HOLT CALIFORNIA

Physical Science

Study Guide A
with Directed Reading Worksheets

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TO THE STUDENT

Do you need to review the concepts in the text? If so, this booklet will help you. The *Study Guide* is an important tool to help you organize what you have learned from the chapter so that you can succeed in your studies. The booklet contains a Directed Reading worksheet and a Vocabulary and Section Summary worksheet for each section of the chapter.

Use these worksheets in the following ways:

- as a reading guide to identify and study the main concepts of each chapter before or after you read the text
- as a place to record and review the main concepts and definitions from the text
- as a reference to determine which topics you have learned well and which topics you may need to study further

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Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Science and Scientists (pp. 8–13)

STARTING WITH A QUESTION

Write the letter of the correct answer in the space provided.

_____ **1.** What is knowledge obtained by investigating the natural world called?
- **a.** questions
- **b.** science
- **c.** facts
- **d.** nature

In Your Own Neighborhood

_____ **2.** What might happen if you looked at your neighborhood in a new way?
- **a.** You might ask questions.
- **b.** You might discover a new planet.
- **c.** You might get sick.
- **d.** You might not get home.

The World and Beyond

_____ **3.** What places do scientists ask questions about?
- **a.** only about Earth
- **b.** only about what's around them
- **c.** only about things they see
- **d.** about any place in the universe

INVESTIGATION: THE SEARCH FOR ANSWERS

Research

Use the terms from the following list to complete the sentences below.

experimentation research observation

4. Looking up information on the Internet is _____.

5. Carefully looking and recording what you see is _____.

6. Using different mirrors to see how your reflection changes is _____.

APPLYING THE ANSWERS

Saving Lives

_____ **7.** How have scientists helped protect people during automobile accidents?
- **a.** Scientists have made cars faster.
- **b.** Scientists have made larger engines.
- **c.** Scientists have designed air bags.
- **d.** Scientists have made fuel less expensive.

Saving Resources

_____ **8.** What has science done to help make resources last longer?
- **a.** found ways to recycle steel
- **b.** found ways to use more water
- **c.** found ways to avoid recycling
- **d.** found ways to fix used cars

Protecting the Environment

_____ **9.** How do chlorofluorocarbons harm the environment?
- **a.** They keep sunlight from Earth.
- **b.** They pollute water.
- **c.** They harm the ozone layer.
- **d.** They cause storms.

_____ **10.** What does the ozone layer do?
- **a.** It keeps storms from harming Earth.
- **b.** It protects the planet from harmful UV light.
- **c.** It allows more sunlight to reach the planet.
- **d.** It pollutes the air.

SCIENTISTS EVERYWHERE

Meteorologist

Match the correct description with the correct term. Write the letter in the space provided.

_____ **11.** a scientist who studies volcanoes

_____ **12.** a person who studies the atmosphere

_____ **13.** a person who draws scientific pictures

_____ **14.** a person who studies the make-up of rocks

_____ **15.** a person who studies living things and their environment

- **a.** meteorologist
- **b.** ecologist
- **c.** geochemist
- **d.** volcanologist
- **e.** science illustrator

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Scientific Methods (pp. 14–21)

WHAT ARE SCIENTIFIC METHODS?

Write the letter of the correct answer in the space provided.

_____ **1.** What are the ways that scientists answer questions and solve problems?
- **a.** physical science
- **b.** physics
- **c.** observations
- **d.** scientific methods

ASKING A QUESTION

_____ **2.** In the figure showing scientific methods, which of the following is NOT a step?
- **a.** testing the hypothesis
- **b.** answering a question
- **c.** drawing conclusions
- **d.** making observations

_____ **3.** How do scientists use scientific methods?
- **a.** They always use all the steps.
- **b.** They always use the steps in the same order.
- **c.** They use the steps in different ways.
- **d.** They never do steps over again.

_____ **4.** What does asking questions help scientists to do?
- **a.** find answers with less investigation
- **b.** focus the purpose of an investigation
- **c.** memorize answers
- **d.** know where to find answers

_____ **5.** What is the word for using the senses to gather information?
- **a.** investigation
- **b.** measurement
- **c.** knowledge
- **d.** observation

A Real-World Question

_____ **6.** What is the comparison of energy output with energy input?
- **a.** efficiency
- **b.** hypothesis
- **c.** observation
- **d.** physical science

_____ **7.** When scientists studied boat propulsion, what did they learn about propellers?
- **a.** They are efficient but unreliable.
- **b.** They are efficient.
- **c.** They are not very efficient.
- **d.** They are not efficient but reliable.

The Importance of Boat Efficiency

_____ **8.** Why is it important to make boats and ships more efficient?
- **a.** to use less fuel
- **b.** to use more fuel
- **c.** to spend more money
- **d.** to make boats slower

_____ **9.** Based on their observations, what question did the MIT scientists ask?
- **a.** How can boat propulsion be made less efficient?
- **b.** How can boat propulsion be made more efficient?
- **c.** How can boat propellers be made less efficient?
- **d.** How can penguins be made more efficient?

FORMING A HYPOTHESIS

_____ **10.** What is a possible explanation based on knowledge and observation called?
- **a.** a scientific law
- **b.** physical science
- **c.** a theory
- **d.** a hypothesis

_____ **11.** What should be true of a good hypothesis?
- **a.** It should be reusable.
- **b.** It should be testable.
- **c.** It should be a question.
- **d.** It should be untrue.

A Possible Answer from Nature

_____ **12.** What observations led Czarnowski to form his hypothesis?
- **a.** how easily penguins propel themselves
- **b.** how easily boats propel themselves
- **c.** how badly penguins propel themselves
- **d.** how badly boats propel themselves

_____ **13.** What was Czarnowski's hypothesis about propulsion systems?
- **a.** Propeller-driven systems are always efficient.
- **b.** Penguin-like systems are less efficient.
- **c.** Penguin-like systems are more efficient.
- **d.** Propeller-driven systems are more efficient.

Making Predictions

_____ **14.** What do scientists do before testing a hypothesis?
- **a.** make another hypothesis
- **b.** answer all questions
- **c.** make predictions
- **d.** make errors

TESTING THE HYPOTHESIS

_____ **15.** What must you do after you form a hypothesis?
- **a.** Test the hypothesis.
- **b.** Change the hypothesis.
- **c.** Disprove a prediction.
- **d.** Answer the hypothesis.

_____ **16.** What should you do if you test your hypothesis and find that it is off the mark?
- **a.** Stop working on the problem.
- **b.** Change the hypothesis.
- **c.** Don't change the hypothesis.
- **d.** Don't test the hypothesis again.

Controlled Experiments

_____ **17.** What did the MIT scientists use to test their hypothesis?
- **a.** a model penguin
- **b.** a boat with a penguin-like shape
- **c.** a boat with penguin-like flippers
- **d.** a computer model

Use the terms from the following list to complete the sentences below.

controlled experiment experimental group
variable parameter controlled parameter

18. A group that is the same as the control group except for one factor is a(n) _____.

19. A factor that makes the experimental group different from the control group is a(n) _____.

20. An experiment that compares results from a control group and experimental groups is a(n) _____.

21. A factor that is kept the same between groups is a(n) _____.

Testing *Proteus*

Write the letter of the correct answer in the space provided.

_____ **22.** What are any pieces of information gathered through experimentation called?
- **a.** factors
- **b.** particles
- **c.** ideas
- **d.** data

ANALYZING THE RESULTS

_____ **23.** What must you find out after conducting an experiment and collecting data?
- **a.** if the answers are right
- **b.** if the results support your hypothesis
- **c.** if the answers can be corrected
- **d.** if the results can be changed

_____ **24.** Why do scientists do calculations and create tables and graphs?
- **a.** to help them develop hypotheses
- **b.** to make analyzing results easier
- **c.** to impress other scientists
- **d.** to conduct a controlled experiment

Analyzing *Proteus*

_____ **25.** What were used to show the data collected in the *Proteus* experiment?
- **a.** books and reports
- **b.** propellers and flippers
- **c.** line and bar graphs
- **d.** television and radio

DRAWING CONCLUSIONS

_____ **26.** What must you do at the end of an investigation?
- **a.** Draw a conclusion.
- **b.** Draw a bar graph.
- **c.** Draw a picture.
- **d.** Make a line graph.

The *Proteus* Conclusion

_____ **27.** What conclusion did the scientists come to after they analyzed results of the *Proteus* test?
- **a.** Their hypothesis was not supported.
- **b.** They needed a new investigation.
- **c.** Their hypothesis was supported.
- **d.** They had too much data.

COMMUNICATING RESULTS

_____ **28.** Why is it important to communicate the results of scientific investigations?
- **a.** so other scientists can verify your results
- **b.** to get the credit
- **c.** because the question is answered
- **d.** to prevent other scientists from doing their own tests

_____ **29.** Where did the MIT scientists publish their results about *Proteus*?
- **a.** nowhere
- **b.** television, radio, and the Internet
- **c.** academic papers, science magazines, and the Internet
- **d.** books, magazines, and comic books

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Safety in Science (pp. 22–27)

KEEPING YOURSELF SAFE

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following is NOT a way to keep yourself safe in a lab?
- **a.** wearing proper safety equipment
- **b.** being careful to prevent accidents
- **c.** bumping into people in the lab
- **d.** using lab materials in a safe way

Avoiding Accidents

_____ **2.** How can you help avoid accidents in the lab?
- **a.** Pay attention, and follow directions.
- **b.** Don't ask questions or do experiments.
- **c.** Walk around, and talk to your friends.
- **d.** Ignore what is happening around you.

Reporting Accidents

_____ **3.** If there is an accident, what should you do?
- **a.** Run out of the classroom.
- **b.** Let your teacher know right away.
- **c.** Don't tell anyone.
- **d.** Scream and jump up and down.

ELEMENTS OF SAFETY

Understanding Safety Symbols

_____ **4.** What do safety symbols tell you?
- **a.** how to bake cookies
- **b.** what precautions to take
- **c.** how to do experiments
- **d.** when to leave the classroom

Match each safety symbol with the correct meaning. Write the letter in the space provided.

_____ **5.** 

_____ **6.** 

_____ **7.** 

- **a.** sharp object
- **b.** heating safety
- **c.** clothing protection

Following Safety Symbols

_____ **8.** What will your teacher explain to you about each safety symbol?
- **a.** what precautions it requires
- **b.** how to draw it
- **c.** where to find it
- **d.** when to follow it

_____ **9.** What should you do if you see the symbol for heating safety?
- **a.** Wash your hands.
- **b.** Stop working on the activity.
- **c.** Clear flammable things off your work area.
- **d.** Take off your safety equipment.

Following Directions

_____ **10.** What should you always do before a science activity?
- **a.** Take off your safety equipment.
- **b.** Talk to your best friend about it.
- **c.** Read all instructions very carefully.
- **d.** Leave the room.

_____ **11.** If you don't understand directions, who should you ask to explain them?
- **a.** the school principal
- **b.** your parents
- **c.** your best friend
- **d.** your science teacher

Neatness

_____ **12.** Why should you be neat when you work in a science lab?
- **a.** to make your work area look nice
- **b.** to please your teacher
- **c.** so you will be safer
- **d.** so you can go home early

Using Proper Safety Equipment

_____ **13.** What should you always wear when you enter the lab area?
- **a.** heat-resistant gloves
- **b.** safety goggles
- **c.** rubber boots
- **d.** ear phones

_____ **14.** What should you do if you need to handle hot objects?
- **a.** Use your apron.
- **b.** Ask your friend to handle them.
- **c.** Call the teacher.
- **d.** Wear heat-resistant gloves.

Cleaning Up

_____ **15.** What should you do with a cracked glass bowl after an activity?
- **a.** Give it to your teacher.
- **b.** Ask your friend what to do with it.
- **c.** Take it home.
- **d.** Try to repair it.

Match each description with the correct safety element. Write the letter in the space provided.

_____ **16.** clearing books off your work area

_____ **17.** wiping your work area with damp paper towels

_____ **18.** wearing goggles and an apron

_____ **19.** knowing what the symbol of a small animal means

_____ **20.** doing what the instructions and your teacher say

- **a.** recognizing safety symbols
- **b.** following directions
- **c.** practicing neatness
- **d.** using the right safety equipment
- **e.** cleaning up properly

RESPONDING TO ACCIDENTS

Write the letter of the correct answer in the space provided.

_____ **21.** Why should you know where emergency equipment is located in your lab?
- **a.** so you can do experiments
- **b.** so you can get it after an accident
- **c.** so you can prevent accidents
- **d.** so you can go home early

Proper Accident Procedures

_____ **22.** What should you do first after an accident?

a. Tell the principal.
b. Leave the area with your friends.
c. Scream for help.
d. Make sure you are safe.

Use the terms from the following list to complete the sentences below..

first aid accident

23. Always report a(n) _____ to your teacher even if you are afraid you will get in trouble.

24. Emergency medical care for someone who has been hurt or who is sick is called _____.

Procedures for Accidental Injuries

Write the letter of the correct answer in the space provided.

_____ **25.** What can you do if someone gets a heat burn?

a. Apply pressure with a paper towel.
b. Hold the burn under cold water.
c. Bring food to the injured person.
d. Wash out the eyes in an eye bath.

_____ **26.** How should you treat a cut?

a. Wash the cut in an eye bath.
b. Rinse the cut and hold it under cold water.
c. Rinse the cut and apply pressure.
d. Bring food to the injured person.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Science and Scientists

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. science

_____

_____

SECTION SUMMARY

Read the following section summary.

- Scientific progress is made by asking meaningful questions and conducting careful investigations.
- Three methods of investigation are research, observation, and experimentation.
- Science affects people's daily lives. Science can help save lives and resources and can help improve the environment.
- There are several types of scientists and many jobs that use science.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Scientific Methods

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. scientific methods

_____

_____

2. observation

_____

_____

3. hypothesis

_____

_____

4. data

_____

_____

SECTION SUMMARY

Read the following section summary.

- Scientific methods are the ways in which scientists answer questions and solve problems.
- Asking a question usually results from making an observation. Questioning is often the first step in using scientific methods.
- A hypothesis is a possible explanation or answer to a question. A good hypothesis is testable by an experiment.
- After performing an experiment, you should analyze your results. Analyzing is usually done by using calculations, tables, and graphs.
- After analyzing your results, you should draw conclusions about whether your hypothesis is supported.
- Communicating your results allows others to check or continue your work. You can communicate through reports, posters, and the Internet.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Safety in Science

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. first aid

_____

_____

SECTION SUMMARY

Read the following section summary.

- Appropriate safety precautions must always be taken when conducting scientific investigations.
- Scientists use symbols to alert them to particular dangers that they face when performing experiments in science.
- Goggles, gloves, and aprons are proper safety equipment that should be used in a science laboratory.
- If you suffer any injury during an experiment, inform your teacher immediately.
- Proper first-aid procedures must be followed when an accident occurs in the lab.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Tools and Models in Science (pp. 42–49)

Write the letter of the correct answer in the space below.

_____ **1.** How can a tool best be described?
- **a.** anything that helps you do a task
- **b.** anything that gives you energy
- **c.** anything that uses electricity
- **d.** anything that has a handle

TOOLS IN SCIENCE

_____ **2.** Which of the following should you do when you collect data?
- **a.** Use faulty measurement tools.
- **b.** Clean your tools.
- **c.** Use the proper measurement tools.
- **d.** Use inaccurate measurements.

_____ **3.** Which of the following tools is NOT used to evaluate and analyze data?
- **a.** calculator
- **b.** meterstick
- **c.** graph
- **d.** computer

MAKING MEASUREMENTS

_____ **4.** How was an inch measured in England many years ago?
- **a.** by using grains of barley
- **b.** by using calculators
- **c.** by using flower petals
- **d.** by using corn stalks

The International System of Units

_____ **5.** What is the system of measurement used by most scientists called?
- **a.** the International System of Measures
- **b.** the French System of Units
- **c.** the Universal Unit System
- **d.** the International System of Units

_____ **6.** Which of the following is another name for the SI system of measurement?
- **a.** the French academy system
- **b.** the metric system
- **c.** the International Unit System
- **d.** the National System of Measurement

_____ **7.** What are all units of the SI system of measurement based on?
- **a.** the number 5
- **b.** the number 10
- **c.** the number 1,000
- **d.** the number 15

_____ **8.** In measuring, what does *kilo-* mean?
- **a.** 10 times
- **b.** 100 times
- **c.** 1,000 times
- **d.** 10,000 times

_____ **9.** In measuring, what does *milli-* mean?
- **a.** 1/100 times
- **b.** 5/100 times
- **c.** 1/2,000 times
- **d.** 1/1,000 times

Length

_____ **10.** What is the basic SI unit of length?
- **a.** a meter
- **b.** a kilogram
- **c.** a kelvin
- **d.** a milli

Mass

Use the terms from the following list to complete the sentences below.

mass	liter	
volume	density	kilogram

11. The amount of matter in an object is its _____.

12. The basic SI unit for mass is the _____.

13. A measure of the size of an object is its _____.

14. A unit of measure used to express liquid volume is the _____

15. The ratio of the mass of a substance to the volume of the substance is its _____.

Temperature

Write the letter of the correct answer in the space below.

_____ **16.** Which of the following is a measure of how hot or how cold something is?
- **a.** temperature
- **b.** mass
- **c.** length
- **d.** volume

_____ **17.** Which of the following are NOT units used to measure temperature?
- **a.** grams
- **b.** degrees Fahrenheit
- **c.** kelvins
- **d.** degrees Celsius

MODELS IN SCIENCE

_____ **18.** What is a representation of an object or process called?
- **a.** an estimate
- **b.** a sample
- **c.** a model
- **d.** data

_____ **19.** Which of the following uses something familiar to explain something unfamiliar?
- **a.** a thermometer
- **b.** a tool
- **c.** a calculator
- **d.** a model

Physical Models

Use the terms from the following list to complete the sentences below.

conceptual model	physical model
mathematical model	variable

20. A doll is an example of a(n) _____.

21. A model can make an inaccurate prediction if a wrong _____ is used.

22. A model that puts many ideas together to explain or summarize something is called a(n) _____.

23. A model that is used to predict the weather is an example of a(n) _____.

Models: The Right Size

Write the letter of the correct answer in the space below.

_____ **24.** Which of the following is used to represent things that are very small or very large?
- **a.** a model
- **b.** a cylinder
- **c.** a tool
- **d.** data

The Limits of Models

_____ **25.** Why are models limited in their usefulness?
- **a.** Models are too difficult to make.
- **b.** Models are never used in science.
- **c.** Models are not exactly like the real object.
- **d.** Models are never accurate.

USING MODELS FOR SCIENTIFIC PROGRESS

_____ **26.** Which of the following statements about models is NOT true?
- **a.** Scientists use models to communicate information.
- **b.** Models cannot help explain difficult information.
- **c.** Models can represent scientific ideas and objects.
- **d.** Models help explain difficult information.

SCIENTIFIC THEORIES

Match the correct definition with the correct term. Write the letter in the space provided.

_____ **27.** a system of ideas that explains observations and is supported by scientific evidence

_____ **28.** a statement or equation that reliably predicts events under certain conditions

_____ **29.** a representation used by scientists to explain theories and construct laws

- **a.** law
- **b.** theory
- **c.** model

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Organizing Your Data (pp. 50–55)

CREATING A DATA TABLE

Write the letter of the correct answer in the space below.

_____ **1.** Which of the following can be the first step in organizing data?
- **a.** Choose a topic.
- **b.** Gather information.
- **c.** Create a data table.
- **d.** Analyze the data.

Organizing: The First Step

_____ **2.** Which of the following must you determine before starting an experiment?
- **a.** what information you will gather
- **b.** what conclusions you will draw
- **c.** how you will interpret the data
- **d.** whether your hypothesis is correct

Independent and Dependent Variables

_____ **3.** The factor in an experiment that the investigator can change is called what?
- **a.** the dependent variable
- **b.** an observation
- **c.** the independent variable
- **d.** an estimate

_____ **4.** Where is the independent variable found in a data table?
- **a.** in the first column
- **b.** in the estimate column
- **c.** in the second column
- **d.** in the experiment column

_____ **5.** The factor that the scientist measures in an experiment is called what?
- **a.** the independent variable
- **b.** the density
- **c.** an estimate
- **d.** the dependent variable

_____ **6.** Where is the dependent variable found in a data table?
- **a.** in the first column
- **b.** in the estimate column
- **c.** in the second column
- **d.** in the experiment column

Variable and Controlled Parameters

_____ **7.** How do controlled parameters and variable parameters differ?
- **a.** Controlled parameters can be measured, and variable parameters cannot.
- **b.** Controlled parameters stay constant, and variable parameters change.
- **c.** Controlled parameters change, and variable parameters do not.
- **d.** Controlled parameters and variable parameters do not differ.

