, infrared waves, gamma rays).
4. Your body can sense (radio waves, infrared waves, microwaves) as heat.
5. Electromagnetic waves with wavelengths between those of infrared and ultraviolet waves are (microwaves, X rays, visible light).
6. Portable phones use (infrared waves, visible light, microwaves) to operate.
7. Ultraviolet waves have (more energy than, less energy than, the same energy as) X rays.
8. Cellular phones use (microwaves, infrared waves, ultraviolet waves).
9. (Gamma rays, X rays, Ultraviolet waves) are used in hospitals to sterilize equipment.
10. Pit vipers have special organs that detect changes in (infrared, ultraviolet) waves.
11. The ozone layer in the atmosphere is important because it absorbs excess (visible light, radio waves, ultraviolet radiation).
12. The waves with the highest frequencies in the electromagnetic spectrum are (gamma rays, X rays, radio waves).
13. As the frequency of an electromagnetic wave decreases, its wavelength (increases, decreases, remains the same).

Name Date Class

SECTION 3 Study Guide

Using Electromagnetic Waves

Chapter 18

Directions: *Answer the following questions on the lines provided.*

1. How is information transmitted from a radio station's disk jockey to your ears?

2. List two advantages of using radio waves for communications.

3. What is the GPS? How does it work?

Directions: *Circle the term in parentheses that best completes the statement.*

4. When you modulate a radio wave, you (change it, intensify it, make it louder).

5. To tune in a radio station, you move your dial to the frequency of its (signature wave, carrier wave, microwave).

6. AM radio carries information by changing the (amplitude, speed, frequency) of the radio wave.

7. In fiber-optic cables, telephone information is transmitted as (sound, light, ultraviolet) waves.

8. Radio waves that transmit information to the other side of the world are sent (to satellites, directly through Earth).

Name Date Class

SECTION 1 Study Guide

Properties of Light

Chapter 19

Directions: *Use the words in the word bank to complete the summary statements.*

absorbs	**green**	**reflected**
all	**light bulbs**	**Sun**
blue	**longest**	**violet**
combining	**orange**	**wavelength**
eyes	**prism**	**white**
emits	**red**	**yellow**

A light source (**1**)_____ countless light rays in (**2**)_____ directions. Light sources include (**3**)_____ and the (**4**)_____. When light strikes an object, rays are (**5**)_____in all directions. You see the object when some of the rays enter your (**6**)_____.

A (**7**)_____ separates a beam of white light into many colors. Each different color of light has a different (**8**)_____. The color of light with the shortest wavelength is (**9**)_____ and the color with the (**10**)_____ wavelength is red. A black object (**11**)_____ all wavelengths of visible light and a (**12**)_____ object reflects all wavelengths of visible light. The color of an object depends on the wavelengths of light that it reflects. For example, a purple leaf reflects (**13**)_____ light and absorbs all other wavelengths. Some colors are formed by (**14**)_____ colors. The three primary colors of light are (**15**)_____, (**16**)_____ and (**17**)_____. (**18**)_____light, for example, can be formed by a combination of red light and green light.

Directions: *Define* translucent, transparent, *and* opaque *and give an example of an object of each type.*

		Definition	Example
19.	**opaque**		
20.	**translucent**		
21.	**transparent**		

Name Date Class

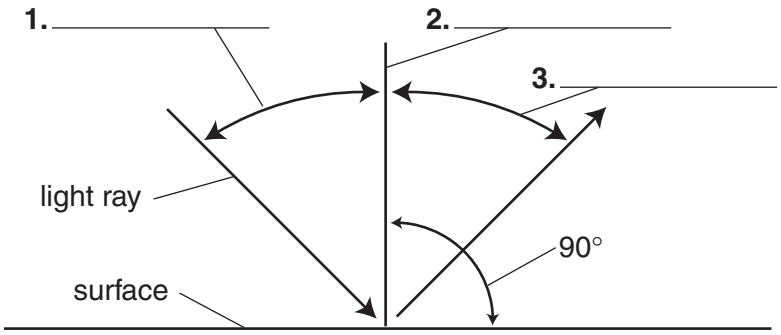
SECTION 2 Study Guide

Reflection and Mirrors

Chapter 19

Directions: *Use the items listed below to label the diagram. Then complete the sentence that describes the diagram.*

angle of incidence **angle of reflection** **the normal**



The law of reflection states that the **4.** _____ of **5.** _____ is equal to the **6.** _____ of **7.** _____.