CREATING A GRAPH

_____ **8.** What do graphs help you do?
- **a.** represent an object or system
- **b.** explain hypotheses and observations
- **c.** measure the size of an object
- **d.** identify trends and make predictions

Axes

Use the terms from the following list to complete the sentences below.

range	axis
dependent variable	independent variable

9. One of two or more reference lines that mark the borders of a graph is called a(n) _____.

10. The x-axis on a graph usually represents the _____ in a data table.

11. The y-axis on a graph usually represents the _____ in a data table.

12. To find the _____ of an axis, subtract the smallest value of a variable from the largest value of the same variable.

Scale

Use the terms from the following list to complete the sentences below.

scale	line of best fit	title

13. The size that is used for each box on the graph is called the _____.

14. A smooth line that includes some but not all data points is called the _____.

15. The independent and dependent variables are often included in a graph's _____.

PATTERNS SHOWN BY GRAPHS

Match the correct definition with the correct term. Write the letter in the space provided.

_____ **16.** a graph that shows the relationship between variables with a straight line

_____ **17.** a graph that cannot show the relationship between variables as a straight line

_____ **18.** a relationship in which the dependent variable and the independent variable both increase

_____ **19.** a relationship in which one variable increases while the other variable decreases

a. nonlinear graph
b. linear graph
c. direct
d. inverse

Using Computers to Create Graphs

Write the letter of the correct answer in the space below.

_____ **20.** Which of the following can help scientists organize data?
a. a theory
b. a meterstick
c. a computer
d. a law

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Analyzing Your Data (pp. 56–61)

WHY MATHEMATICS?

Write the letter of the correct answer in the space below.

_____ **1.** Which of the following is NOT a property that is determined by using mathematics?
- **a.** volume
- **b.** texture
- **c.** density
- **d.** area

_____ **2.** Which of the following does mathematics help scientists to do?
- **a.** learn how to play musical instruments
- **b.** travel to countries all over the world
- **c.** summarize large amounts of data
- **d.** learn foreign languages

_____ **3.** Which of the following is often called the "language of science"?
- **a.** mathematics
- **b.** physics
- **c.** biology
- **d.** botany

ACCURACY OF DATA

_____ **4.** Which of the following should you do to get accurate readings?
- **a.** Use incorrect tools.
- **b.** Use tools correctly.
- **c.** Use broken equipment.
- **d.** Use tools incorrectly.

Choosing Tools and Using Them Correctly

_____ **5.** Which of the following is the correct way to read liquid volume?
- **a.** Look at the bottom of the meniscus from a high angle.
- **b.** Look at the top of the meniscus from a low angle.
- **c.** Look at the top of the meniscus at eye level.
- **d.** Look at the bottom of the meniscus at eye level.

REPRODUCIBILITY OF DATA

_____ **6.** Which of the following must happen in order for scientists to accept scientific data?
- **a.** The data must be reproducible.
- **b.** The data cannot be reproducible.
- **c.** The data must be based on a model.
- **d.** The data must be shown on a graph.

DESCRIBING THE ENTIRE SET OF DATA

_____ **7.** How many data points must be added together to find the mean?
- **a.** all
- **b.** one-third
- **c.** one quarter
- **d.** half

_____ **8.** Which of the following is best used when one data point is much smaller or much larger than the other data points?
- **a.** mean
- **b.** median
- **c.** mode
- **d.** estimate

_____ **9.** Which of the following values occurs most often in a data set?
- **a.** mode
- **b.** median
- **c.** mean
- **d.** estimate

Use the terms from the following list to complete the sentences below.

median mean mode

10. The number obtained by adding up the data for a given characteristic and dividing this sum by the number of individuals is called the

_____.

11. The value of the middle item when data are arranged in order by size is called the _____..

12. The most frequently occurring value in a data set is called the

_____.

SLOPE OF A LINE

Match the correct description with the correct term. Write the letter in the space provided.

_____ **13.** a measure of the slant of a line; the ratio of rise over run

_____ **14.** vertical change

_____ **15.** horizontal change

a. rise
b. run
c. slope

Using Slope to Analyze Data

Write the letter of the correct answer in the space below.

_____ **16.** Which of the following can be used to analyze data on a graph?
a. stopwatch
b. slope
c. spring scale
d. graduated cylinder

Slope as the Constant in $y = kx$

_____ **17.** Which of the following represents the constant, or slope of the line, in the equation $y = kx$?
a. y
b. yk
c. k
d. kx

Comparing Linear and Nonlinear Graphs

Use the terms from the following list to complete the sentences below.

linear graph nonlinear graph

18. The relationship between x and y will appear as a straight line on a(n) _____.

19. The relationship between x and y will appear as a curved line on a(n) _____.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Tools and Models in Science

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. mass

2. model

3. volume

4. theory

5. density

6. law

7. temperature

SECTION SUMMARY

Read the following section summary.

- Tools are used to make observations, take measurements, and analyze data.
- The International System of Units (SI) is the standard system of measurement.
- Length, mass, volume, density, and temperature are common measurements.
- A model uses familiar things to describe unfamiliar things.
- Physical, conceptual, and mathematical models are commonly used in science.
- A scientific theory is an explanation for many hypotheses and observations.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Organizing Your Data

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. independent variable

_____

_____

_____

2. dependent variable

_____

_____

_____

3. axis

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Scientists use data tables to organize information.
- Labels and units are important parts of data tables and graphs.
- The independent variable is the factor that the investigator changes.
- The dependent variable is the factor that the investigator measures.
- The line of best fit shows the trend of a linear graph.
- Graphs help show patterns, or trends, in data.
- Linear and nonlinear graphs show different relationships between variables.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Analyzing Your Data

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. mean

2. mode

3. median

4. slope

SECTION SUMMARY

Read the following section summary.

- Mathematics is an important tool for understanding and summarizing data.
- The accuracy and reproducibility of data used in scientific investigations affect the results.
- Mean, median, and mode summarize an entire set of data.
- Slope is the degree of slant of a straight line.
- The slope of a straight line represents a constant that can be used to understand and analyze data.
- Linear and nonlinear graphs result from different relationships in the data.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: What Is Matter? (pp. 78–83)

MATTER

Write the letter of the correct answer in the space provided.

_____ **1.** What do humans, hot soup, and a neon sign have in common?
- **a.** They are brightly colored.
- **b.** They are found in space.
- **c.** They are made of matter.
- **d.** They have the same volume.

_____ **2.** What has mass and takes up space?
- **a.** volume
- **b.** matter
- **c.** weight
- **d.** space

MATTER AND VOLUME

_____ **3.** What does the word *volume* refer to?
- **a.** an amount of matter
- **b.** an effect of gravity
- **c.** an amount of space
- **d.** an effect of mass

_____ **4.** Why can't another CD fit in a rack once the rack is completely filled?
- **a.** because all the space is taken up
- **b.** because the CD has mass
- **c.** because space has three dimensions
- **d.** because the rack has no volume

Liquid Volume

_____ **5.** Which of the following units would be best for expressing the volume of water in a lake?
- **a.** grams (g)
- **b.** liters (L)
- **c.** meters (m)
- **d.** milliliters (mL)

_____ **6.** Which of the following units would be best for expressing the volume of soda in a can?
- **a.** centimeters (cm)
- **b.** grams (g)
- **c.** liters (L)
- **d.** milliliters (mL)

Measuring the Volume of Liquids

Use the terms from the following list to complete the sentences below.

cubic meniscus volume

7. To measure volume with a graduated cylinder, look at the bottom of the _____.

8. The volume of solid objects is usually expressed in _____ units.

9. To find the _____ of a regular solid, multiply its length, width, and height.

Volume of an Irregularly Shaped Solid Object

Use the terms from the following list to complete the sentences below.

irregular solid cubic centimeters milliliter (mL)

10. To find the volume of a(n) _____, measure the amount of water that the object displaces.

11. One cubic centimeter (1 cm^3) is equal to one _____.

12. To express the volume of an irregular solid, you must change milliliters to _____.

MATTER AND MASS

Write the letter of the correct answer in the space provided.

_____ **13.** What is the measure of the amount of matter in an object?
- **a.** matter
- **b.** mass
- **c.** volume
- **d.** weight

_____ **14.** Which of the following is true about the mass of an object?
- **a.** Mass depends on the object's location.
- **b.** Mass is a measure of gravity.
- **c.** Mass does not depend on the object's location.
- **d.** Mass depends in part on weight.

_____ **15.** How could you change the mass of an object?
- **a.** Move it to the moon.
- **b.** Take some of its matter away.
- **c.** Make Earth spin faster.
- **d.** Change the object's weight.

The Difference Between Mass and Weight

_____ **16.** Which of the following is a measure of gravitational force?
- **a.** inertia
- **b.** mass
- **c.** volume
- **d.** weight

_____ **17.** What is the force that keeps objects from floating into space called?
- **a.** mass
- **b.** inertia
- **c.** gravitational force
- **d.** volume

_____ **18.** Which of the following is true about the weight of an object?
- **a.** Weight is measured with a balance.
- **b.** Weight is the same on the moon as on Earth.
- **c.** Weight is the same as mass.
- **d.** Weight depends on location in the universe.

Measuring Mass and Weight

_____ **19.** What is the weight on Earth of an object with a mass of 100 g?
- **a.** 1 newton
- **b.** 1 cm^2
- **c.** 1 mL
- **d.** 1 kilogram

Directed Reading A *continued*

Use the terms from the following list to complete the sentences below.

newton kilogram mass

20. If a brick and a sponge have the same volume, the brick has more _____.

21. The SI unit for mass is the _____.

22. The unit for weight is the SI unit for force called the _____.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Physical Properties (pp. 84–89)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following kinds of questions would be most useful for identifying objects?
- **a.** questions about their properties
- **b.** questions about their age
- **c.** questions about their weight
- **d.** questions about their volume

IDENTIFYING PHYSICAL PROPERTIES

_____ **2.** What is a characteristic of an object that can be observed without changing the object's identity?
- **a.** a chemical property
- **b.** a flexible property
- **c.** a physical property
- **d.** a measurable property

Match the correct example with the correct property. Write the letter in the space provided.

_____ **3.** aluminum flattened into thin sheets of foil

_____ **4.** an ice cube made of solid water

_____ **5.** copper pulled into thin wires

- **a.** ductility
- **b.** state
- **c.** malleability

Match the correct example with the correct property. Write the letter in the space provided.

_____ **6.** flavored drink mix dissolving in water

_____ **7.** a rose smelling sweet

_____ **8.** a foam cup protecting your hand from a hot drink

- **a.** thermal conductivity
- **b.** solubility
- **c.** odor

Density

Write the letter of the correct answer in the space provided.

_____ **9.** Which physical property is the amount of matter in a given space, or volume?
- **a.** density
- **b.** ductility
- **c.** state
- **d.** weight

_____ **10.** If you know an object's mass (m) and volume (V), what equation would you use to find its density?

a. $D = m \times V$

b. $D = \frac{m}{V}$

c. $D = \frac{V}{m}$

d. $D = V + m$

_____ **11.** Which of the following units are most often used for the density of a solid?
- **a.** g/mL
- **b.** m^3/kg
- **c.** N/cm^3
- **d.** g/cm^3

Using Density to Identify Substances

_____ **12.** Which of the following is true of the density of each substance in the table titled Densities of Common Substances?
- **a.** The density makes the substance heavy.
- **b.** The density differs from the densities of other substances.
- **c.** The density is different at different times.
- **d.** The density is greater than the density of water.

_____ **13.** What is the density of lead shown in the table titled Densities of Common Substances?
- **a.** 1.00 g/cm^3
- **b.** 0.0001663 g/cm^3
- **c.** 13.55 g/cm^3
- **d.** 11.35 g/cm^3

_____ **14.** Which substance in the table titled Densities of Common Substances is a liquid that has a density greater than that of water?
- **a.** mercury
- **b.** ice
- **c.** helium
- **d.** lead

Density of Solids

_____ **15.** How does the volume of a kilogram of lead compare with the volume of a kilogram of feathers?
- **a.** The lead has a larger volume.
- **b.** The lead has a smaller volume.
- **c.** The feathers have a smaller volume.
- **d.** The volumes are the same.

Density, Floating, and Sinking

_____ **16.** What happens to a solid object in water if its density is greater than water?
- **a.** The object floats on top.
- **b.** The object dissolves.
- **c.** The object floats in the middle.
- **d.** The object sinks to the bottom.

Liquid Layers

_____ **17.** What causes different liquids to form layers when they are poured into a container?
- **a.** the amounts of each liquid
- **b.** differences in density
- **c.** differences in color
- **d.** the temperatures of the liquids

_____ **18.** Where is the least dense liquid found when liquids form layers?
- **a.** in the lightest-colored layer
- **b.** in the middle layer
- **c.** floating on the top
- **d.** settled to the bottom

PHYSICAL CHANGES: NO NEW SUBSTANCES

Use the terms from the following list to complete the sentences below.

identity physical change state

19. Any change in matter that changes only its physical form is called a(n) _____.

20. All changes that cause a change of _____ are considered physical changes.

21. When silver is molded into a pendant, its _____ is the same.

Examples of Physical Changes

Write the letter of the correct answer in the space provided.

_____ **22.** Which of the following actions does NOT cause a purely physical change?
- **a.** sanding a piece of wood
- **b.** burning a piece of wood
- **c.** dissolving sugar in water
- **d.** freezing water

_____ **23.** Why is making ice from water a physical change?
- **a.** The ice has some new properties.
- **b.** The ice floats on water.
- **c.** The water changes its state.
- **d.** The water changes its identity.

Reversibility of Physical Changes

_____ **24.** Why are physical changes often easy to undo?
- **a.** The identity of the substance changes.
- **b.** The substance disappears.
- **c.** The identity of the substance does not change.
- **d.** Two new substances are made.

Matter and Physical Changes

_____ **25.** Why is making a star from a piece of paper considered a physical change?
- **a.** The paper's state has changed.
- **b.** The paper's identity is the same.
- **c.** The paper's color is the same.
- **d.** The paper has aged.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Chemical Properties (pp. 90–95)

IDENTIFYING CHEMICAL PROPERTIES

Use the terms from the following list to complete the sentences below.

flammability	nonflammability
reactivity	chemical property

1. A property of matter that describes its ability to change into entirely new substances is called a(n) _____.

2. The ability of substances to change and form one or more new substances is a chemical property called _____.

3. The ability of a substance to burn is a chemical property known as _____.

4. Something that cannot burn has the property of _____.

Comparing Physical and Chemical Properties

Write the letter of the correct answer in the space provided.

_____ **5.** Which of the following sets of words describes only physical properties of a material?
- **a.** liquid, dense, flammable
- **b.** solid, ductile, yellow
- **c.** flammable, malleable, liquid
- **d.** powdery, reactive, insoluble

_____ **6.** What chemical property causes rust to form on a nail?
- **a.** conductivity
- **b.** nonflammability
- **c.** reactivity with oxygen
- **d.** flammability

_____ **7.** What do physical changes NOT change?
- **a.** the identity of the matter
- **b.** the amount of matter
- **c.** the state of matter
- **d.** the volume of the sample

_____ **8.** What makes chemical properties hard to observe?
- **a.** They cause changes of state.
- **b.** You can't see them until they produce new materials.
- **c.** Wearing protective glasses is required.
- **d.** They happen too quickly.

Characteristic Properties

_____ **9.** Which of these statements is true about characteristic properties of substances?
- **a.** They depend on sample size.
- **b.** They can only be physical properties.
- **c.** They can only be chemical properties.
- **d.** They can be physical properties or chemical properties.

CHEMICAL CHANGES AND NEW SUBSTANCES

_____ **10.** Which of these phrases describes a chemical change?
- **a.** pouring milk into a glass
- **b.** melting an ice cube
- **c.** digesting food in your body
- **d.** bending an iron nail

Use the terms from the following list to complete the sentences below.

change property

11. A chemical _____ describes which changes can happen to a substance.

12. A chemical _____ is a process by which substances actually change into new substances.

What Happens During a Chemical Change?

Write the letter of the correct answer in the space provided.

_____ **13.** Which of the following is an example of a chemical change?
- **a.** sugar dissolving
- **b.** a cake baking
- **c.** chocolate melting
- **d.** water freezing

_____ **14.** Which of the following describes what happens to the substances involved in a chemical change?
- **a.** The substances keep their identities.
- **b.** The substances change in form.
- **c.** The substances change into new substances with different properties.
- **d.** The substances combine and mix.

Signs of Chemical Changes

_____ **15.** Which of the following usually happens during a chemical change?
- **a.** Heat is released or absorbed.
- **b.** The state of the matter changes.
- **c.** The identity of the matter stays the same.
- **d.** No heat is released or absorbed.

Matter and Chemical Changes

_____ **16.** Why are chemical changes difficult to reverse?
- **a.** because they involve physical changes
- **b.** because they change the matter's form
- **c.** because they change the identity of the matter
- **d.** because their products are hard to find

PHYSICAL VERSUS CHEMICAL CHANGES

_____ **17.** What is the type and the arrangement of the matter in an object called?
- **a.** the physical properties of the object
- **b.** the reactivity of the object
- **c.** the flammability of the object
- **d.** the composition of the object

_____ **18.** How does a physical change differ from a chemical change?
- **a.** The change is not reversible.
- **b.** The composition of the matter is unchanged.
- **c.** New properties of the matter are created.
- **d.** New materials are produced.

_____ **19.** What do chemical changes in a substance alter?
- **a.** the state of the substance
- **b.** the composition of the substance
- **c.** the size of the substance
- **d.** nothing in the substance

Reversing Changes

_____ **20.** Why are chemical changes difficult to reverse?
- **a.** because they involve changes in composition
- **b.** because they involve changes in form
- **c.** because they involve changes in state
- **d.** because the temperature increases

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

What Is Matter?

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. matter

_____

_____

2. volume

_____

_____

3. meniscus

_____

_____

4. mass

_____

_____

5. weight

_____

_____

SECTION SUMMARY

Read the following section summary.

- Two properties of matter are volume and mass.
- Volume is the amount of space taken up by an object.
- Mass is a measure of the amount of matter in an object.
- The SI unit of volume is the liter (L). The SI unit of mass is the kilogram (kg).
- Weight is a measure of the gravitational force on an object, usually in relation to Earth. Weight is expressed in newtons (N).

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Physical Properties

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. physical property

2. density

3. physical change

SECTION SUMMARY

Read the following section summary.

- Physical properties of matter can be observed without changing the identity of the matter.
- Examples of physical properties are melting temperature, density, hardness, thermal conductivity, and electrical conductivity.
- Density is the amount of matter in a given space.
- Density can be used to identify substances because the density of a substance is constant at a given pressure and temperature.
- When a substance undergoes a physical change, its identity stays the same.
- Physical changes include dissolving, cutting, bending, freezing, and melting.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Chemical Properties

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. chemical property

_____

_____

_____

2. chemical change

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Chemical properties describe the ability of a substance to change into a new substance.
- The chemical properties of a substance describe how the substance will behave under conditions that favor a chemical change.
- Reactivity and flammability are chemical properties.
- New substances form as a result of a chemical change.
- Chemical changes usually liberate or absorb heat.
- Chemical changes alter the composition of a substance.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Four States of Matter (pp. 110–113)

MATTER: MOVING PARTICLES

Write the letter of the correct answer in the space provided.

_____ **1.** What are solids, liquids, and gases examples of?
- **a.** plasmas
- **b.** states of matter
- **c.** atoms
- **d.** molecules

_____ **2.** Which of the following is true of the particles that make up matter?
- **a.** They are in constant motion.
- **b.** They only move in solids.
- **c.** They only move in liquids.
- **d.** They only move in gases.

Match the correct description with the correct term. Write the letter in the space provided.

_____ **3.** Particles vibrate in place.

_____ **4.** Particles move independently.

_____ **5.** Particles are loosely connected.

- **a.** solid
- **b.** liquid
- **c.** gas

SOLIDS

Write the letter of the correct answer in the space provided.

_____ **6.** What stays the same in solids?
- **a.** shape and volume
- **b.** color and shape
- **c.** position and shape
- **d.** state and volume

LIQUIDS

_____ **7.** Which statement is true of liquids?
- **a.** They have a fixed shape but not a fixed volume.
- **b.** They have a fixed shape and a fixed volume.
- **c.** They have a fixed volume but not a fixed shape.
- **d.** They do not have a fixed shape or volume.

_____ **8.** What happens to the volume of a liquid poured into a larger container?
- **a.** It increases.
- **b.** It decreases.
- **c.** It stays the same.
- **d.** It increases and then decreases.

GASES

_____ **9.** Which of the following states of matter has no fixed shape or volume and does not conduct electricity?
- **a.** gas
- **b.** liquid
- **c.** solid
- **d.** plasma

_____ **10.** What is true of the particles of a gas?
- **a.** They are very close together.
- **b.** They are always far apart.
- **c.** They slide past each other.
- **d.** They move freely and collide randomly.

_____ **11.** Why can a small tank of helium gas fill many balloons?
- **a.** because the amount of empty space between the particles can change
- **b.** because helium is a liquid
- **c.** because balloons are solid
- **d.** because the particles of helium in the tank are farther apart than particles in the balloon

PLASMAS

_____ **12.** What is the most common state of matter in the universe?
- **a.** plasma
- **b.** solid
- **c.** liquid
- **d.** gas

_____ **13.** Which of the following properties of plasma is different from gases?
- **a.** no definite shape
- **b.** no definite volume
- **c.** particles move freely
- **d.** conducts electric current

_____ **14.** How can artificial plasmas be formed?
- **a.** by passing electric charges through solids
- **b.** by passing electric charges through liquids
- **c.** by passing electric charges through gases
- **d.** by passing electric charges through plasmas

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Changes of State (pp. 114–119)

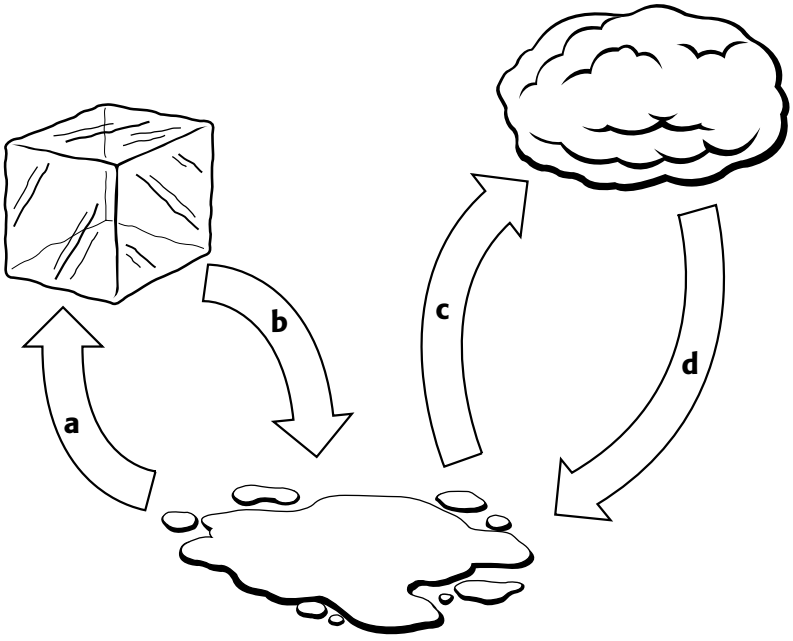
ENERGY AND CHANGES OF STATE

Write the letter of the correct answer in the space provided.

_____ **1.** What kind of change is a change of state?
- **a.** a chemical change
- **b.** a change in the identity of a substance
- **c.** a physical and chemical change
- **d.** a physical change

_____ **2.** Which of the following is NOT true?
- **a.** Particles move differently depending on state.
- **b.** Energy must be added or removed to change state.
- **c.** Particles have the same amount of energy in different states.
- **d.** Particles have different amounts of energy in different states.

Match the labels to the graphic. Write the letter in the space provided.



_____ **3.** freezing

_____ **4.** evaporation

_____ **5.** condensation

_____ **6.** melting

MELTING: SOLID TO LIQUID

Write the letter of the correct answer in the space provided.

_____ **7.** What is a change in state from a solid to a liquid?
- **a.** freezing
- **b.** melting
- **c.** evaporation
- **d.** sublimation

Melting Point

_____ **8.** What is the temperature at which a solid changes to a liquid called?
- **a.** melting point
- **b.** boiling point
- **c.** freezing point
- **d.** evaporation point

Adding Energy

_____ **9.** What must be absorbed for a solid to melt?
- **a.** water
- **b.** atoms
- **c.** energy
- **d.** molecules

FREEZING: LIQUID TO SOLID

_____ **10.** What is the change in state from a liquid to a solid called?
- **a.** evaporation
- **b.** melting
- **c.** sublimation
- **d.** freezing

Removing Energy

_____ **11.** Which of the following is the same as the freezing point of an object?
- **a.** its melting point
- **b.** its evaporation point
- **c.** its sublimation point
- **d.** its boiling point

EVAPORATION: LIQUID TO GAS

_____ **12.** Which of the following is the change in state from a liquid to a gas?
- **a.** melting
- **b.** freezing
- **c.** sublimation
- **d.** evaporation

Evaporation and Boiling

_____ **13.** Which of the following is the conversion of liquid to vapor throughout the liquid?
- **a.** boiling
- **b.** freezing
- **c.** sublimation
- **d.** evaporation

_____ **14.** When water is boiling, which of the following does NOT happen?
- **a.** Molecular motion increases.
- **b.** Molecular motion decreases.
- **c.** Water molecules overcome attraction.
- **d.** Water vapor escapes.

Effects of Pressure on Boiling Point

_____ **15.** What happens to the boiling point of a substance as you go higher above sea level?
- **a.** The boiling point gets higher.
- **b.** The boiling point stays the same.
- **c.** The boiling point gets lower.
- **d.** The substance won't boil.

CONDENSATION: GAS TO LIQUID

_____ **16.** What is condensation?
- **a.** the change of state from a liquid to a gas
- **b.** the change of state from a solid to a gas
- **c.** the change of state from a gas to a solid
- **d.** the change of state from a gas to a liquid

_____ **17.** Which of the following must happen for gas to become a liquid?
- **a.** Small numbers of particles must clump together.
- **b.** Large numbers of particles must spread apart.
- **c.** Large numbers of particles must clump together.
- **d.** Small numbers of particles must spread apart.

SUBLIMATION: SOLID TO GAS

_____ **18.** Dry ice changes from a solid to a gas during what process?
- **a.** melting
- **b.** freezing
- **c.** boiling
- **d.** sublimation

_____ **19.** What happens to the particles of a substance during sublimation?
- **a.** They spread far apart.
- **b.** They clump close together.
- **c.** They lose energy.
- **d.** They maintain the same energy.

TEMPERATURE AND CHANGES OF STATE

_____ **20.** What happens when the temperature of a substance changes?
- **a.** The speed of the particles stays the same.
- **b.** The speed of the particles changes.
- **c.** The substance always melts.
- **d.** The substance always freezes.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Four States of Matter

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. states of matter

_____

_____

2. solid

_____

_____

3. liquid

_____

_____

4. gas

_____

_____

5. plasma

_____

_____

SECTION SUMMARY

Read the following section summary.

- Particles of matter are in constant motion. The states of matter depend on the motion of particles.
- A solid has a definite shape and volume. A liquid has a definite volume but not a definite shape.
- A gas does not have a definite volume or shape. Plasma, a fourth state of matter, does not have a definite shape or volume, and its particles are broken apart.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Changes of State

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. change of state

2. melting

3. evaporation

4. boiling

5. condensation

6. sublimation

SECTION SUMMARY

Read the following section summary.

- A change of state is the conversion of a substance from one physical form to another.
- A change of state requires a loss or gain of energy by a substance's particles.
- Melting is the change from a solid to a liquid, and freezing is the change from a liquid to a solid.
- Both boiling and evaporation result in a liquid changing to a gas.
- Condensation is the change of a gas to a liquid. It is the reverse of evaporation.
- Sublimation changes a solid directly to a gas.
- The temperature of a substance does not change during a change of state.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Elements (pp. 134–137)

ELEMENTS, THE SIMPLEST SUBSTANCES

Write the letter of the correct answer in the space provided.

_____ **1.** A pure substance that cannot be broken down into simpler substances by physical or chemical means is called what?
- **a.** a material
- **b.** a mixture
- **c.** an element
- **d.** a chemical

Only One Kind of Atom

_____ **2.** What is a substance in which all of the "building-block" particles are identical called?
- **a.** an element
- **b.** a pure substance
- **c.** a mineral
- **d.** a solution

_____ **3.** Which of the following are the building-block particles for elements?
- **a.** atoms
- **b.** electrons
- **c.** protons
- **d.** neutrons

CLASSIFYING ELEMENTS

_____ **4.** Which of the following is NOT a physical property of an element?
- **a.** reactivity
- **b.** hardness
- **c.** melting point
- **d.** density

_____ **5.** Why does a helium-filled balloon float up when you let go?
- **a.** Helium is more dense than air.
- **b.** Helium is less dense than air.
- **c.** Krypton is less dense than helium.
- **d.** Air is less dense than helium.

Identifying Elements by Their Properties

Match the correct description with the correct term. Write the letter in the space provided.

_____ **6.** is a characteristic chemical property of elements

_____ **7.** can be identified by its unique properties

_____ **8.** combines with oxygen to form rust

_____ **9.** has a melting point of 1,495°C

a. element
b. flammability
c. iron
d. cobalt

GROUPING ELEMENTS

Categories of Elements

Use the terms from the following list to complete the sentences below.

nonmetals
elements
metals
metalloids

10. All _____ are either metals, metalloids, or nonmetals.

11. Elements that are shiny and conduct heat and electric current are _____.

12. Elements that are poor conductors of heat are _____.

13. Elements with properties of both metals and nonmetals are called _____.

Categories Are Similar

Match the correct description with the correct term. Write the letter in the space provided.

_____ **14.** elements that are malleable

_____ **15.** traits that identify elements in a category

_____ **16.** another name for metalloids

_____ **17.** elements that are dull

a. characteristic properties
b. semimetals
c. metals
d. nonmetals

Directed Reading A *continued*

Match the correct description with the correct term. Write the letter in the space provided.

_____ **18.** iodine, sulfur, neon

_____ **19.** lead, copper, tin

_____ **20.** silicon, boron, antimony

a. nonmetals
b. metalloids
c. metals

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Compounds (pp. 138–141)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following substances is a compound?
- **a.** oxygen
- **b.** magnesium
- **c.** water
- **d.** copper

COMPOUNDS: MADE OF ELEMENTS

_____ **2.** What kind of substance is composed of two or more elements that are chemically combined?
- **a.** an element
- **b.** a compound
- **c.** a mixture
- **d.** a particle

_____ **3.** Which of the following elements combine to form the compound citric acid?
- **a.** hydrogen and oxygen
- **b.** carbon and oxygen
- **c.** hydrogen, carbon, and oxygen
- **d.** sodium, hydrogen, carbon, and oxygen

Chemical Reactions Form Compounds

_____ **4.** Which of the following is the process by which substances change into new substances?
- **a.** a chemical reaction
- **b.** a chain reaction
- **c.** a physical reaction
- **d.** an atomic reaction

PROPERTIES OF COMPOUNDS

_____ **5.** Which of the following statements about compounds is true?
- **a.** All compounds react with acid.
- **b.** Each compound has its own physical properties.
- **c.** Compounds are used to identify elements.
- **d.** Compounds are similar to elements.

Properties: Compounds Versus Elements

_____ **6.** Why are we able to eat sodium and chlorine in a compound?
- **a.** Sodium reacts violently with calcium.
- **b.** Chlorine is table salt.
- **c.** The compound is harmless.
- **d.** Sodium is a metal.

The Ratio of Elements in a Compound

_____ **7.** How do elements join to form compounds?
- **a.** never in the same ratio
- **b.** in a specific mass ratio
- **c.** randomly
- **d.** in a 1:8 mass ratio

BREAKING DOWN COMPOUNDS

Use the terms from the following list to complete the sentences below.

carbonic acid chemical change carbon dioxide

8. The compound that helps give some drinks "fizz" is called _____.

9. When you open a soft drink, carbonic acid breaks down into _____ and water.

10. The only way to break down compounds is through a(n) _____.

COMPOUNDS IN YOUR WORLD

Compounds in Industry

Write the letter of the correct answer in the space provided.

_____ **11.** Which of the following compounds is broken down to make aluminum?
- **a.** mercury oxide
- **b.** aluminum oxide
- **c.** aluminum chloride
- **d.** magnesium oxide

Compounds in Nature

_____ **12.** Which of the following can form compounds from nitrogen in the air?
- **a.** bacteria
- **b.** pea plants
- **c.** animals
- **d.** all plants

_____ **13.** What type of compound do plants and animals use to make proteins?
- **a.** sugar
- **b.** ammonia
- **c.** carbon dioxide
- **d.** nitrogen compounds

_____ **14.** What do plants use during photosynthesis to make carbohydrates?
- **a.** soil
- **b.** carbon dioxide
- **c.** carbon monoxide
- **d.** oxygen

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Mixtures (pp. 142–147)

PROPERTIES OF MIXTURES

Use the terms from the following list to complete the sentences below.

mixture	compound
physical	identity

1. A combination of substances that are not chemically combined is called a(n) _____.

2. Two or more materials that combine chemically form a(n) _____.

3. In a mixture, the _____ of the substances doesn't change.

4. Mixtures can be separated through _____ changes.

Separating Mixtures Through Physical Methods

Match the correct description with the correct term. Write the letter in the space provided.

_____ **5.** used to separate crude oil

_____ **6.** used to separate a mixture of aluminum and iron

_____ **7.** used to separate the parts of blood

_____ **8.** used to separate sulfur and table salt

a. distillation
b. centrifuge
c. filter
d. magnet

The Ratio of Components in a Mixture

Write the letter of the correct answer in the space provided.

_____ **9.** Which of the following affects the color of granite?
a. ratio of minerals
b. amount of mixture
c. temperatures of mixture
d. weight of minerals

SOLUTIONS

_____ **10.** Which of the following is NOT true of solutions?
- **a.** They contain a solute.
- **b.** They contain evenly mixed substances.
- **c.** They contain a solvent.
- **d.** They look like two substances.

_____ **11.** When substances separate and spread evenly throughout a mixture, what is the process called?
- **a.** solute
- **b.** dissolving
- **c.** chemical change
- **d.** solubility

_____ **12.** What is the substance that is dissolved in a solution called?
- **a.** solute
- **b.** solvent
- **c.** compound
- **d.** mixture

_____ **13.** In a solution, what is the substance in which something dissolves called?
- **a.** solute
- **b.** solvent
- **c.** compound
- **d.** mixture

Use the terms from the following list to complete the sentences below.

solvent	particles	alloy
soluble	solution	

14. Salt is _____ in water because it dissolves in water.

15. In a solution of two gases, the substance that is present in the largest amount is called the _____.

16. A solid solution of metals or nonmetals dissolved in metal is called a(n) _____.

17. A solution contains many small _____.

18. The particles in a(n) _____ are so small that they don't scatter light.

CONCENTRATION OF SOLUTIONS

Write the letter of the correct answer in the space provided.

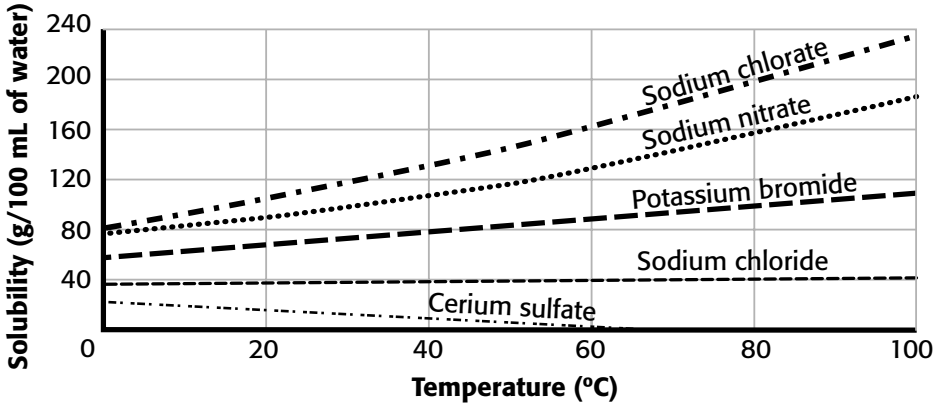
_____ **19.** What is a measure of the amount of solute dissolved in a given amount of solvent called?
- **a.** solution
- **b.** concentration
- **c.** mixture
- **d.** solvent

_____ **20.** What is one way of expressing concentration?
- **a.** in grams of solute per milliliter of solvent
- **b.** in grams of solute per millimeter of solvent
- **c.** in grams of solvent per milliliter of solute
- **d.** in grams of solvent per millimeter of solute

_____ **21.** How does a concentrated solution differ from a dilute solution if both solutions have the same volume?
- **a.** The concentrated solution has more solvent.
- **b.** The concentrated solution has less solvent.
- **c.** The concentrated solution has more solute.
- **d.** The concentrated solution has less solute.

Solubility

Use the graph below to answer questions 22 and 23. Write the letter of the correct answer in the space provided.



_____ **22.** Which solid is less soluble at higher temperatures than at lower temperatures?
- **a.** sodium chloride
- **b.** potassium bromide
- **c.** sodium nitrate
- **d.** cerium sulfate

_____ **23.** Which solid's solubility is least affected by temperature changes?
- **a.** cerium sulfate
- **b.** sodium nitrate
- **c.** potassium bromide
- **d.** sodium chloride

Use the terms from the following list to complete the sentences below.

temperature solubility

24. The ability of one substance to dissolve in another at a given temperature and pressure is called _____.

25. In a solution, the _____ usually affects the solubility.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Elements

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. element

_____

_____

2. pure substance

_____

_____

3. metal

_____

_____

4. nonmetal

_____

_____

5. metalloid

_____

_____

SECTION SUMMARY

Read the following section summary.

- A substance in which all of the particles are alike is a pure substance.
- An element is a pure substance that cannot be broken down into anything simpler by physical or chemical means.
- Each element has a unique set of physical and chemical properties.
- Elements are classified as metals, nonmetals, or metalloids, based on their properties.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Compounds

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. compound

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- A compound is a pure substance composed of two or more elements.
- During a chemical reaction, the atoms of two or more elements react with each other to form molecules of compounds.
- Each compound has unique physical and chemical properties that differ from those of the elements that make up the compound.
- Compounds can be broken down into simpler substances only by chemical changes.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Mixtures

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. mixture

2. solution

3. solute

4. solvent

5. concentration

6. solubility

SECTION SUMMARY

Read the following section summary.

- A mixture is a combination of two or more substances, each of which keeps its own characteristics.
- Mixtures can be separated by physical means, such as filtration and evaporation.
- A solution is a mixture that appears to be a single substance but is composed of a solute dissolved in a solvent.
- Concentration is a measure of the amount of solute dissolved in a given amount of solvent.
- The solubility of a solute is the ability of the solute to dissolve in a solvent at a certain temperature.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Development of the Atomic Theory (pp. 164–171)

THE BEGINNING OF ATOMIC THEORY

Write the letter of the correct answer in the space provided.

_____ **1.** Around 440 BCE, who thought that matter is made of particles that cannot be cut?
- **a.** Bohr
- **b.** Dalton
- **c.** Aristotle
- **d.** Democritus

_____ **2.** What does the word *atom* mean?
- **a.** dividable
- **b.** invisible
- **c.** hard particles
- **d.** not able to be divided

_____ **3.** What is the smallest particle into which an element can be divided?
- **a.** a nucleus
- **b.** a proton
- **c.** an atom
- **d.** a neutron

DALTON'S ATOMIC THEORY BASED ON EXPERIMENTS

_____ **4.** Which of the following ideas was part of Dalton's atomic theory?
- **a.** All substances are made of atoms.
- **b.** Atoms can be divided.
- **c.** Atoms can be destroyed.
- **d.** Some substances are made of atoms.