Directions: *Answer the following questions on the lines provided.*

8. Light rays reflect off a rough surface.

a. Do the rays reflect in many directions or few? _____

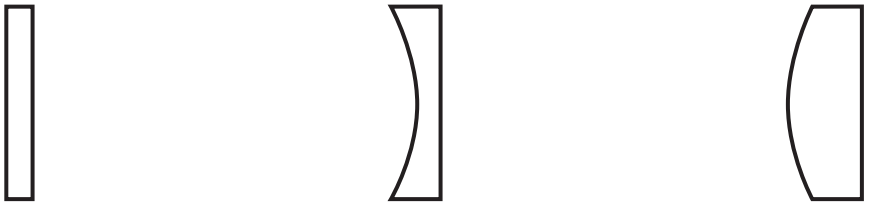
b. What type of reflection is this? _____

9. Light rays reflect off a smooth surface.

a. Do the rays reflect in many directions or few? _____

b. What type of reflection is this? _____

Directions: *Label each diagram as a* **plane mirror**, *a* **concave mirror**, *or a* **convex mirror**. *Draw incoming and reflecting light rays.*



10. _____ **11.** _____ **12.** _____

Name Date Class

SECTION 3 Study Guide

Refraction and Lenses

Chapter 19

Directions: *Read each pair of statements. One or both of them are correct. Circle the ones that are correct. Cross out any incorrect ones.*

1. Light travels at the same speed in all mediums.

Light travels at different speeds in different mediums.

2. Refraction is the change of speed of a light wave as it moves from one medium to another.

Refraction is the bending of a light wave as it moves from one medium to another.

3. The greater the change in the speed of a light wave, the more it refracts.

The greater the change in the speed of a light wave, the less it refracts.

4. A lens is a transparent object with at least one curved side that causes light to refract.

A lens is a transparent object with two curved sides that cause light to refract.

5. A convex lens is also called a converging lens.

A concave lens is also called a diverging lens.

Directions: *Identify each statement as describing a* **convex lens**, *a* **concave lens**, *or* **both**.

_____ **6.** a lens that is thicker in the center than at the edges

_____ **7.** a lens that is thicker at the edges than at the center

_____ **8.** causes light rays passing through it to meet at a focal point

_____ **9.** has an optical axis

_____ **10.** an object more than two focal lengths from the lens will have an inverted image

_____ **11.** causes light rays passing through it to diverge

_____ **12.** causes light rays passing through it to refract

_____ **13.** used to correct nearsightedness

_____ **14.** used to correct farsightedness

_____ **15.** creates a focal point

Name Date Class

SECTION 4 Study Guide

Using Mirrors and Lenses

Chapter 19

Directions: *Using complete sentences, answer the following questions about microscopes.*

1. What is an objective lens?

_____

2. What is an ocular lens?

_____

3. Explain how a microscope allows the viewer to see very small objects?

_____

4. Why is it important to know that the lenses in microscopes are convex lenses?

_____

Directions: *The terms below describe reflecting or refracting telescopes. Write the terms that best describe each type in the correct column. Some terms will appear in both lists.*

heavy weight	**gathers as much light as possible**		**enlarges gathered light**
convex lens	**reflects gathered light**	**sags when too large**	**more expensive**
does not sag	**less expensive**	**concave mirror**	**lighter weight**

Refracting Telescope

5. _____ **8.** _____

6. _____ **9.** _____

7. _____ **10.** _____

Reflecting Telescope

11. _____ **14.** _____

12. _____ **15.** _____

13. _____ **16.** _____

Directions: *Answer the following question about cameras, using complete sentences.*

17. Your friend wants to build a camera and asks you to pick up a concave lens at the hobby shop. You say that is the wrong kind of lens. Explain why you say this and what is important to know about a convex lens in a camera.

_____

_____

Name Date Class

SECTION 1 Study Guide

Electric Charge

Chapter 20

Directions: *Unscramble the terms to fill in the blanks in the summary paragraphs.*

When an atom gains electrons, it gains a **(1)**_____ (venagtie) charge. When an atom loses electrons, it becomes **(2)**_____ (soipviet). When many electrons move from one solid object to another, the charge created is called **(3)**_____ (actsti). Unlike electrons, **(4)**_____ (roptnos) usually do not move from one object to another. However, in **(5)**_____ (loustinos) both are positive and negative. **(6)**_____ (snio), such as sodium and **(7)**_____ (drochlie), can move. This enables **(8)**_____ (never) impulses to be transmitted.