_____ **5.** What happened to Dalton's theory in the late 1800s?
- **a.** Dalton's theory was ignored.
- **b.** Dalton's theory was disproved.
- **c.** Dalton's theory was proved.
- **d.** Dalton's theory was changed.

THOMSON'S DISCOVERY OF ELECTRONS

_____ **6.** What did Thomson discover about atoms?
- **a.** Atoms cannot be divided.
- **b.** There are small particles inside atoms.
- **c.** There are no small particles in atoms.
- **d.** All atoms have negative charges.

Use the terms from the following list to complete the sentences below.

electrons particles positively

7. Thomson discovered that a(n) _____ charged plate in a cathode-ray tube attracted an invisible beam.

8. Thomson concluded that the beam was made of _____ that have negative electric charges.

9. The negatively charged particles Thomson discovered are called _____.

_____ **10.** Which of the following is true according to Thomson's plum-pudding model?
- **a.** Electrons are mixed throughout an atom.
- **b.** Electrons are in the center of an atom.
- **c.** Electrons are positively charged.
- **d.** Electrons are absent from an atom.

RUTHERFORD'S ATOMIC "SHOOTING GALLERY"

_____ **11.** What did Rutherford expect all the charged particles to do?
- **a.** to pass right through the gold foil
- **b.** to deflect to the sides of the gold foil
- **c.** to bounce straight back
- **d.** to become "blobs" of matter

_____ **12.** Which of the following statements is NOT true of Rutherford's results?
- **a.** Some of the particles turned to one side.
- **b.** Some of the particles did not move.
- **c.** Most of the particles passed through the gold foil.
- **d.** Some of the particles bounced straight back.

THE NUCLEUS AND THE ELECTRONS

_____ **13.** What did Rutherford revise in 1911?
- **a.** the atomic theory
- **b.** the particle theory
- **c.** the electron theory
- **d.** the scientific theory

_____ **14.** What positively charged area did Rutherford believe was in the center of an atom?
a. an electron
b. a nucleus
c. a particle
d. a proton

_____ **15.** What important idea emerged from the results of Rutherford's experiment?
a. Atoms are mostly empty space with no nucleus.
b. Atoms are mostly electrons.
c. Atoms are mostly empty space with a tiny, massive nucleus.
d. Atoms have electrons in the nucleus.

Bohr's Electron Levels

_____ **16.** How did Bohr propose that electrons move around the nucleus?
a. in a variety of ways
b. haphazardly
c. between the levels
d. in definite paths

The Modern Atomic Theory

_____ **17.** What model represents current atomic theory?
a. electron-cloud model
b. plum-pudding model
c. Rutherford's model
d. Bohr's model

_____ **18.** What is an atom's electron cloud?
a. a region where electrons are never found
b. a region where protons are likely to be found
c. a region where neutrons are likely to be found
d. a region where electrons are likely to be found

Energy Levels

_____ **19.** What is each electron's definite energy based on?
a. its weight
b. its size
c. its location around the nucleus
d. its location inside the nucleus

THE SIZE OF AN ATOM

_____ **20.** Which of the following statements is true?

a. A penny has about 20,000 atoms.
b. A penny has more atoms than Earth has people.
c. Aluminum is made up of large-sized atoms.
d. Aluminum atoms have a diameter of about 3 cm.

Observing Atoms

_____ **21.** Which of the following tools do scientists now use to observe atoms?

a. light waves
b. a scanning tunneling electron microscope
c. a telescope
d. a camera

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: The Atom (pp. 172–179)

THE PARTS OF AN ATOM

Subatomic Particles

_____ **1.** Why are protons, neutrons, and electrons called *subatomic particles*?
- **a.** because they are much smaller than an atom
- **b.** because they are much larger than an atom
- **c.** because they are not part of an atom
- **d.** because they are mostly empty space

The Nucleus

_____ **2.** What two particles make up an atom's nucleus?
- **a.** atomic mass units and electrons
- **b.** protons and electrons
- **c.** protons and neutrons
- **d.** electrons and neutrons

Match the correct description with the correct term. Write the letter in the space provided.

_____ **3.** unit of mass that describes the mass of an atom

_____ **4.** particle with no electrical charge

_____ **5.** particle that is positively charged

_____ **6.** particle that is negatively charged

_____ **7.** part that contains most of the mass of an atom

- **a.** electron
- **b.** nucleus
- **c.** proton
- **d.** neutron
- **e.** atomic mass unit

Outside the Nucleus

_____ **8.** How does the mass of an electron compare to the mass of protons and neutrons?
- **a.** It is much larger.
- **b.** It is the same.
- **c.** It is much smaller.
- **d.** It is unknown.

ATOMS AND ELEMENTS

Use the terms from the following list to complete the sentences below.

helium hydrogen electron

9. The simplest atom has one proton and one _____.

10. The simplest atom is the _____ atom.

11. If you build an atom using two protons, two neutrons, and two electrons, you have built an atom of _____.

Use the terms from the following list to complete the sentences below.

periodic table atomic number
neutrons element

12. An atom does not have to have equal numbers of protons and _____.

13. The number of protons in the nucleus of an atom is the _____ of that atom.

14. All atoms of a(n) _____ have the same atomic number.

15. The atomic number of each element is listed on the _____.

ISOTOPES

_____ **16.** What do isotopes always have?
- **a.** the same number of protons
- **b.** the same number of neutrons
- **c.** a different atomic number
- **d.** the same mass

_____ **17.** How are isotopes of the same element different?
- **a.** They have different numbers of protons.
- **b.** They have different numbers of neutrons.
- **c.** They have different numbers of electrons.
- **d.** They have different numbers of ions.

Properties of Isotopes

_____ **18.** Which phrase best describes radioactive isotopes?
- **a.** They are stable.
- **b.** They never change.
- **c.** They are unstable.
- **d.** They don't produce energy.

The Difference Between Isotopes

_____ **19.** What is an atom's mass number?
- **a.** the sum of the protons and neutrons in the nucleus
- **b.** the sum of the protons and electrons in the nucleus
- **c.** the sum of the neutrons and electrons in the nucleus
- **d.** the number of electrons in the nucleus

_____ **20.** What is the mass number of an isotope that has 5 protons, 6 neutrons, and 5 electrons?
- **a.** 1
- **b.** 11
- **c.** 10
- **d.** 16

Naming Isotopes

_____ **21.** What is the name of a carbon isotope that has a mass number of 12?
- **a.** carbon-8
- **b.** carbon-12
- **c.** carbon-6
- **d.** carbon-18

Isotopes and Atomic Mass

_____ **22.** What is the weighted average of the masses of all the naturally occurring isotopes of an element called?
- **a.** atomic number
- **b.** mass number
- **c.** isotope mass
- **d.** atomic mass

FORCES IN ATOMS

Use the terms from the following list to complete the sentences below.

strong force	electromagnetic force
weak force	gravitational force

23. Protons stay together in the nucleus because of _____.

24. Objects are pulled toward one another because of _____.

25. An important force in radioactive atoms is the _____.

26. The electrons are held around the nucleus because of _____.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Development of the Atomic Theory

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. atom

_____

_____

2. electron

_____

_____

3. nucleus

_____

_____

4. electron cloud

_____

_____

SECTION SUMMARY

Read the following section summary.

- Democritus thought that matter is composed of atoms.
- Dalton based his theory on observations of how elements combine.
- Thomson discovered electrons in atoms.
- Rutherford discovered that atoms are mostly empty space with a dense, positive nucleus.
- Bohr proposed that electrons are located in levels at certain distances from the nucleus.
- The electron-cloud model represents the current atomic theory.
- Atoms are extremely tiny, but scanning tunneling electron microscopes can be used to form direct images of them.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

The Atom

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. proton

2. atomic mass unit

3. neutron

4. atomic number

5. isotope

6. mass number

7. atomic mass

SECTION SUMMARY

Read the following section summary.

- Atoms consist of a nucleus, which has protons and usually neutrons, and electrons, which are located in electron clouds around the nucleus.
- The number of protons in the nucleus of an atom is that atom's atomic number. All atoms of an element have the same atomic number.
- Different isotopes of an element have different numbers of neutrons in their nuclei. Isotopes of an element share most chemical and physical properties.
- The mass number of an atom is the sum of the atom's neutrons and protons.
- Atomic mass is a weighted average of the masses of all natural isotopes of an element.
- The forces at work in an atom are gravitational force, electromagnetic force, strong force, and weak force.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Arranging the Elements (pp. 194–201)

DISCOVERING A PATTERN

Write the letter of the correct answer in the space provided.

_____ **1.** How did Dmitri Mendeleev, the Russian chemist, arrange the elements?
- **a.** in order of increasing density
- **b.** in order of increasing melting point
- **c.** in order of increasing shine
- **d.** in order of increasing atomic mass

Periodic Properties of the Elements

_____ **2.** What does *periodic* mean?
- **a.** occurs or repeats at regular intervals
- **b.** occurs almost never
- **c.** occurs only once
- **d.** occurs once or twice

_____ **3.** Mendeleev's pattern repeated after how many elements?
- **a.** every two elements
- **b.** every three elements
- **c.** every seven elements
- **d.** every five elements

_____ **4.** What did Mendeleev's table become known as?
- **a.** the periodic graph of the elements
- **b.** the periodic table of the elements
- **c.** the table of periodic elements
- **d.** the chart of periodic elements

Predicting Properties of Missing Elements

_____ **5.** How did Mendeleev predict the properties of missing elements?
- **a.** by making the properties up
- **b.** by ignoring the properties of found elements
- **c.** by using the pattern he found
- **d.** by not following the pattern

CHANGING THE ARRANGEMENT

_____ **6.** Which of the following did the British scientist Henry Moseley determine?
- **a.** the atomic number of an atom
- **b.** the atomic mass of an atom
- **c.** the number of atoms in a proton
- **d.** the periodic table of elements

_____ **7.** How are the elements arranged horizontally on the periodic table?
- **a.** by similar chemical properties
- **b.** by atomic mass
- **c.** in order of increasing atomic number
- **d.** in order of decreasing atomic number

PERIODIC TABLE OF THE ELEMENTS

_____ **8.** Which of the following items is NOT included in each square of the periodic table in your text?
- **a.** atomic number
- **b.** chemical symbol
- **c.** melting point
- **d.** atomic mass

_____ **9.** On the periodic table in your text, what color indicates an element is a solid?
- **a.** red
- **b.** blue
- **c.** green
- **d.** yellow

THE PERIODIC TABLE AND CLASSES OF ELEMENTS

Use the terms from the following list to complete the sentences below.

nonmetals	semimetals
metals	periodic table

10. Most of the elements in the _____ are metals.

11. More than half of the _____ are gases at room temperature.

12. All _____ are good conductors of electric current.

13. Metalloids are also called _____.

DECODING THE PERIODIC TABLE

Chemical Symbols

Use the terms from the following list to complete the sentences below.

chemical symbol californium mendelevium

14. Some elements, such as _____, are named after scientists.

15. Some elements, such as _____, are named after places.

16. For most elements, the _____ has one or two letters, the first of which is always capitalized.

Periods

Write the letter of the correct answer in the space provided.

_____ **17.** What is each horizontal row of elements on the periodic table called?
- **a.** a group
- **b.** a period
- **c.** a family
- **d.** a property

_____ **18.** In what direction do you read periods?
- **a.** from top to bottom
- **b.** from bottom to top
- **c.** from left to right
- **d.** from right to left

_____ **19.** What kind of pattern do properties of elements in a row follow?
- **a.** a musical pattern
- **b.** a square pattern
- **c.** a repeating, or periodic, pattern
- **d.** a star-shaped pattern

Groups

_____ **20.** What is another name for a group of elements?
- **a.** a period
- **b.** a family
- **c.** an element
- **d.** an electron

_____ **21.** Which of the following elements usually have similar properties?
- **a.** elements in a period
- **b.** elements in a group
- **c.** elements with the same color
- **d.** elements in a horizontal row

Atomic Number

_____ **22.** How many of the recently discovered elements follow the periodic law?
- **a.** half of them
- **b.** none of them
- **c.** every fifth element
- **d.** all of them

_____ **23.** What does the periodic law say about the properties of elements?
- **a.** They change periodically with the atomic numbers of the elements.
- **b.** They change periodically with the atomic mass of the elements.
- **c.** They change periodically with the mass number of the elements.
- **d.** They change periodically when the compound changes.

_____ **24.** Where is the atomic number found for each element on the periodic table in your book?
- **a.** to the left of the chemical symbol of each element
- **b.** to the right of the chemical symbol of each element
- **c.** below the chemical symbol of each element
- **d.** above the chemical symbol of each element

_____ **25.** What are isotopes?
- **a.** atoms that have the same number of protons but different numbers of electrons
- **b.** atoms that have the same number of protons but different numbers of neutrons
- **c.** atoms that have the same number of protons but different numbers of nuclei
- **d.** atoms that have the same number of electrons but different numbers of nuclei

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Grouping the Elements (pp. 202–209)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following gives elements in a family or group similar properties?
- **a.** the same atomic mass
- **b.** the same number of protons
- **c.** the same number of electrons in their outer energy level
- **d.** the same number of neutrons

_____ **2.** At the atomic level, what makes elements reactive?
- **a.** Their atoms have the same number of neutrons.
- **b.** Their atoms have the same number of protons.
- **c.** Their atoms have the same number of electrons.
- **d.** Their atoms take, give, or share electrons with other atoms.

GROUP 1: ALKALI METALS

_____ **3.** In the periodic table of elements, what is the symbol for potassium?
- **a.** Li
- **b.** K
- **c.** Cs
- **d.** Fr

_____ **4.** How are the alkali metals similar?
- **a.** They are very reactive.
- **b.** They have very few uses.
- **c.** They are so hard they cannot be cut.
- **d.** They are often stored in water.

_____ **5.** How many outer-level electrons do alkali metal atoms have?
- **a.** four
- **b.** three
- **c.** two
- **d.** one

GROUP 2: ALKALINE-EARTH METALS

_____ **6.** In the chart that illustrates Group 2 elements, which element is not an alkaline-earth metal?
- **a.** magnesium
- **b.** calcium
- **c.** barium
- **d.** sodium

_____ **7.** Which of the following is true about all the alkaline-earth metals?
- **a.** They have low density.
- **b.** They are less reactive than alkali metals are.
- **c.** They have three outer-level electrons.
- **d.** They have few uses.

GROUPS 3–12: TRANSITION METALS

_____ **8.** Which of the following is true about transition metals?
- **a.** They are less reactive than alkali and alkaline-earth metals.
- **b.** They are more reactive than alkali and alkaline-earth metals.
- **c.** They are equally as reactive as alkali and alkaline-earth metals.
- **d.** They are not reactive.

_____ **9.** If groups are read from top to bottom, what elements are in Group 3?
- **a.** Sc, Ti, V, Mn
- **b.** V, Nb, Ta, Db
- **c.** Sc, Y, La, Ac
- **d.** La, Hf, Ta, W

_____ **10.** What type of metal are the lanthanides and the actinides?
- **a.** transition metals
- **b.** alkali metals
- **c.** alkaline-earth metals
- **d.** precious metals

Properties of Transition Metals

_____ **11.** Which of the following describes most transition metals?
- **a.** poor conductors of electric current
- **b.** dull
- **c.** good conductors of thermal energy
- **d.** low density and melting points

GROUP 13: BORON GROUP

Use the terms from the following list to complete the sentences below.

metal	boron
aluminum	oxygen

12. The most common element in Group 13 is _____, which is used to make airplane parts.

13. Aluminum is useful because it is a lightweight _____.

14. All elements in the _____ group are reactive and solid at room temperature.

15. Aluminum reacts with _____ in the air, preventing further reaction of the aluminum.

GROUP 14: CARBON GROUP

Use the terms from the following list to complete the sentences below.

silicon	tin
carbon	nonmetal

16. Group 14 of the periodic table contains one _____, two metalloids, and three metals.

17. Compounds of _____, such as proteins, fats, and carbohydrates, are necessary for living things on Earth.

18. Germanium and _____ are used to make computer chips.

19. The symbol Sn stands for the metal _____.

GROUP 15: NITROGEN GROUP

Write the letter of the correct answer in the space provided.

_____ **20.** What element can nitrogen react with to make ammonia?

a. phosphorus
b. hydrogen
c. oxygen
d. arsenic

_____ **21.** Which element in Group 15 is found in nature only combined with other elements?
- **a.** nitrogen
- **b.** oxygen
- **c.** hydrogen
- **d.** phosphorus

GROUP 16: OXYGEN GROUP

_____ **22.** How much oxygen is in the air you breathe?
- **a.** 20%
- **b.** 40%
- **c.** 80%
- **d.** none

_____ **23.** What is necessary for substances to burn?
- **a.** fertilizer
- **b.** oxygen
- **c.** nitrogen
- **d.** arsenic

_____ **24.** What element of the oxygen group is a yellow solid in nature and is used to make sulfuric acid?
- **a.** nitrogen
- **b.** oxygen
- **c.** sulfur
- **d.** phosphorus

GROUP 17: HALOGENS

_____ **25.** Why are halogens so reactive?
- **a.** because their atoms only need two electrons to complete their outer level
- **b.** because they are excellent conductors of electric current
- **c.** because their atoms only need one electron to complete their outer level
- **d.** because they have so few electrons in their outer level

_____ **26.** What is made when a halogen reacts with a metal?
- **a.** a salt
- **b.** a metalloid
- **c.** a nonmetal
- **d.** an electron

GROUP 18: NOBLE GASES

_____ **27.** Because scientists originally thought that these elements would not react at all, what were the noble gases first called?
- **a.** inept gases
- **b.** inert gases
- **c.** inverted gases
- **d.** nongases

_____ **28.** How many nonmetals make up Group 18?
- **a.** five
- **b.** six
- **c.** three
- **d.** two

_____ **29.** What element helps light bulbs last longer?
- **a.** neon
- **b.** krypton
- **c.** argon
- **d.** xenon

HYDROGEN

_____ **30.** What is the symbol for hydrogen?
- **a.** Hy
- **b.** K
- **c.** H
- **d.** Hi

_____ **31.** Which word or words describe hydrogen?
- **a.** colorless gas
- **b.** unreactive
- **c.** high density
- **d.** not abundant

The Uniqueness of Hydrogen

_____ **32.** Where is hydrogen located on the periodic table?
- **a.** in Group 1
- **b.** in Group 18
- **c.** above Group 1
- **d.** below Group 1

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Arranging the Elements

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. periodic

_____

_____

2. period

_____

_____

3. group

_____

_____

4. periodic law

_____

_____

SECTION SUMMARY

Read the following section summary.

- Mendeleev developed the first periodic table by listing the elements in order of increasing atomic mass. He used his table to predict that elements with certain properties would be discovered later.
- Properties of elements repeat in a regular, or periodic, pattern.
- Moseley rearranged the elements in order of increasing atomic number.
- Elements in the periodic table are classified as metals, nonmetals, and metalloids.
- Each element has a chemical symbol that identifies elements that make up compounds.
- A horizontal row of elements is called a period. Physical and chemical properties of elements change across each period.
- A vertical column of elements is called a group or family. Elements in a group usually have similar properties.
- The periodic law states that the repeating chemical and physical properties of elements relate to and depend on elements' atomic numbers.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Grouping the Elements

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. alkali metal

2. alkaline-earth metal

3. halogen

4. noble gas

SECTION SUMMARY

Read the following section summary.

- Elements that are classified as alkali metals (Group 1) are the most reactive metals. Atoms of the alkali metals have one electron in their outer level.
- Elements that are classified as alkaline-earth metals (Group 2) are less reactive than the alkali metals are. Atoms of the alkaline-earth metals have two electrons in their outer level.
- Elements that are classified as transition metals (Groups 3–12) include most of the well-known metals and the lanthanides and actinides.
- Groups 13–16 contain the metalloids and some metals and nonmetals.
- Halogens (Group 17) are very reactive nonmetals. Atoms of the halogens have seven electrons in their outer level.
- Noble gases (Group 18) are unreactive nonmetals. Atoms of the noble gases have a full set of electrons in their outer level.
- Hydrogen is set off by itself in the periodic table. Its properties do not match the properties of any one group.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Electrons and Chemical Bonding (pp. 226–229)

COMBINING ATOMS THROUGH CHEMICAL BONDING

Write the letter of the correct answer in the space provided.

_____ **1.** Which of these substances is a combination of carbon, hydrogen, and oxygen?
- **a.** sugar
- **b.** salt
- **c.** water
- **d.** sulfuric acid

_____ **2.** What is the joining of atoms to form new substances called?
- **a.** chemical bonding
- **b.** physical bonding
- **c.** chemical compounding
- **d.** atomic joining

_____ **3.** What do you call an interaction that holds two atoms together?
- **a.** a chemical hold
- **b.** a chemical bond
- **c.** a chemical connection
- **d.** an atomic bond

_____ **4.** What can be shared in chemical bonds?
- **a.** atoms
- **b.** protons
- **c.** electrons
- **d.** neutrons

Discussing Bonding Using Models

_____ **5.** What do we use to help us know why atoms form bonds?
- **a.** observations
- **b.** maps
- **c.** charts
- **d.** models

ELECTRON NUMBER AND ORGANIZATION

_____ **6.** How many valence electrons are in an oxygen atom?
- **a.** 2
- **b.** 4
- **c.** 6
- **d.** 8

Use the terms from the following list to complete the sentences below.

valence electron	atomic number
group	energy levels

7. The number of protons in an atom is its _____.

8. Electrons in an atom are organized in _____.

9. On the periodic table, atoms in the same _____ have the same number of valence electrons.

10. An electron in the outermost energy level of an atom is a(n) _____.

TO BOND OR NOT TO BOND

Write the letter of the correct answer in the space provided.

_____ **11.** What determines whether an atom will form bonds?
- **a.** the number of electrons
- **b.** the number of valence electrons
- **c.** the number of protons
- **d.** the number of neutrons

_____ **12.** Which group on the periodic table contains elements that do not normally form bonds?
- **a.** Group 2
- **b.** Group 6
- **c.** Group 10
- **d.** Group 18

Use the terms from the following list to complete the sentences below.

eight	two
electrons	helium

13. Atoms bond by gaining, losing, or sharing _____.

14. A filled outermost level in most atoms has _____ electrons.

15. The first energy level of an atom can hold only _____ electrons.

16. The outermost energy level in a(n) _____ atom is also the first energy level.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Ionic Bonds (pp. 230–235)

FORMING IONIC BONDS

Write the letter of the correct answer in the space provided.

_____ **1.** What do you call a bond that forms when electrons are transferred from one atom to another?
- **a.** a compound bond
- **b.** an ionic bond
- **c.** a crystal bond
- **d.** an atomic bond

Charged Particles

_____ **2.** What are charged particles that form when atoms gain or lose electrons?
- **a.** ions
- **b.** neutrons
- **c.** bonds
- **d.** particle atoms

_____ **3.** Why are ions charged particles?
- **a.** The number of electrons does not equal the number of protons.
- **b.** The number of protons does not equal the number of neutrons.
- **c.** The number of neutrons does not equal the number of electrons.
- **d.** The electric charges of the electrons and protons cancel each other.

FORMING POSITIVE IONS

_____ **4.** An aluminum atom can lose 3 electrons in order to have a full outer energy level. What charge does the resulting aluminum ion have?
- **a.** 1^+
- **b.** 3^+
- **c.** 2^+
- **d.** 2^+

_____ **5.** What is the chemical symbol for an aluminum ion?
- **a.** Al^{3+}
- **b.** Al^{3-}
- **c.** Al^{2+}
- **d.** Al^{2-}

Use the terms from the following list to complete the sentences below.

positive ions valence electrons ion
energy negative ions

6. If an aluminum atom loses its three valence electrons, it becomes a(n) _____.

7. For electrons to pull away from atoms, _____ is needed.

8. When atoms lose electrons in an ionic bond, they form _____.

9. Most metals have few _____ and form positive ions.

10. The energy needed to take electrons from metals comes from the formation of _____.

FORMING NEGATIVE IONS

Write the letter of the correct answer in the space provided.

_____ **11.** When atoms gain electrons during chemical changes, what charge do they have?
- **a.** positive charge
- **b.** negative charge
- **c.** neutral charge
- **d.** electric charge

How Nonmetal Atoms Become Negative Ions

_____ **12.** The symbol for the oxide ion is O^{2-}. How many electrons must an oxygen atom gain to become an oxide ion?
- **a.** 0
- **b.** 1
- **c.** 2
- **d.** 3

_____ **13.** What ending is used for the names of negative ions?
- **a.** *-ion*
- **b.** *-ade*
- **c.** *-ide*
- **d.** *-ite*

The Energy of Gaining Electrons

_____ **14.** What do atoms of Group 17 elements give off when they gain electrons?
- **a.** energy
- **b.** protons
- **c.** bonds
- **d.** charges

FORMING IONIC COMPOUNDS

_____ **15.** How do the properties of sodium and chlorine compare to the properties of the ionic compound sodium chloride?
- **a.** They are the same.
- **b.** They are charged.
- **c.** They have a crystal lattice structure.
- **d.** They are different.

_____ **16.** What is the repeating three-dimensional pattern that forms when ions bond?
- **a.** a compound
- **b.** a chemical compound
- **c.** a crystal lattice
- **d.** an ionic bond

IONIC COMPOUNDS

Properties of Ionic Compounds

_____ **17.** Which of the following is a property of many ionic compounds?
- **a.** low melting point
- **b.** high melting point
- **c.** low boiling point
- **d.** malleability

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Covalent and Metallic Bonds (pp. 236–241)

COVALENT BONDS

Write the letter of the correct answer in the space provided.

_____ **1.** Sugar and water are each held together by which type of bond?
- **a.** metallic
- **b.** covalent
- **c.** ionic
- **d.** atomic

_____ **2.** Which is a typical property of a substance formed with covalent bonds?
- **a.** low melting point
- **b.** high density
- **c.** malleability
- **d.** high boiling point

_____ **3.** What forms when atoms share one or more pairs of electrons?
- **a.** a valence electron
- **b.** an ionic bond
- **c.** an element
- **d.** a covalent bond

Covalent Bonds and Molecules

Match the correct description with the correct term. Write the letter in the space provided.

_____ **4.** consists of two or more atoms joined together in a definite ratio

_____ **5.** used to show the valence electrons in an atom

- **a.** molecule
- **b.** electron-dot diagram

COVALENT COMPOUNDS AND MOLECULES

Write the letter of the correct answer in the space provided.

_____ **6.** What is the smallest unit of a covalently bonded compound that keeps all the properties of the compound?
- **a.** a molecule
- **b.** an electron
- **c.** a covalent bond
- **d.** an ion

The Simplest Molecules

_____ **7.** What is a molecule made up of two atoms called?
- **a.** a diatomic element
- **b.** a diatomic molecule
- **c.** a molecular element
- **d.** a covalent molecule

_____ **8.** What is an element found in nature as diatomic molecules called?
- **a.** a diatomic element
- **b.** a diatomic molecule
- **c.** a molecular element
- **d.** a covalent molecule

_____ **9.** Oxygen and nitrogen are examples of which of the following?
- **a.** diatomic elements
- **b.** monatomic molecules
- **c.** molecular elements
- **d.** ionic molecules

_____ **10.** How are shared electrons in molecules of diatomic elements counted?
- **a.** as valence electrons for each atom
- **b.** as valence molecules for each item
- **c.** as extra electrons
- **d.** They aren't counted.

More-Complex Molecules

Use the terms from the following list to complete the sentences below.

diatomic	complex
carbon	four

11. The simplest molecules are _____ molecules.

12. Soap and proteins are examples of _____ molecules.

13. The basis of many complex molecules is the _____ atom.

14. Carbon atoms need to make _____ covalent bonds to have eight valence electrons.

METALLIC BONDS

Use the terms from the following list to complete the sentences below.

electrons metallic bond

15. A bond that forms when charged metal ions attract electrons in a metal is a(n) _____.

16. Positively charged metal ions form when metal atoms lose _____.

Movement of Electrons Throughout a Metal

Write the letter of the correct answer in the space provided.

_____ **17.** Why does bonding occur in metals?
- **a.** because the atoms are far apart
- **b.** because the atoms are shiny
- **c.** because the outer energy levels of the atoms overlap
- **d.** because the outer energy levels of the atoms are far apart

PROPERTIES OF METALS

_____ **18.** Which one of the following properties is NOT due to metallic bonds?
- **a.** electrical conductivity
- **b.** ductility
- **c.** solubility
- **d.** malleability

Match the correct definition with the correct term. Write the letter in the space provided.

_____ **19.** the ability of metal to be drawn into wires

_____ **20.** the ability of metal to be hammered into sheets

_____ **21.** allow metals to be bent, but not broken

_____ **22.** the ability to conduct electric current

- **a.** moving electrons
- **b.** malleability
- **c.** ductility
- **d.** conductivity

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Electrons and Chemical Bonding

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. chemical bonding

2. chemical bond

3. valence electron

SECTION SUMMARY

Read the following section summary.

- Chemical bonds form when atoms join to form new substances. A chemical bond is an interaction that holds two atoms together.
- A valence electron is an electron in the outermost energy level of an atom.
- Most atoms form bonds by gaining, losing, or sharing electrons until they have eight valence electrons. Atoms of some elements need only two electrons to fill their outermost level.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Ionic Bonds

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. ionic bond

2. ion

3. crystal lattice

SECTION SUMMARY

Read the following section summary.

- An ionic bond forms when electrons are transferred from one atom to another. During ionic bonding, the atoms become oppositely charged ions.
- Ionic bonding usually occurs between atoms of metals and atoms of nonmetals.
- Energy is needed to remove electrons from metal atoms. Energy is released when most nonmetal atoms gain electrons.
- Ionic compounds form solids by building up a three-dimensional repeating pattern called a crystal lattice.
- Ionic compounds are brittle and highly soluble, with high melting and boiling points.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Covalent and Metallic Bonds

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. covalent bond

2. molecule

3. metallic bond

SECTION SUMMARY

Read the following section summary.

- In covalent bonding, two atoms share electrons. A covalent bond forms when atoms share one or more pairs of electrons.
- Covalently bonded atoms form a particle called a *molecule*. A molecule is the smallest particle of a compound that has the chemical properties of the compound.
- In metallic bonding, the valence electrons move throughout the metal. A metallic bond is formed by the attraction between positive metal ions and the electrons in the metal.
- Properties of metals include electrical conductivity, ductility, and malleability.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Forming New Substances (pp. 256–261)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following causes leaves to change color?
- **a.** energy
- **b.** precipitate
- **c.** chlorophyll
- **d.** gas

CHEMICAL REACTIONS

_____ **2.** Which of the following occurs when chlorophyll breaks down into new substances?
- **a.** solid formation
- **b.** a chemical reaction
- **c.** a physical reaction
- **d.** gas formation

_____ **3.** Which of the following is true of the new materials formed in a chemical reaction?
- **a.** Their physical and chemical properties differ from those of the original materials.
- **b.** Their properties are the same as those of the original materials.
- **c.** Only their physical properties differ from those of the original materials.
- **d.** Only their chemical properties differ from those of the original materials.

Signs of Chemical Reactions

_____ **4.** Which of the following is a sign of a chemical reaction?
- **a.** thermal energy from a fire
- **b.** ice melting on the ground
- **c.** steam from a teapot
- **d.** water freezing on a pond

Use the terms from the following list to complete the sentences below.

precipitate chemical reaction

5. When a substance changes to make a new substance,

a(n) _____ occurs.

6. A solid that is formed in a solution is called a(n) _____.

A Change of Properties

Write the letter of the correct answer in the space provided.

_____ **7.** How can you be sure a chemical reaction is happening?

a. A solid dissolves.
b. A new substance with different properties forms.
c. Water turns to steam.
d. A mixture is made.

BONDS: HOLDING MOLECULES TOGETHER

Use the terms from the following list to complete the sentences below.

diatomic substances
chemical bond molecules

8. The force that holds two atoms together is called

a(n) _____.

9. When _____ bump into one another with enough energy, chemical bonds can break.

10. When chemical bonds break, the atoms rearrange to form new

_____.

11. A molecule made up of two atoms is _____.

REACTIONS AND ENERGY

Exothermic Reactions

Write the letter of the correct answer in the space provided.

_____ **12.** What happens in an exothermic reaction?

a. Heat is released.
b. Heat is taken in.
c. Heat changes to gas.
d. Heat changes to light.

Endothermic Reactions

_____ **13.** What happens in an endothermic reaction?
- **a.** Heat is released.
- **b.** Heat is taken in.
- **c.** Water is released.
- **d.** Water is taken in.

_____ **14.** Which of the following is an example of an endothermic process?
- **a.** a fire
- **b.** steam
- **c.** a light stick
- **d.** photosynthesis

The Law of Conservation of Energy

_____ **15.** According to the law of conservation of energy, which of the following is NOT true?
- **a.** Energy can be transferred.
- **b.** Energy cannot be created or destroyed.
- **c.** Energy cannot change forms.
- **d.** Energy can change forms.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Chemical Formulas and Equations (pp. 262–267)

CHEMICAL FORMULAS

Write the letter of the correct answer in the space provided.

_____ **1.** About how many elements form all substances?
- **a.** 10
- **b.** 100
- **c.** 200
- **d.** 1,000

_____ **2.** A combination of chemical symbols and numbers that represents a substance is called what?
- **a.** a chemical formula
- **b.** a chemical bond
- **c.** a chemical sentence
- **d.** a chemical reaction

_____ **3.** What does a chemical formula show about each element?
- **a.** the number of atoms
- **b.** the number of chemicals
- **c.** the number of electrons
- **d.** the number of metals

_____ **4.** What is the number 2 called in the formula H_2O?
- **a.** a superscript
- **b.** an element
- **c.** a symbol
- **d.** a subscript

Writing Formulas for Covalent Compounds

_____ **5.** Which of the following is the chemical formula for carbon dioxide?
- **a.** C_2O
- **b.** CO_2
- **c.** 2CO
- **d.** CO

_____ **6.** What does a prefix in a chemical's name represent?
- **a.** the number of atoms of one element
- **b.** the number of chemicals
- **c.** the number of molecules
- **d.** the number of elements

Writing Formulas for Ionic Compounds

_____ **7.** What makes up an ionic compound?
- **a.** two chemicals
- **b.** two nonmetals
- **c.** a metal and a nonmetal
- **d.** two charged metals

_____ **8.** What is the overall charge in an ionic compound?
- **a.** 2
- **b.** 1
- **c.** 0
- **d.** –1

CHEMICAL EQUATIONS

Describing Reactions by Using Equations

Use the terms from the following list to complete the sentences below.

product reactant chemical equation

9. Using chemical symbols and numbers to describe a chemical reaction is known as a(n) _____.

10. A substance or molecule that participates in a chemical reaction is called a(n) _____.

11. The substance that forms in a chemical reaction is called a(n) _____.

The Importance of Accuracy

Write the letter of the correct answer in the space provided.

_____ **12.** Which of the following is true of the chemical symbols CO_2, CO, and Co?
- **a.** No one will ever confuse them.
- **b.** Confusing them will not make a difference.
- **c.** They represent the same chemical formula.
- **d.** They represent different chemical formulas and elements.

Why Equations Must Be Balanced

_____ **13.** Which of the following happens to atoms in a chemical reaction?
- **a.** They are sometimes lost, never rearranged.
- **b.** They are sometimes lost, gained, or rearranged.
- **c.** They are never lost or gained, just rearranged.
- **d.** They are lost or gained, never rearranged.

_____ **14.** When you write a chemical equation, the number of atoms of each element in the reactants must be what?
- **a.** equal to the number in the products
- **b.** less than one
- **c.** greater than one
- **d.** zero

_____ **15.** Which law states that mass is neither created nor destroyed in ordinary chemical and physical changes?
- **a.** law of conservation of energy
- **b.** law of chemical reactions
- **c.** law of conservation of mass
- **d.** law of balanced equations

How to Balance an Equation

_____ **16.** Which of the following is the coefficient in the formula $2H_2O$?
- **a.** O
- **b.** 2
- **c.** H_2O
- **d.** H_2

_____ **17.** What must be done for a chemical equation to be balanced?
- **a.** All molecules must be counted.
- **b.** All chemicals must be equal.
- **c.** All atoms must be counted.
- **d.** All atoms must be discounted.

_____ **18.** When you balance an equation, which of the following are changed?
- **a.** metals
- **b.** subscripts
- **c.** coefficients
- **d.** formulas

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Forming New Substances

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. chemical reaction

_____

_____

2. precipitate

_____

_____

3. exothermic reaction

_____

_____

4. endothermic reaction

_____

_____

5. law of conservation of energy

_____

_____

SECTION SUMMARY

Read the following section summary.

- A chemical reaction is a process by which substances change to form new substances with new chemical and physical properties.
- Signs that indicate a chemical reaction has taken place are a color change, formation of a gas or a solid, and the release or absorption of energy.
- During a reaction, bonds are broken, atoms are rearranged, and new bonds are formed.
- Exothermic reactions give off energy, and endothermic reactions absorb energy.
- The law of conservation of energy states that energy is neither created nor destroyed.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Chemical Formulas and Equations

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. chemical formula

_____

_____

2. chemical equation

_____

_____

3. reactant

_____

_____

4. product

_____

_____

5. law of conservation of mass

_____

_____

SECTION SUMMARY

Read the following section summary.

- A chemical formula uses symbols and subscripts to describe the makeup of a compound.
- Chemical formulas can often be written from the names of covalent and ionic compounds.
- A chemical equation uses chemical formulas, chemical symbols, and coefficients to describe a reaction.
- A balanced equation has the same numbers and kinds of atoms on each side of the equation.
- A balanced equation shows the law of conservation of mass: mass is neither created nor destroyed during ordinary physical and chemical changes.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Ionic and Covalent Compounds (pp. 282–285)

Write the letter of the correct answer in the space provided.

_____ **1.** What is the interaction that holds atoms and ions together called?
- **a.** an electron bond
- **b.** a chemical bond
- **c.** an ionic bond
- **d.** a valence bond

_____ **2.** What kind of electron determines if a compound is covalent or ionic?
- **a.** ionic
- **b.** covalent
- **c.** compound
- **d.** valence

IONIC COMPOUNDS AND THEIR PROPERTIES

Use the terms from the following list to complete the sentences below.

ions	sodium chloride
metals	ionic compounds

3. An ionic bond is an attraction between oppositely charged _____.

4. Compounds that have ionic bonds are called _____.

5. Ionic compounds can be formed when _____ react with nonmetals.

6. Another name for table salt is _____.

Brittleness

Write the letter of the correct answer in the space provided.

_____ **7.** What do ionic compounds usually do when they are hit?
- **a.** roll over
- **b.** break apart
- **c.** form a lattice
- **d.** bond together

_____ **8.** What kind of structure does an ionic compound have?
- **a.** ionic
- **b.** opposite
- **c.** brittle
- **d.** crystal lattice

High Melting Points

Use the terms from the following list to complete the sentences below.

solids ionic compounds

9. Strong bonds make _____ have high melting points.

10. High melting points are the reason that most ionic compounds are _____ at room temperature.

Solubility and Electrical Conductivity

Write the letter of the correct answer in the space provided.

_____ **11.** What do many ionic compounds dissolve easily in?
- **a.** air
- **b.** water
- **c.** oil
- **d.** current

_____ **12.** What do water molecules do to ions?
- **a.** push them together
- **b.** conduct them
- **c.** pull them apart
- **d.** heat them

_____ **13.** What can an ionic compound conduct after it dissolves in water?
- **a.** ions
- **b.** electric current
- **c.** crystals
- **d.** heat

COVALENT COMPOUNDS AND THEIR PROPERTIES

_____ **14.** What kind of compound is formed by the sharing of electrons?
- **a.** an ionic compound
- **b.** a crystal compound
- **c.** a covalent compound
- **d.** an electron compound

_____ **15.** What is the group of atoms that make up a single unit of a covalent compound called?
a. an ionic bond
b. a salt
c. a molecule
d. a crystal lattice

Solubility

_____ **16.** What do many covalent compounds NOT dissolve well in?
a. air
b. water
c. gas
d. oil

Low Melting Points

_____ **17.** How do the attractive forces of covalent compounds differ from those of ionic compounds?
a. The attractive forces are hotter.
b. The attractive forces are weaker.
c. The attractive forces are colder.
d. The attractive forces are larger.