Directions: *List the four steps that use ions to transmit nerve impulses.*

9. _____

10. _____

11. _____

12. _____

Directions: *Match the terms from the word bank with the correct phrases below.*

conductor	**electric field**	**electric force**	**insulator**
electric discharge	**electric field lines**	**induced charge**	

_____ **13.** something charged objects exert on each other, that depends on the amount of charge on each object and the distance between them

_____ **14.** something that causes two charged balloons to repel each other without touching

_____ **15.** lines that are drawn away from a positive charge and toward a negative charge

_____ **16.** a material in which electrons can not move easily, such as glass and plastic

_____ **17.** a material in which electrons can move easily, such as gold and copper

_____ **18.** electric charge moves quickly from one location to another, as in a lightning strike

_____ **19.** using Earth as a conductor to avoid lightning damage

_____ **20.** separation of positive and negative charges due to an electric field

Name Date Class

SECTION 2 Study Guide

Electric Current

Chapter 20

Directions: *Complete the paragraphs using the terms listed below.*

chemical reactions	**ohms**	**electric potential energy**	
resistance	**volts**	**electric current**	
negative	**positive**	**V**	**circuit**

Life as we know it would be impossible without electricity. Think of the number of electrical devices we rely on every day: lights, refrigerators, computers, televisions, flashlights, car headlights, watches–the list is endless. All of these devices, and countless others, need a constant, steady source of electrical energy. This steady source of electrical energy comes from a(n) **1.** _____, which is the steady flow of electrons through a conductor.

This steady flow of electricity requires a closed path, or **2.** _____, through which to flow. Its basic elements are a conductor, such as wire, through which electrons flow and a source of electrons, such as a battery.

An electric current carries energy that comes from separating positive and negative charges. Negatively charged electrons "seek out" positively charged electrons to recombine. This can only happen if they travel through the circuit. In a circuit, the electrons flow from the **3.** _____ end to the **4.** _____ end.

A familiar source of electrons in electric circuits is a battery. The total stored electrical energy in a battery—the energy available to do work—is called **5.** _____. This energy is measured in units called **6.** _____, which is abbreviated **7.** _____. Batteries rely on **8.** _____ to separate positive and negative electrical charges. When the negative and positive ends of the charges are connected by a conductor, a circuit forms and the electrical energy is available to do work.

However, the electrons don't flow completely freely through the circuit. Depending on the material used for the conductor, the electrons have more or less difficulty flowing. The measure of how difficult it is for electrons to flow through a circuit is called **9.** _____. This is measured in units called **10.** _____.

Name Date Class

SECTION 3 Study Guide

Electric Circuits

Chapter 20

Directions: *Use the terms and statements from the list below to complete the table.*

kilowatt **amount of electric energy used by a device**
series: a circuit that has only one path for the electric current to follow
Ohm's law **power = current × voltage** **series circuit**
parallel: a circuit that has more than one path for the electric current to follow
watt **voltage = current × resistance** **kW**
P = I × V **parallel circuit** **V = I × R** **W**

Important Facts About Electric Circuits	
1. There is a relationship among voltage, current, and resistance in an electric circuit.	
a. Name of law:	
b. Expression of law:	
c. Equation:	
2. There are two types of electric circuits.	
a. Two types of circuits:	**(1)** **(2)**
b. Definitions of these circuits:	**(1)** **(2)**
3. The electrical power of a circuit can be measured.	
a. Definition of electrical power:	
b. Unit of electrical power:	**(1)** Name: **(2)** Abbreviation: **(3)** Term for 1000 units: **(4)** Abbreviation for 1000 units:
c. Determining the electrical power of a circuit:	**(1)** Expression: **(2)** Formula:

SECTION 1 Study Guide

What is magnetism?

Chapter 21

Directions: *You have two bar magnets. Describe or draw different arrangements of the two magnets to make the magnets behave as described.*

	What the magnets will do	Diagram or Description	
1.	repel, end on	**1.**	**2.**
2.	attract, end on	**3.**	**4.**
3.	attract, side by side	**5.**	
4.	repel, side by side	**6.**	

Directions: *Use the words from the word bank to fill in the blanks in the summary paragraph below.*

away	**magnets**	**rocks**	**toward**
charged	**iron**	**north**	**south**
domains	**magnetosphere**	**outer**	**stronger**

Magnetic field lines begin at a magnet's (**7**)_____ pole and end at the (**8**)_____ pole. Field lines that curve (**9**)_____ each other show attraction. Field lines that curve (**10**)_____ from each other show repulsion. When the field is (**11**)_____, the lines will be closer together.