_____ **18.** Why do covalent compounds have lower melting points than ionic compounds?
a. Less heat is needed to separate their molecules.
b. More heat is needed to separate their molecules.
c. Their molecules cannot separate.
d. Their molecules are always separated.

Electrical Conductivity

_____ **19.** Which of the following is a covalent compound that dissolves in water?
a. oil
b. salt
c. sugar
d. nickel oxide

_____ **20.** What kind of compound is sugar?
a. attractive
b. covalent
c. ionic
d. metal

_____ **21.** Why can't a solution of sugar and water conduct an electric current?
a. Sugar forms too many ions.
b. Sugar is not a covalent compound.
c. Sugar doesn't form ions.
d. Sugar dissolves in water.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Acids and Bases (pp. 286–291)

ACIDS AND THEIR PROPERTIES

Write the letter of the correct answer in the space provided.

_____ **1.** What is a compound that increases hydronium ions in solution called?
- **a.** oxygen
- **b.** an acid
- **c.** an indicator
- **d.** carbon

_____ **2.** What kind of ions separate from acids in solution?
- **a.** oxygen
- **b.** carbon
- **c.** water
- **d.** hydrogen

_____ **3.** What do hydrogen ions bond with to form hydronium ions?
- **a.** oxygen ions
- **b.** carbon ions
- **c.** water molecules
- **d.** other hydrogen ions

Acids Have a Sour Flavor

Use the terms from the following list to complete the sentences below.

corrosive acids citric

4. Foods that taste sour usually contain _____.

5. The taste of citrus fruits comes from _____ acid.

6. Many acids are _____, which means that they can destroy things.

Acids Change Colors of Indicators

Write the letter of the correct answer in the space provided.

_____ **7.** What is a compound that can change color depending on conditions such as pH?
- **a.** water
- **b.** hydrogen
- **c.** paper
- **d.** an indicator

_____ **8.** What happens when acid is added to blue litmus paper?
- **a.** The paper turns red.
- **b.** The paper turns green.
- **c.** The paper stays blue.
- **d.** The paper turns orange.

_____ **9.** Which of the following is NOT an indicator?
- **a.** blue litmus paper
- **b.** red litmus paper
- **c.** bromthymol blue
- **d.** hydrochloric acid

Acids React With Metals

_____ **10.** What do acids that react with some metals produce?
- **a.** oxygen gas
- **b.** hydrogen gas
- **c.** natural gas
- **d.** helium gas

Acids Conduct Electric Current

_____ **11.** Because acids form ions, what can they conduct?
- **a.** water molecules
- **b.** acid solutions
- **c.** electric current
- **d.** hydronium

Uses of Acids

Match the correct description with the correct term. Write the letter in the space provided.

_____ **12.** used to make paper

_____ **13.** used to make plastics

_____ **14.** used in soft drinks

_____ **15.** used in swimming pools

- **a.** hydrochloric acid
- **b.** nitric acid
- **c.** sulfuric acid
- **d.** carbonic acid

BASES AND THEIR PROPERTIES

Write the letter of the correct answer in the space provided.

_____ **16.** What is a compound that adds hydroxide ions when dissolved in water called?
- **a.** an acid
- **b.** a base
- **c.** sodium
- **d.** neutral

_____ **17.** Which ions give bases their properties?
- **a.** sodium ions
- **b.** hydrogen ions
- **c.** hydroxide ions
- **d.** chloride ions

Bases Have a Bitter Flavor and a Slippery Feel

_____ **18.** What gives soap a bitter taste and slippery feel?
- **a.** a base
- **b.** an acid
- **c.** dirt
- **d.** water

_____ **19.** Why should you NEVER taste or touch an unknown base?
- **a.** Many are slimy.
- **b.** Many are too watery.
- **c.** Many turn colors.
- **d.** Many are corrosive.

Bases Change Color of Indicators

_____ **20.** Bases change the color of red litmus paper to what color?
- **a.** green
- **b.** blue
- **c.** orange
- **d.** pink

Bases Conduct Electric Current

_____ **21.** Because bases increase hydroxide ions in solution, what can they conduct?
- **a.** water molecules
- **b.** negativity
- **c.** hydrogen
- **d.** electric current

Uses of Bases

Match the correct description with the correct term. Write the letter in the space provided.

_____ **22.** used in soap

_____ **23.** used in cement

_____ **24.** used in antacids

_____ **25.** used in household cleaners

a. ammonia

b. calcium hydroxide

c. magnesium hydroxide

d. sodium hydroxide

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Solutions of Acids and Bases (pp. 292–295)

STRENGTHS OF ACIDS AND BASES

Write the letter of the correct answer in the space provided.

_____ **1.** What does the strength of an acid or base depend on?
- **a.** molecules that bond together
- **b.** concentration
- **c.** the number of molecules that break apart
- **d.** the amount of the acids or base

Strong Versus Weak Acids

_____ **2.** When a strong acid dissolves in water, how many molecules break apart?
- **a.** only a few
- **b.** about one fourth
- **c.** about half
- **d.** all

_____ **3.** When a weak acid dissolves in water, how many molecules break apart?
- **a.** only a few
- **b.** about one fourth
- **c.** about half
- **d.** all

Strong Versus Weak Bases

_____ **4.** What would you call a base if all of its molecules break apart in water?
- **a.** a weak base
- **b.** a neutral base
- **c.** a strong base
- **d.** a medium base

ACIDS, BASES, AND NEUTRALIZATION

Use the terms from the following list to complete the sentences below.

salt neutralization water

5. When acids and bases combine to form a neutral solution, it is called a(n) _____ reaction.

6. H^+ ions in an acid and OH^- ions in a base combine to form _____.

7. If the water in an acid-base solution evaporates, the ions form a(n) _____.

The pH Scale

Write the letter of the correct answer in the space provided.

_____ **8.** What is the value used to express acidity or basicity called?
- **a.** solution
- **b.** indicator
- **c.** pH
- **d.** concentration

_____ **9.** What identifies whether a solution has an acid or a base?
- **a.** water
- **b.** indicator
- **c.** electric current
- **d.** concentration

_____ **10.** What is the pH of a neutral solution such as pure water?
- **a.** 7
- **b.** 4
- **c.** 1
- **d.** 9

_____ **11.** What is the pH of a basic solution?
- **a.** less than 7
- **b.** greater than 7
- **c.** 7
- **d.** neutral

_____ **12.** What is the pH of an acidic solution?
- **a.** greater than 7
- **b.** less than 7
- **c.** 7
- **d.** neutral

Match the correct description with the correct term. Write the letter in the space provided.

_____ **13.** basic solution

_____ **14.** acidic solution

_____ **15.** neutral solution

a. lemon juice
b. detergent
c. pure water

Using Indicators to Determine pH

Write the letter of the correct answer in the space provided.

_____ **16.** What can a group of indicators be used to find?
- **a.** electric current
- **b.** pH
- **c.** solution
- **d.** concentration

_____ **17.** What electronic device can be used to find the pH of a solution?
- **a.** litmus paper
- **b.** pH paper
- **c.** bromthymol blue
- **d.** a pH meter

pH and the Environment

_____ **18.** What do living things need in their environment?
- **a.** polluted air
- **b.** a certain pH
- **c.** colors
- **d.** indicators

_____ **19.** What can die if acid rain lowers the pH of lakes?
- **a.** indicators
- **b.** robins
- **c.** fish
- **d.** rocks

SALTS

_____ **20.** What is formed when an acid neutralizes a base?
- **a.** water and a salt
- **b.** snow and ice
- **c.** an indicator
- **d.** a high pH

Uses of Salts

Match the correct description with the correct term Write the letter in the space provided.

_____ **21.** used to preserve food

_____ **22.** used to make wallboard

_____ **23.** used to season food

a. sodium chloride

b. calcium sulfate

c. sodium nitrate

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Ionic and Covalent Compounds

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. chemical bond

_____

_____

_____

2. ionic compound

_____

_____

_____

3. covalent compound

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Ionic compounds have ionic bonds between ions of opposite charges.
- Ionic compounds are usually brittle, have high melting points, dissolve in water, and often conduct an electric current in solution.
- Covalent compounds have covalent bonds and consist of particles called *molecules*.
- Many covalent compounds have low melting points, do not dissolve in water, and do not conduct an electric current in solution.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Acids and Bases

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. acid

2. indicator

3. base

SECTION SUMMARY

Read the following section summary.

- An acid is a compound that increases the number of hydronium ions in solution.
- Acids taste sour, turn blue litmus paper red, react with metals to produce hydrogen gas, and may conduct an electric current when in solution.
- Acids are used for industrial purposes and in household products.
- A base is a compound that increases the number of hydroxide ions in solution.
- Bases taste bitter, feel slippery, and turn red litmus paper blue. Most solutions of bases conduct an electric current.
- Bases are used in cleaning products and antacids.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Solutions of Acids and Bases

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. neutralization reaction

2. pH

3. salt

SECTION SUMMARY

Read the following section summary.

- Every molecule of a strong acid or base breaks apart to form ions. Few molecules of weak acids and bases break apart to form ions.
- An acid and a base can neutralize one another to make salt and water.
- pH is a measure of hydronium ion concentration in a solution.
- A salt is an ionic compound formed when an acid reacts with a base.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Elements in Living Things (pp. 310–313)

THE BONDING OF CARBON ATOMS

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following is an element that has a central role in the chemistry of living organisms?
- **a.** carbon
- **b.** sugar
- **c.** glucose
- **d.** helium

_____ **2.** Which of the following is NOT true about carbon?
- **a.** It can form long chains with other carbon atoms.
- **b.** Some of its molecules have thousands of atoms.
- **c.** It can bond with carbon atoms only.
- **d.** It can bond with atoms of other elements.

Carbon Backbones

_____ **3.** How many valence electrons does each carbon atom have?
- **a.** one
- **b.** two
- **c.** three
- **d.** four

_____ **4.** How many bonds can each carbon atom make?
- **a.** one
- **b.** two
- **c.** three
- **d.** four

_____ **5.** What do models of carbon backbones show about atoms in a molecule?
- **a.** what color the atoms are
- **b.** how the atoms are connected
- **c.** how heavy the atoms are
- **d.** what size the atoms are

Single Bonds

_____ **6.** What are covalent compounds that contain carbon called?
- **a.** organic compounds
- **b.** sulfuric compounds
- **c.** ionic compounds
- **d.** fuel compounds

_____ **7.** What are organic compounds made of?
- **a.** metals
- **b.** water molecules
- **c.** carbon-based molecules
- **d.** acids

Use the terms from the following list to complete the sentences below.

single bond	triple bond
double bond	petroleum

8. A(n) _____ is formed when carbon atoms form two covalent bonds between them.

9. Gasoline is made from _____.

10. When carbon atoms form four separate covalent bonds, each bond is called a(n) _____.

11. A grouping of three bonds between two carbon atoms is called a(n) _____.

OTHER ELEMENTS IN LIVING ORGANISMS

Write the letter of the correct answer in the space provided.

_____ **12.** On what do all living things depend?
- **a.** physical compounds
- **b.** organic compounds
- **c.** nuclear compounds
- **d.** atomic compounds

Elements in Organic Compounds

_____ **13.** What six elements make up most of the molecules in your body?
- **a.** carbon, helium, oxygen, nitrogen, sulfur, and phosphorus
- **b.** carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus
- **c.** carbon, hydrogen, oxygen, nitrogen, sulfur, and potassium
- **d.** calcium, hydrogen, oxygen, nitrogen, and phosphorus

Organic Compounds—Not Just from Living Things!

_____ **14.** On what element are all organic compounds based?
- **a.** helium
- **b.** nitrogen
- **c.** sulfur
- **d.** carbon

_____ **15.** Which of the following is NOT true about organic compounds?
- **a.** They are all based on carbon.
- **b.** They make up living organisms.
- **c.** They can only be made by living organisms.
- **d.** They can be manufactured.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Compounds of Living Things (pp. 314–319)

Write the letter of the correct answer in the space provided.

_____ **1.** What are large organic compounds that living things make and use called?
- **a.** biochemicals
- **b.** atoms
- **c.** polymers
- **d.** chains

CARBOHYDRATES

Use the terms from the following list to complete the sentences below.

simple	carbohydrates
complex	polymer

2. A class of nutrients that includes sugar, starches, and fiber is called _____.

3. A chain of repeating units is called a(n) _____.

4. Sugars like glucose are _____ carbohydrates.

5. Thousands of sugar molecules can make _____ carbohydrates.

LIPIDS

Write the letter of the correct answer in the space provided.

_____ **6.** What type of biochemical does NOT dissolve in water?
- **a.** protein
- **b.** lipid
- **c.** carbohydrate
- **d.** vitamin

_____ **7.** What do lipids store?
- **a.** energy
- **b.** starch
- **c.** plants
- **d.** vitamins

_____ **8.** Which of the following is NOT true of lipids?
- **a.** They are mostly made of carbon and hydrogen.
- **b.** They are very large molecules.
- **c.** They are used to store some vitamins.
- **d.** They have very short chains of carbon atoms.

PROTEINS

Use the terms from the following list to complete the sentences below.

hemoglobin amino acids proteins

9. Biochemicals made up of amino acids are called _____.

10. A protein called _____ is found in red blood cells.

11. The building blocks of proteins are called _____.

NUCLEIC ACIDS

Use the terms from the following list to complete the sentences below.

nucleotides proteins nucleic acids

12. Nucleic acids carry information that cells need to make

_____.

13. The largest molecules made by living things are _____.

14. Subunits that make up nucleic acids are called _____.

DNA AND RNA

Match the correct description with the correct term. Write the letter in the space provided.

_____ **15.** make up the rungs of the DNA ladder

_____ **16.** helps build proteins

_____ **17.** a cell's genetic material

- **a.** DNA
- **b.** RNA
- **c.** nucleotides

OTHER IMPORTANT COMPOUNDS

Water

Write the letter of the correct answer in the space provided.

_____ **18.** What makes up 70% of your body?
- **a.** carbohydrates
- **b.** fat
- **c.** water
- **d.** protein

_____ **19.** Which of the following is NOT one of water's functions?
- **a.** regulating temperature
- **b.** helping to transport substances
- **c.** providing lubrication
- **d.** storing genetic information

Salt

_____ **20.** What role does salt play in your body?
- **a.** It helps nerve cells.
- **b.** It helps vision.
- **c.** It helps energy.
- **d.** It helps lubrication.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Elements in Living Things

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. organic compound

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Organic compounds are compounds that contain the element carbon.
- Organic compounds play a central role in the chemistry of living organisms because of carbon's ability to bond with other elements and to form long chains with other carbon atoms.
- Living organisms are made of compounds that are composed mostly of the elements carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Compounds of Living Things

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. carbohydrate

2. lipid

3. protein

4. nucleic acid

SECTION SUMMARY

Read the following section summary.

- Carbohydrates provide energy for living organisms. Many complex carbohydrates are made of long chains of simple sugars.
- Lipids have long carbon chains, store energy, and make up cell membranes.
- Proteins are composed of amino acids and perform special functions within cells.
- Nucleic acids store the genetic information that cells use to make proteins.
- In addition to large biochemical compounds, much smaller compounds, such as water and salt, are also important to organisms.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Measuring Motion (pp. 336–343)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following is occurring all around us, even if we don't see anything moving?
- **a.** average speed
- **b.** motion
- **c.** constant velocity
- **d.** constant acceleration

MOTION AND REFERENCE POINTS

_____ **2.** What is a reference point?
- **a.** an object that appears to stay in place
- **b.** an object that appears to keep moving
- **c.** an object that stays at the same velocity
- **d.** an object that stays at the same acceleration

_____ **3.** What is an object's change in position over time relative to a reference point called?
- **a.** speed
- **b.** acceleration
- **c.** friction
- **d.** motion

Standard Reference Points

_____ **4.** A nonmoving object on Earth's surface can be used as which of the following for seeing motion?
- **a.** a standard reference point
- **b.** a standard starting point
- **c.** a standard finishing point
- **d.** a standard midpoint

Motion in a Two-Dimensional System

_____ **5.** On the grid in the figure that illustrates motion in a two-dimensional system, where is the starting reference point?
- **a.** one position to the right on the x-axis
- **b.** where the x-axis meets the y-axis
- **c.** one position to the left on the x-axis
- **d.** one position up on the y-axis

_____ **6.** How would the motion of an object moving to the right be described in reference to a two-dimensional grid?
- **a.** in the positive direction on the y-axis
- **b.** in the negative direction on the y-axis
- **c.** in the negative direction on the x-axis
- **d.** in the positive direction on the x-axis

AVERAGE SPEED

Use the terms from the following list to complete the sentences below.

average speed meters speed

7. The rate at which an object moves is its _____.

8. The total distance traveled divided by the total time taken to travel is called _____.

9. One way to express speed is with the SI unit of _____ per second.

Making a Graph Showing Speed

Write the letter of the correct answer in the space provided.

_____ **10.** Distance units are plotted on the y-axis of a graph showing speed. Which of the following is plotted on the x-axis?
- **a.** meters
- **b.** speed
- **c.** motion
- **d.** time

Recognizing Speed on a Graph

_____ **11.** Why might the distance traveled in a given second vary on a graph showing speed?
- **a.** because the speed is constant
- **b.** because the speed is not constant
- **c.** because there is no motion
- **d.** because motion is constant

VELOCITY: DIRECTION MATTERS

_____ **12.** What is the speed of an object in a particular direction called?
- **a.** distance
- **b.** speed
- **c.** velocity
- **d.** acceleration

Speed Versus Velocity

_____ **13.** What is the difference between speed and velocity?
- **a.** Speed must include a direction.
- **b.** Velocity must include a direction.
- **c.** Speed and velocity are the same.
- **d.** Velocity never includes a direction.

_____ **14.** Which of the following could describe an airplane's velocity?
- **a.** 600 km/h
- **b.** 600 mi/h
- **c.** 600 km/h south
- **d.** 600 south

Changing Velocity

_____ **15.** What happens if an object's speed and/or direction changes?
- **a.** The object's velocity changes.
- **b.** The object's starting point changes.
- **c.** The object's reference point changes.
- **d.** The object's SI units change.

ACCELERATION

Use the terms from the following list to complete the sentences below.

deceleration	acceleration
positive	negative

16. The rate at which velocity changes over time is called _____.

17. An increase in speed is sometimes called _____ acceleration.

18. An decrease in speed is sometimes called _____ acceleration.

19. Negative acceleration is also called _____.

Circular Motion: Continuous Acceleration

Write the letter of the correct answer in the space provided.

_____ **20.** What is the acceleration that occurs when an object moves at a constant speed in circular motion called?
- **a.** velocity
- **b.** positive acceleration
- **c.** negative acceleration
- **d.** centripetal acceleration

Recognizing Acceleration on a Graph

_____ **21.** What does positive acceleration look like on a graph of speed versus time?
- **a.** a line sloping upward as time passes
- **b.** a line sloping downward as time passes
- **c.** a straight horizontal line
- **d.** a straight vertical line

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: What Is a Force? (pp. 344–349)

Use the terms from the following list to complete the sentences below.

direction	force
newton	magnitude

1. In science, a push or a pull exerted on an object is called a(n) _____.

2. The two properties of force are _____ and _____.

3. The SI unit for force is called a(n) _____.

FORCES ACTING ON OBJECTS

Write the letter of the correct answer in the space provided.

_____ **4.** Which of the following can cause a change in an object's motion?
- **a.** magnitude
- **b.** force
- **c.** direction
- **d.** no force

_____ **5.** What does a person sitting on a chair exert on the chair?
- **a.** speed
- **b.** direction
- **c.** no force
- **d.** force

_____ **6.** Why doesn't the force you exert when sitting on a chair cause the chair to move?
- **a.** because the floor exerts an unbalancing force on the chair
- **b.** because the floor exerts a balancing force on the chair
- **c.** because the floor exerts no force on the chair
- **d.** because the floor exerts too much force on the chair

COMBINED EFFECT OF FORCES

_____ **7.** What is the combination of all forces acting on an object called?
- **a.** energy
- **b.** net force
- **c.** motion
- **d.** heat

Forces in the Same Direction

_____ **8.** How do you find the net force when the two forces act in the same direction?
- **a.** The two forces are divided.
- **b.** The two forces are multiplied.
- **c.** The two forces are subtracted.
- **d.** The two forces are added.

Forces in Opposite Directions

_____ **9.** How do you find the net force when the two forces act in opposite directions?
- **a.** Subtract the smaller force from the larger force.
- **b.** Add the two forces.
- **c.** Divide the larger force by the smaller force.
- **d.** Multiply the forces.

BALANCED FORCES: NO CHANGE IN MOTION

_____ **10.** Which of the following will not cause a change in the motion of an object?
- **a.** newtons
- **b.** net forces
- **c.** unbalanced forces
- **d.** balanced forces

_____ **11.** When the forces on an object are balanced, what is the net force?
- **a.** 0 N
- **b.** 1 N
- **c.** 2 N
- **d.** 3 N

_____ **12.** What force balances the force of gravity on a hanging light?
- **a.** compression
- **b.** tension
- **c.** velocity
- **d.** net force

Use the terms from the following list to complete the sentences below.

balanced compression tension

13. When matter is pulled or stretched, the resulting force is called _____.

14. When matter is pushed or squeezed, the resulting force is called _____.

15. Static objects that have only _____ forces acting on them will not start moving.

UNBALANCED FORCES: VELOCITY CHANGES

Use the terms from the following list to complete the sentences below.

velocity force
unbalanced static

16. When the forces on an object are _____, the net force on the object is not 0 N.

17. Unbalanced forces are needed to change the _____ of moving objects.

18. Unbalanced forces will cause _____ objects to start moving.

19. Every moving object started moving because an unbalanced _____ acted on it.

Unbalanced Forces and Direction of Motion

Write the letter of the correct answer in the space provided.

_____ **20.** How often do objects move in the direction of the unbalanced force?
- **a.** always
- **b.** never
- **c.** sometimes
- **d.** rarely

_____ **21.** Which of the following shows that an object can move in a different direction from the direction of an unbalanced force acting on it?
- **a.** kicking a soccer ball
- **b.** rolling a ball downhill
- **c.** twirling a ball on a string
- **d.** hitting a volleyball

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Friction: A Force That Opposes Motion (pp. 350–355)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following is a force that opposes motion between two surfaces that are in contact?
- **a.** push
- **b.** gravity
- **c.** friction
- **d.** thrust

THE SOURCE OF FRICTION

_____ **2.** Which of the following is created when the hills and valleys of two surfaces stick to each other?
- **a.** balanced force
- **b.** velocity
- **c.** gravity
- **d.** friction

_____ **3.** Which of the following can be said about the magnitude of friction between two surfaces?
- **a.** The magnitude of friction doesn't depend on anything.
- **b.** The magnitude of friction depends on many factors.
- **c.** The magnitude of friction is always constant.
- **d.** There is no magnitude of friction.

The Effect of Force on Friction

_____ **4.** If the force pushing surfaces together increases, which of the following occurs?
- **a.** The closer contact increases the friction.
- **b.** The closer contact decreases the friction.
- **c.** The friction stays the same.
- **d.** Friction is not involved.

The Effect of Material on Friction

_____ **5.** Friction is usually greater between materials that have what type of surfaces?
- **a.** large
- **b.** rough
- **c.** smooth
- **d.** small

_____ **6.** Why is the magnitude of friction between a table-tennis ball and a wood floor small?
- **a.** because the floor has a smooth surface
- **b.** because the floor has a large surface area
- **c.** because the floor has a rough surface
- **d.** because the floor has a small surface area

TYPES OF FRICTION

_____ **7.** What are the two main types of friction?
- **a.** smooth and rough
- **b.** kinetic and static
- **c.** light and heavy
- **d.** moving and nonmoving

Kinetic Friction

Use the terms from the following list to complete the sentences below.

rolling moving sliding

8. The type of friction observed between _____ surfaces is called kinetic friction.

9. The type of friction used to write with a pencil is called _____ kinetic friction.

10. Transportation that has wheels uses _____ kinetic friction.

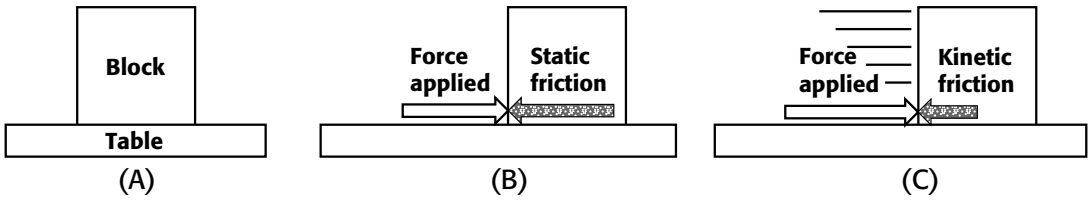
Static Friction

Write the letter of the correct answer in the space provided.

_____ **11.** What kind of friction exists when a force does not cause an object to move?
- **a.** static
- **b.** kinetic
- **c.** sliding
- **d.** rolling

_____ **12.** What happens to static friction as soon as an object starts moving?
- **a.** It increases.
- **b.** It decreases.
- **c.** It stays the same.
- **d.** It is replaced by kinetic friction.

Use the figures below to answer questions 13, 14, and 15. Write the letter of the correct answer in the space provided.



_____ **13.** Look at Figure A above. Why does the block not move?
- **a.** because no force is applied
- **b.** because of the force of friction
- **c.** because of static friction
- **d.** because of kinetic friction

_____ **14.** Look at Figure B above. The block does not move. What force keeps the block from moving?
- **a.** rolling kinetic friction
- **b.** sliding kinetic friction
- **c.** static friction
- **d.** kinetic friction

_____ **15.** Look at Figure C above. The block is moving. What force acts against the block's motion?
- **a.** static friction
- **b.** sliding kinetic friction
- **c.** rolling kinetic friction
- **d.** gravity

FRICTION: HARMFUL AND HELPFUL

_____ **16.** What is one way that friction by wind and water can be harmful?
- **a.** Friction causes erosion.
- **b.** Friction causes disease.
- **c.** Friction causes overwatering.
- **d.** Friction causes drought.

_____ **17.** What would happen if you tried to walk without friction?
- **a.** You would change direction.
- **b.** You would get lost.
- **c.** You would slip and fall.
- **d.** You would go slower.

Ways to Reduce Friction

_____ **18.** What does a lubricant do?
- **a.** increases friction between surfaces
- **b.** reduces friction between surfaces
- **c.** increases force between surfaces
- **d.** reduces force between surfaces

_____ **19.** What can be used to reduce friction between the wheels and axles of bicycles?
- **a.** sandpaper
- **b.** brakes
- **c.** dirt
- **d.** ball bearings

Ways to Increase Friction

_____ **20.** How does sand on an icy road keep cars from sliding?
- **a.** It makes the surface rougher.
- **b.** It makes the surface smoother.
- **c.** It makes the surface hotter.
- **d.** It makes the surface steeper.

_____ **21.** What is one way to increase friction when you sand a piece of wood?
- **a.** Freeze the wood.
- **b.** Use oil.
- **c.** Press harder.
- **d.** Use ball bearings.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Measuring Motion

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. motion

_____

_____

2. average speed

_____

_____

3. velocity

_____

_____

4. acceleration

_____

_____

SECTION SUMMARY

Read the following section summary.

- An object is in motion if it changes position over time in relation to a reference point.
- Average speed is the total distance that an object travels divided by the total time that the object takes to travel that distance.
- Speed can be shown on a graph of position versus time.
- Velocity is speed as well as the direction of motion. The velocity of an object changes if the object's speed, direction, or both change.
- Acceleration is the rate at which velocity changes.
- An object can accelerate by changing speed, direction, or both.
- Acceleration can be shown on a graph of speed versus time.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

What Is a Force?

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. force

_____

_____

2. newton

_____

_____

3. net force

_____

_____

SECTION SUMMARY

Read the following section summary.

- A force is a push or a pull. Forces have magnitude and direction and are expressed in newtons.
- Forces always act on objects.
- The combined effect of the forces acting on an object is the net force.
- Forces acting in the same direction are added. Forces acting in opposite directions are subtracted.
- Balanced forces cause no change in motion. The forces on a static object are balanced and can be identified.
- Unbalanced forces cause a change in velocity.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Friction: A Force That Opposes Motion

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. friction

_____

_____

SECTION SUMMARY

Read the following section summary.

- Friction is a force that acts in a direction opposite to the direction of motion.
- Factors that affect the magnitude of friction include the force pushing the surfaces together and the materials that make up the surfaces.
- Kinetic friction is a force that, when unbalanced, can change the velocity of a moving object.
- Static friction can balance other forces and can prevent changes in motion.
- Friction can be helpful or harmful.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Gravity: A Force of Attraction (pp. 370–375)

Write the letter of the correct answer in the space provided.

_____ **1.** What is the force of attraction between objects due to their masses?
- **a.** magnetism
- **b.** gravity
- **c.** net force
- **d.** natural force

THE EFFECTS OF GRAVITY ON MATTER

_____ **2.** Why is all matter affected by gravity?
- **a.** All matter has weight.
- **b.** All matter has size.
- **c.** All matter has volume.
- **d.** All matter has mass.

_____ **3.** Why don't you notice smaller objects move toward each other due to gravity?
- **a.** The distance is too small.
- **b.** The distance is too large.
- **c.** Their masses are too small.
- **d.** Their masses are too large.

Earth's Gravitational Force

_____ **4.** What force must be overcome to lift objects or parts of your body?
- **a.** magnetic force
- **b.** gravitational force
- **c.** net force
- **d.** natural force

NEWTON AND THE STUDY OF GRAVITY

The Core of an Idea

_____ **5.** What unbalanced force did Newton conclude makes an apple fall?
- **a.** magnetism
- **b.** gravity
- **c.** net force
- **d.** natural force

_____ **6.** What unbalanced force did Newton conclude makes the moon circle Earth?
- **a.** magnetism
- **b.** gravity
- **c.** net force
- **d.** natural force

The Birth of a Law

_____ **7.** What law describes how gravitational force, mass, and distance are related?
- **a.** the law of conservation of gravity
- **b.** the law of conservation of mass
- **c.** the law of universal gravitation
- **d.** the law of universal mass

_____ **8.** What does the law of universal gravitation apply to?
- **a.** everything in the universe
- **b.** only to Earth
- **c.** only to outer space
- **d.** only to the solar system

THE LAW OF UNIVERSAL GRAVITATION

Part 1: Gravitational Force and Mass

_____ **9.** What happens to gravitational force as the mass of things increases?
- **a.** It disappears.
- **b.** It decreases.
- **c.** It increases.
- **d.** It stays the same.

Part 2: Gravitational Force and Distance

_____ **10.** Why doesn't the sun's gravitational force affect you more than Earth's does?
- **a.** The sun has more velocity.
- **b.** Earth has more air pressure.
- **c.** Earth is moving faster.
- **d.** The sun is much farther away.

_____ **11.** What happens to the gravitational force between two objects that move farther apart?
- **a.** It increases.
- **b.** It decreases.
- **c.** It does not change.
- **d.** It changes at random.

WEIGHT AND GRAVITATIONAL FORCE

_____ **12.** What is the measure of the gravitational force on an object called?
- **a.** temperature
- **b.** distance
- **c.** weight
- **d.** mass

The Differences Between Weight and Mass

_____ **13.** What is the amount of matter in an object called?
- **a.** temperature
- **b.** distance
- **c.** weight
- **d.** mass

_____ **14.** What happens to an object's mass when gravitational force is increased?
- **a.** It increases and then decreases.
- **b.** It does not change.
- **c.** It increases.
- **d.** It decreases.

_____ **15.** What happens to an object if it is moved from Earth to Jupiter?
- **a.** Its weight and mass increase.
- **b.** Its weight and mass decrease.
- **c.** Its weigh increases and mass remains the same.
- **d.** Its mass increases and weight remains the same.

_____ **16.** About how much is the moon's gravitational force compared to Earth's?
- **a.** one-sixth
- **b.** one-third
- **c.** one-half
- **d.** one-quarter

GRAVITY AND STATIC OBJECTS

_____ **17.** What is a static object?
- **a.** a moving object
- **b.** a nonmoving object
- **c.** a weightless object
- **d.** a massless object

_____ **18.** Why doesn't a static object move downward?
- **a.** Gravity on the object is balanced by an upward force.
- **b.** Gravity does not pull on static objects.
- **c.** Static objects don't have weight.
- **d.** Static objects don't have mass.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Gravity and Motion (pp. 376–383)

GRAVITY AND FALLING OBJECTS

Write the letter of the correct answer in the space provided.

_____ **1.** Which scientist first thought that the amount of time it takes an object to fall does not depend on the object's mass?
- **a.** Isaac Newton
- **b.** Galileo Galilei
- **c.** Albert Einstein
- **d.** Marie Curie

Gravity and Acceleration

_____ **2.** Why do objects fall to the ground at the same rate?
- **a.** Their acceleration is the same.
- **b.** Their masses are the same.
- **c.** Their weights are the same.
- **d.** Their sizes are the same.

_____ **3.** Why is a heavier object harder to accelerate than a lighter one?
- **a.** It has more mass.
- **b.** It has less mass.
- **c.** It is larger.
- **d.** It is harder to throw.

Acceleration and Changes in Velocity

Match the correct description with the correct term. Write the letter in the space provided.

_____ **4.** the rate at which velocity changes over time

_____ **5.** the rate at which everything falls toward Earth

_____ **6.** the change in velocity of a falling object

- **a.** $v = g \times t$
- **b.** acceleration
- **c.** $9.8\ \text{m/s}^2$

Match the correct description with the correct term. Write the letter in the space provided.

_____ **7.** the symbol for acceleration due to gravity

_____ **8.** the symbol for the time an object takes to fall

_____ **9.** the symbol for change in velocity

- **a.** v
- **b.** g
- **c.** t

AIR RESISTANCE AND FALLING OBJECTS

Write the letter of the correct answer in the space provided.

_____ **10.** What is the term for a force that works against the motion of objects through air?
- **a.** gravity
- **b.** terminal velocity
- **c.** free fall
- **d.** air resistance

_____ **11.** Why does a flat sheet of paper fall more slowly than a crumbled sheet?
- **a.** Gravity exerts less force on a flat sheet.
- **b.** The crumbled paper is heavier.
- **c.** The flat paper is lighter.
- **d.** The flat paper has more air resistance.

Acceleration and Terminal Velocity

Match the correct description with the correct term. Write the letter in the space provided.

_____ **12.** when only the force of gravity is acting on an object

_____ **13.** when a falling object stops accelerating

- **a.** terminal velocity
- **b.** free fall

PROJECTILE MOTION AND GRAVITY

Write the letter of the correct answer in the space provided.

_____ **14.** When you throw something, what do you call its curved path?
- **a.** terminal velocity
- **b.** projectile motion
- **c.** terminal motion
- **d.** projectile velocity

Horizontal Movement

_____ **15.** Why does the horizontal velocity of a ball remain the same after it leaves your hand?
- **a.** Your hand is still applying force to the ball.
- **b.** There are no forces that can change the ball's horizontal velocity.
- **c.** Your friend catches the ball before the horizontal velocity can change.
- **d.** There is no force of gravity acting on the ball.

Vertical Movement

_____ **16.** What gives a ball vertical movement after it leaves your hand?
- **a.** gravity
- **b.** air resistance
- **c.** the force of your hand
- **d.** projectile motion

_____ **17.** When you throw a ball, what pulls it down?
- **a.** acceleration
- **b.** horizontal movement
- **c.** air resistance
- **d.** gravity

_____ **18.** If you want to hit a target, where should you aim?
- **a.** at the target
- **b.** below the target
- **c.** above the target
- **d.** to either side of the target

ORBITING AND GRAVITY

_____ **19.** When is an object orbiting?
- **a.** When it reaches terminal velocity.
- **b.** When it comes against air resistance.
- **c.** When it is moving around another object in space.
- **d.** When it moves in a straight line.

_____ **20.** The forward motion of an orbiting spacecraft combines with what other motion?
- **a.** backward motion
- **b.** horizontal movement
- **c.** terminal motion
- **d.** free fall

Orbiting and Centripetal Force

_____ **21.** Which of the following is orbiting?
- **a.** a planet moving around the sun
- **b.** a plane in flight
- **c.** a balloon
- **d.** a rocket flying straight up

_____ **22.** Which is NOT true of centripetal force?

a. It is an unbalanced force.
b. It can hold objects in nearly circular paths.
c. It pushes outward.
d. It means "a force toward the center."

Gravity and the Solar System

_____ **23.** Which of the following helps maintain the shape of the solar system?

a. gravity
b. terminal velocity
c. air resistance
d. upward force

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Newton's Laws of Motion (pp. 384–391)

NEWTON'S FIRST LAW

Part 1: Objects at Rest

Write the letter of the correct answer in the space provided.

_____ **1.** Which is an example of an object at rest?
- **a.** a jet flying overhead
- **b.** a chair on a floor
- **c.** a rabbit jumping
- **d.** a ball hit by a bat

Part 2: Objects in Motion

_____ **2.** When will objects at rest not stay at rest?
- **a.** when there is no horizontal motion
- **b.** when there is no vertical motion
- **c.** when there is no friction
- **d.** when objects are acted upon by unbalanced forces

_____ **3.** What happens to your body's motion when the bumper car you're riding in hits a stopped car?
- **a.** Your motion stops.
- **b.** Your motion continues with less velocity.
- **c.** Your motion continues with the same velocity.
- **d.** Your motion continues with greater velocity.

Friction and Newton's First Law

_____ **4.** Why does a desk quickly stop moving after you push it across the floor?
- **a.** The natural state of the desk is at rest.
- **b.** There is no longer a force acting on the desk.
- **c.** A balanced force acts on the desk.
- **d.** An unbalanced force acts on the desk.

_____ **5.** What unbalanced force acts on a desk as it slides across the floor?
- **a.** friction
- **b.** gravity
- **c.** the weight of the desk
- **d.** the speed of the desk

Inertia and Newton's First Law

_____ **6.** What is Newton's first law sometimes called?
- **a.** the law of friction
- **b.** the law of unbalanced forces
- **c.** the law of acceleration
- **d.** the law of inertia

_____ **7.** Why do objects that are at rest stay at rest?
- **a.** friction
- **b.** velocity
- **c.** gravity
- **d.** inertia

_____ **8.** Why do objects that are moving keep moving?
- **a.** friction
- **b.** velocity
- **c.** gravity
- **d.** inertia

Mass and Inertia

_____ **9.** What kind of thing has less inertia?
- **a.** something with a large mass
- **b.** something with a small mass
- **c.** something that is moving
- **d.** something that is not moving

NEWTON'S SECOND LAW OF MOTION

Part 1: Acceleration Depends on Mass

_____ **10.** Why does it take more force to accelerate a full cart than an empty one?
- **a.** The full cart has more mass.
- **b.** The full cart is harder to steer.
- **c.** The empty cart has more mass.
- **d.** You run into air resistance.

Part 2: Acceleration and Force

_____ **11.** If you give a cart a harder push, what happens to its acceleration?
- **a.** It decreases.
- **b.** It increases.
- **c.** It stays the same.
- **d.** It varies.

NEWTON'S THIRD LAW OF MOTION

_____ **12.** Which of the following is a simple way to describe Newton's third law of motion?
- **a.** Acceleration depends on force.
- **b.** All forces act in pairs.
- **c.** An object at rest remains at rest.
- **d.** A moving object remains in motion.

Force Pairs Applied to Objects

_____ **13.** What would happen if action and reaction forces acted on the same object?
- **a.** The object would move forward.
- **b.** The object would move backward.
- **c.** The result cannot be predicted.
- **d.** The object would not move.

Action and Reaction Force Pairs

_____ **14.** Which of the following statements about forces is NOT true?
- **a.** Forces act in pairs.
- **b.** An exerted force always has a reaction force.
- **c.** A force never acts by itself.
- **d.** Some forces act alone.

_____ **15.** Which of the following is an example of an action and reaction force pair?
- **a.** gravity from the sun and Earth on a falling ball
- **b.** the forces between a bat and ball
- **c.** air resistance and gravity on a sky diver
- **d.** gravity and friction on a sliding desk

Noticing the Effects of a Reaction Force

_____ **16.** When you drop a ball, what is the action force on the ball?
- **a.** the ball's gravity pulling on Earth
- **b.** Earth's gravity pulling on the ball
- **c.** friction between the ball and Earth
- **d.** your weight

_____ **17.** When you drop a ball, what is the reaction force on the Earth?
- **a.** the ball's gravity pulling on Earth
- **b.** Earth's gravity pulling on the ball
- **c.** friction between the ball and Earth
- **d.** your weight

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Gravity: A Force of Attraction

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. gravity

2. weight

3. mass

SECTION SUMMARY

Read the following section summary.