The atoms of magnetic materials behave like tiny (**12**)_____. Magnetic materials such as (**13**)_____ contain groups of atoms called magnetic (**14**)_____ in which the magnetic fields of the atoms in the group point in the same direction. Earth is surrounded by a magnetic field that is thought to be produced by the movement of molten iron in Earth's (**15**)_____ core. Earth's magnetic field affects a region of space called the (**16**)_____ that deflects most of the (**17**)_____ particles that come from the Sun. The magnetism of some ancient (**18**)_____ contains a record of the direction of Earth's magnetic field and how it has changed over time.

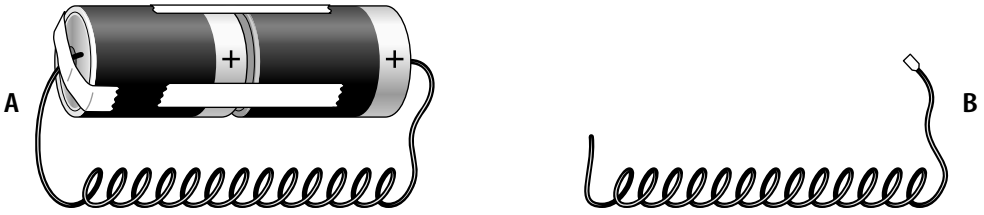
Name Date Class

SECTION 2 Study Guide

Electricity and Magnetism

Chapter 21

Directions: *Use the figures below to answer questions 1 through 5.*



1. In figure A, when electrons move in the coiled wire what is produced?

2. In figure A, if you changed the direction of electron flow by switching the connections to the battery, what would happen?

3. In figure A, if an iron bar were inserted into the wire coil, what would happen to the iron bar?

4. Suppose you wrapped an iron bar with wire and connected the ends of the wire to a battery. What is this device called? What would happen to this device if you disconnected the battery?

5. In figure B, if you repeatedly moved a bar magnet in and out of the wire coil, what would be produced? What is this process called?

Directions: *Answer the following questions on the lines provided.*

6. What is the function of an electric motor in terms of electric power and motion?

7. Briefly explain how an electric motor works.

8. What is the function of an electric generator in terms of electric power and motion?

9. Briefly explain how an electric generator works.

Name Date Class

SECTION 1 Study Guide

Electronics

Chapter 22

Directions: *Fill in the summary chart below with information from the chapter.*

	Type of Signal	Analog	Digital
1.	Description of signal		
2.	Example of signal		
3.	Devices that use that type of signal		

Directions: *List four things that information from an electronic signal can be used to produce.*

4. _____

_____

Directions: *Unscramble the words to complete the section summary statements.*

A changing electric current that carries information is called an **(5)**_____ (cnoirtlcee ainslg).

You could make a digital signal by measuring the temperature every **(6)**_____ (uroh) and making a graph with the results. Another way would be to **(7)**_____ (alemsp) an analog signal at intervals.

Old televisions used **(8)**_____ (umcavu) tubes. They were **(9)**_____ (lubyk), used a lot of electrical **(10)**_____ (wrope), and created a lot of **(11)**_____ (athe).

Modern electronic devices use **(12)**_____ (omoisseucdtrn), which may be n-type or p-type. A **(13)**_____ (oddie) is a device that only allows current to flow in one direction. A **(14)**_____ (anssorrtti) is a device that can be used to amplify signals or as an electronic switch.

Name Date Class

SECTION 2 Study Guide

Computers

Chapter 22

Directions: *Answer the following questions on the lines provided.*

1. What is a computer?

_____

_____

2. Name three places not mentioned in the text where you could find computers.

_____

_____

Directions: *Fill in the blanks with the term that best completes each statement.*

3. Computers store information as _____ information.

4. 0 and 1 are the digits in the _____ system.

5. Each 0 or 1 is called a _____ and eight of these make one _____.

6. Each position in a binary number is based on a(n) _____ of 2.

7. Our everyday number system is based on _____, the binary system is based on 2.

8. The binary number 1011 is _____ in the base 10 system.

9. In a computer, the digits 0 and 1 represent switch positions of _____ and _____.

10. A computer's temporary memory is called _____ or _____.

11. The material stored in RAM will be _____ when the computer is turned off.

12. Information that tells a computer how to operate is stored in _____ or _____.

13. A microprocessor is also called a (n)_____.

14. A _____ is a list of instructions that tells a computer what to do.

15. Computer hardware consists of _____, _____, _____, and a central processing unit.

16. Information on a hard disk or on a floppy disk is stored _____.

17. The Internet is a collection of linked _____.