- Gravity is a force of attraction between objects that is due to their masses. Gravity can be an unbalanced force that causes changes in velocity.
- Gravity holds the solar system together.
- The law of universal gravitation states that all objects attract each other through gravitational force and that the magnitude of this force depends on the objects' masses and the distance between them.
- Mass is the amount of matter in an object. Weight is a measure of the gravitational force on an object.
- Gravity is often balanced by elastic forces due to tension or compression.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Gravity and Motion

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. terminal velocity

_____

_____

_____

2. free fall

_____

_____

_____

3. projectile motion

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Gravity is the force that causes all objects on Earth to accelerate downward at a rate of 9.8 m/s^2.
- Air resistance slows the acceleration of falling objects. An object falls at its terminal velocity when the upward force of air resistance equals the downward force of gravity.
- An object is in free fall if gravity is the only force acting on it.
- Projectile motion is the curved path that an object follows when thrown or propelled near the surface of Earth.
- Projectile motion has two components: horizontal motion and vertical motion. Gravity affects only the vertical motion of projectile motion.
- Gravity provides the centripetal force that keeps objects in orbit.
- Gravity is the force that keeps the solar system together.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Newton's Laws of Motion

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. inertia

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Newton's first law of motion states that the motion of an object will not change if the forces on it are balanced.
- Objects at rest will not move unless acted upon by an unbalanced force.
- Objects in motion will continue to move at a constant speed and in a straight line unless acted upon by an unbalanced force.
- Inertia is the tendency of matter to resist a change in motion. Mass is a measure of inertia.
- Newton's second law of motion states that the acceleration of an object depends on the mass of the object and the amount of force applied.
- The greater the mass of an object is, the greater the force needed to achieve the same acceleration.
- Newton's third law of motion states that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first object.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Fluids and Pressure (pp. 406–411)

Use the terms from the following list to complete the sentences below.

liquids fluid move

1. Any material that can flow and takes the shape of its container is called a(n) _____.

2. Fluids include _____ and gases.

3. Particles in a fluid can _____ past each other.

FLUIDS AND PRESSURE

Use the terms from the following list to complete the sentences below.

pressure force
increases pascal

4. Pumping up a tire _____ the amount of air inside the tire.

5. The amount of force exerted on a given area is called _____.

6. The SI unit for pressure is the _____.

7. Pressure can be calculated by dividing _____ by area.

Pressure and Bubbles

Write the letter of the correct answer in the space provided.

_____ **8.** How do fluids exert pressure?
- **a.** toward the right only
- **b.** toward the left only
- **c.** toward the bottom and top only
- **d.** evenly in all directions

ATMOSPHERIC PRESSURE

Match the correct description with the correct term. Write the letter in the space provided.

_____ **9.** atmospheric pressure at sea level

_____ **10.** layer of gases that surrounds Earth

_____ **11.** caused by the weight of the atmosphere

_____ **12.** force that holds Earth's atmosphere in place

a. atmospheric pressure

b. gravity

c. atmosphere

d. 101,300 Pa

Variation of Atmospheric Pressure

Write the letter of the correct answer in the space provided.

_____ **13.** Where is atmospheric pressure the lowest?

a. at the top of Mount Everest
b. at sea level
c. in an airplane at 12,000 m
d. at 150,000 m above sea level

_____ **14.** Where is the full pressure of the atmosphere exerted?

a. at the top of Mount Everest
b. at sea level
c. in an airplane at 12,000 m
d. at 150,000 m above sea level

Atmospheric Pressure and Depth

_____ **15.** What happens to pressure as you go deeper in the atmosphere?

a. Pressure increases.
b. Pressure decreases.
c. Pressure stays the same.
d. Pressure is not affected.

Pressure Changes and Your Body

_____ **16.** What happens to fluids in your body when atmospheric pressure changes?

a. The fluids adjust to equal pressure.
b. The fluids maintain low pressure.
c. The fluids maintain high pressure.
d. The fluids don't react to pressure.

WATER PRESSURE

Water Pressure and Depth

_____ **17.** Which of the following does NOT affect the total pressure on a diver?
- **a.** water depth
- **b.** water pressure
- **c.** atmospheric pressure
- **d.** total amount of fluid present

Density and Water Pressure

_____ **18.** How much more dense is water than air?
- **a.** 10 times
- **b.** 100 times
- **c.** 1,000 times
- **d.** 8,000 times

_____ **19.** What is the amount of matter in a given volume called?
- **a.** pressure
- **b.** fluid
- **c.** density
- **d.** depth

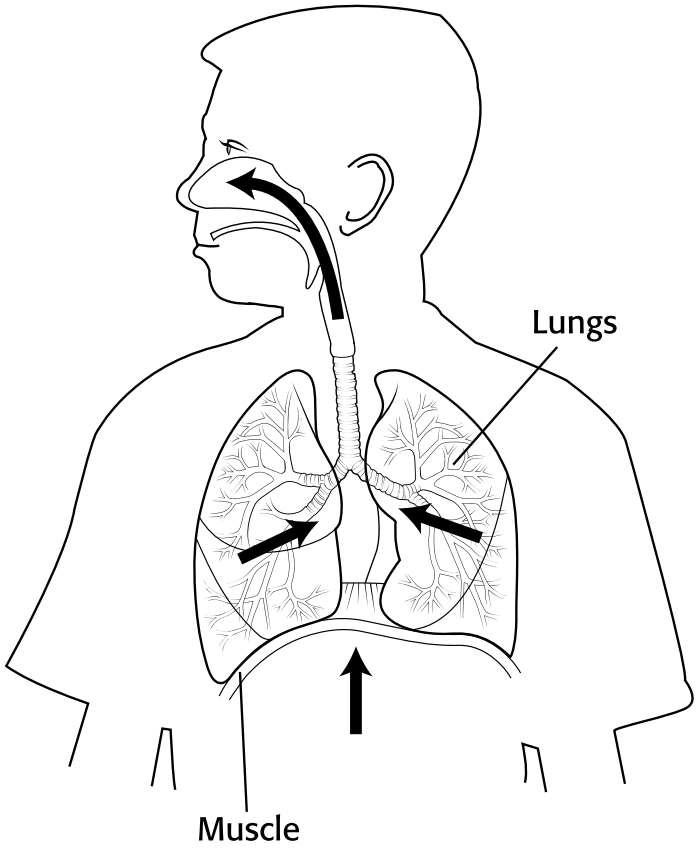
_____ **20.** Which of the following is NOT true?
- **a.** Water and air exert the same pressure.
- **b.** Water weighs more than air.
- **c.** Water exerts more pressure than air.
- **d.** Water is more dense than air.

PRESSURE DIFFERENCES AND FLUID FLOW

_____ **21.** When you drink through a straw, how does the liquid move?
- **a.** through the atmosphere
- **b.** from high to low pressure
- **c.** from low to high pressure
- **d.** through muscles

Pressure Differences and Breathing

Use the drawing below to answer questions 22 and 23. Write the letter of the correct answer in the space provided.



_____ **22.** What happens when the muscle in your chest moves when you exhale?

a. The space in your chest increases.
b. The space in your chest decreases.
c. The air is pushed into your lungs.
d. The pressure in your lungs decreases.

_____ **23.** What happens in the lungs when you exhale?

a. The air moves from low pressure (outside) to high pressure (in the lungs).
b. Lung pressure decreases.
c. The space in your lungs increases.
d. The air moves from high pressure (in the lungs) to low pressure (outside).

Pressure Differences and Tornadoes

_____ **24.** Why does air rush into a tornado?

a. Because air pressure is higher outside.
b. Because air pressure is lower outside.
c. Because air pressure is higher inside.
d. Because air pressure is equal.

_____ **25.** Which of the following is NOT an effect of tornadoes in nature?

a. tree damage
b. building damage
c. strong winds
d. calm winds

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Buoyancy and Density (pp. 412–419)

Write the letter of the correct answer in the space provided.

_____ **1.** What is the upward force that fluids exert on all matter called?
- **a.** pascal force
- **b.** atmospheric pressure
- **c.** buoyant force
- **d.** density

BUOYANT FORCE AND FLUID PRESSURE

Use the terms from the following list to complete the sentences below.

weight depth Archimedes' principle

2. Pressure increases as _____ increases.

3. The principle used to determine buoyant force is called _____.

4. The buoyant force is determined by the _____ of the displaced water.

WEIGHT VERSUS BUOYANT FORCE

Use the terms from the following list to complete the sentences below.

float sink

5. An object that weighs more than the buoyant force on it will _____.

6. An object whose weight equals the buoyant force will _____.

Sinking

Write the letter of the correct answer in the space provided.

_____ **7.** Which of the following is true when a rock sinks in water?
- **a.** Buoyant force is less than the rock's weight.
- **b.** Buoyant force equals the rock's weight.
- **c.** Buoyant force is greater than the rock's weight.
- **d.** There is no buoyant force on the rock.

Floating

_____ **8.** Which of the following is true when a fish floats in water?
- **a.** Buoyant force is less than the fish's weight.
- **b.** Buoyant force equals the fish's weight.
- **c.** Buoyant force is greater than the fish's weight.
- **d.** There is no buoyant force on the fish.

Buoying Up

_____ **9.** Which of the following is true when a duck is buoyed up in water?
- **a.** Buoyant force is less than the duck's weight.
- **b.** Buoyant force equals the duck's weight.
- **c.** Buoyant force is greater than the duck's weight.
- **d.** There is no buoyant force on the duck.

DENSITY AND FLOATING

_____ **10.** What is density?
- **a.** mass per unit volume
- **b.** volume per unit mass
- **c.** weight per unit volume
- **d.** volume per unit weight

_____ **11.** Why does a rock sink in water?
- **a.** The rock is denser than water.
- **b.** Water is denser than the rock.
- **c.** Air is denser than the rock.
- **d.** Water is less dense than air.

More Dense Than Air

_____ **12.** Why don't most substances float in air?
- **a.** Air is too dense.
- **b.** Most substances are denser than air.
- **c.** Air weighs too much.
- **d.** The volume of the atmosphere is too great.

Less Dense Than Air

_____ **13.** Which of the following is less dense than air?
- **a.** water
- **b.** ice
- **c.** helium
- **d.** a duck

DETERMINING DENSITY

_____ **14.** What do you need to find an object's density?
- **a.** its pressure and volume
- **b.** its mass and volume
- **c.** its height and weight
- **d.** its weight and pressure

Volume of a Regular Solid

_____ **15.** How do you find the volume of a regular solid?
- **a.** Add the lengths of the sides.
- **b.** Multiply the lengths of the sides.
- **c.** Divide the lengths by 2.
- **d.** Measure the volume of air displaced.

Volume of an Irregular Solid

_____ **16.** How do you find the volume of an irregular solid?
- **a.** Add the lengths of the sides.
- **b.** Multiply the lengths of the sides.
- **c.** Divide the lengths by 2.
- **d.** Measure the volume of water displaced.

CHANGING OVERALL DENSITY

Changing the Shape

_____ **17.** Which of the following features allows a ship to float?
- **a.** the ship's passengers
- **b.** the ship's shape
- **c.** the ship's hull
- **d.** the ship's material

_____ **18.** Which of the following increases when steel is shaped into a hollow form?
- **a.** the steel's weight
- **b.** the steel's volume
- **c.** the steel's density
- **d.** the overall density

Changing the Mass

Match the correct description with the correct term. Write the letter in the space provided.

_____ **19.** air-filled ballast tanks

_____ **20.** open ballast tanks

_____ **21.** closed ballast tanks into which air is pumped

a. diving submarine
b. rising submarine
c. floating submarine

Changing the Volume

Write the letter of the correct answer in the space provided.

_____ **22.** Which of the following is the organ that keeps some fish from sinking?
a. gills
b. swim bladder
c. lungs
d. brain

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Fluids and Pressure

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. fluid

2. pressure

3. pascal

4. atmospheric pressure

SECTION SUMMARY

Read the following section summary.

- A fluid is any material that flows and that takes the shape of its container.
- Pressure is the amount of force exerted on a given area.
- Moving particles of matter create pressure by colliding with one another and with the walls of their container.
- Atmospheric pressure is the pressure caused by the weight of the atmosphere.
- Fluid pressure increases as depth increases.
- Because water is denser than air, water exerts more pressure than air does.
- Fluids flow from areas of high pressure to areas of low pressure.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Buoyancy and Density

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. buoyant force

_____

_____

_____

2. Archimedes' principle

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- All fluids exert an upward force called *buoyant force*.
- Buoyant force is caused by differences in fluid pressure.
- Archimedes' principle states that the buoyant force on an object is equal to the weight of the fluid displaced by the object.
- Any object that is denser than the surrounding fluid will sink. An object that is less dense than the surrounding fluid will float.
- The overall density of an object can be changed by changing the object's shape, mass, or volume.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Stars (pp. 436–443)

Write the letter of the correct answer in the space provided.

_____ **1.** What do scientists study to learn about far away stars?
- **a.** gravity
- **b.** starlight
- **c.** space
- **d.** continuous spectrum

COLOR OF STARS

_____ **2.** How do scientists tell if a star is warm or cool?
- **a.** by its size
- **b.** by its age
- **c.** by its color
- **d.** by its shape

_____ **3.** Which star is the coolest?
- **a.** a red star
- **b.** a white star
- **c.** a blue star
- **d.** a blue-white star

_____ **4.** Which star is the warmest?
- **a.** a red star
- **b.** a yellow star
- **c.** a blue star
- **d.** an orange star

COMPOSITION OF STARS

_____ **5.** What band of colors is made by white light passing through a glass prism?
- **a.** a spectrum
- **b.** ultraviolet light
- **c.** a wavelength
- **d.** a color wheel

_____ **6.** What do astronomers use to separate a star's light into a spectrum?
- **a.** a telescope
- **b.** a microscope
- **c.** an oscilloscope
- **d.** a spectroscope

Types of Spectra

Use the terms from the following list to complete the sentences below.

continuous spectrum emission lines

7. A spectrum that shows all the colors is called a(n) _____.

8. Hot gases emit wavelengths of light, or colors, called _____.

Trapping the Light: Cosmic Detective Work

Write the letter of the correct answer in the space provided.

_____ **9.** What kind of light is made by the center of a star?
- **a.** blue light
- **b.** yellow light
- **c.** red light
- **d.** white light

_____ **10.** What happens to light in the atmosphere of a star?
- **a.** Colors are emitted.
- **b.** Colors are absorbed.
- **c.** Colors are removed.
- **d.** Colors are added.

_____ **11.** What is the spectrum of a star called?
- **a.** an absorption spectrum
- **b.** a continuous spectrum
- **c.** an emission spectrum
- **d.** a nuclear spectrum

_____ **12.** What colors are shown by black lines on a star's spectrum?
- **a.** colors given off in the atmosphere
- **b.** colors absorbed by the atmosphere
- **c.** colors not affected by the atmosphere
- **d.** colors added by the atmosphere

Identifying Elements by Using Dark Lines

_____ **13.** What spectrum is used to help find elements in a star's atmosphere?
- **a.** an absorption spectrum
- **b.** a continuous spectrum
- **c.** an emission spectrum
- **d.** a nuclear spectrum

The Types of Elements in a Star

_____ **14.** What elements are stars mostly made of?
- **a.** hydrogen and carbon
- **b.** helium and iron
- **c.** hydrogen and helium
- **d.** carbon and iron

_____ **15.** Besides hydrogen and helium, what are the most common elements in stars?
- **a.** carbon, nitrogen, oxygen
- **b.** calcium, iron, sodium
- **c.** mercury, potassium, uranium
- **d.** chlorine, nitrogen, oxygen

CLASSIFYING STARS

_____ **16.** How did early scientists group stars?
- **a.** by size
- **b.** by age
- **c.** by temperature
- **d.** by elements

Differences in Temperature

_____ **17.** How do scientists now group stars?
- **a.** by size
- **b.** by age
- **c.** by temperature
- **d.** by elements

_____ **18.** Which color star is the hottest?
- **a.** yellow
- **b.** blue
- **c.** orange
- **d.** red

Differences in Brightness

_____ **19.** Before they had telescopes, what did astronomers call the brightest stars?
- **a.** first-magnitude stars
- **b.** third-magnitude stars
- **c.** fifth-magnitude stars
- **d.** sixth-magnitude stars

_____ **20.** What kind of numbers are used for the magnitude of dim stars?
- **a.** positive numbers
- **b.** negative numbers
- **c.** whole numbers
- **d.** prime numbers

_____ **21.** What kind of numbers are used for the magnitude of bright stars?
- **a.** positive numbers
- **b.** negative numbers
- **c.** whole numbers
- **d.** prime numbers

_____ **22.** What is the magnitude of Sirius, the brightest star in the night sky?
- **a.** 14
- **b.** –1.4
- **c.** –9.8
- **d.** 9.8

HOW BRIGHT IS THAT STAR?

Apparent Magnitude

Use the terms from the following list to complete the sentences below.

absolute magnitude apparent magnitude

23. The brightness of a star as seen from Earth is _____.

24. The brightness a star would have 32.6 light-years from Earth is _____.

DISTANCE TO THE STARS

Use the terms from the following list to complete the sentences below.

parallax light-year

25. The distance that light travels in one year is a(n) _____.

26. A star may seem to shift in place because of _____.

MOTIONS OF STARS

The Apparent Motion of Stars

Write the letter of the correct answer in the space provided.

_____ **27.** Why do the stars in the sky seem to circle Polaris?
- **a.** Earth rotates.
- **b.** The stars rotate.
- **c.** Polaris rotates.
- **d.** Earth stays in one place.

The Actual Motion of Stars

_____ **28.** Why is it hard to see stars move?
- **a.** Stars move too slowly.
- **b.** Stars move too fast.
- **c.** Stars are too far away.
- **d.** Stars are too close.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: The Life Cycle of Stars (pp. 444–449)

TYPES OF STARS

Write the letter of the correct answer in the space provided.

_____ **1.** Besides by mass, size, brightness, color, temperature, and composition, how are stars classified?
- **a.** by constellation
- **b.** by age
- **c.** by distance from Earth
- **d.** by planetary system

_____ **2.** What happens to the classification of a star as its properties change?
- **a.** Its classification never changes.
- **b.** It stops being classified.
- **c.** Its classification changes twice.
- **d.** Its classification changes.

THE LIFE CYCLE OF SUNLIKE STARS

Use the terms from the following list to complete the sentences below.

_____ **3.** gravity first pulls dust and gas into a sphere

_____ **4.** the longest stage of a star's life cycle

_____ **5.** the center of a star shrinks, and its atmosphere grows very large

_____ **6.** the leftover center of a red giant

- **a.** red giant
- **b.** white dwarf
- **c.** protostar
- **d.** main sequence

A TOOL FOR STUDYING STARS

Write the letter of the correct answer in the space provided.

_____ **7.** What diagram shows how a star's temperature and absolute magnitude are related?
- **a.** the main-sequence diagram
- **b.** the Danish diagram
- **c.** the H-A diagram
- **d.** the H-R diagram

_____ **8.** What is one thing scientists can tell from the H-R diagram?
- **a.** Stars never change over time.
- **b.** Stars change over time.
- **c.** All stars are getting brighter.
- **d.** All stars are getting hotter.

The H-R Diagram

_____ **9.** What appears along the bottom of the H-R diagram?
- **a.** temperature
- **b.** brightness
- **c.** size
- **d.** age

_____ **10.** What appears along the left side of the H-R diagram?
- **a.** temperature
- **b.** brightness
- **c.** size
- **d.** age

_____ **11.** Where do stars spend most of their lifetimes on the H-R diagram?
- **a.** lower right
- **b.** upper left
- **c.** lower left
- **d.** main sequence

_____ **12.** What kind of pattern is the main sequence?
- **a.** horizontal
- **b.** circular
- **c.** diagonal
- **d.** spiral

Match the correct description with the correct term. Write the letter in the space provided.

_____ **13.** top of the H-R diagram

_____ **14.** bottom of the H-R diagram

_____ **15.** right side of the H-R diagram

_____ **16.** left side of the H-R diagram

- **a.** hot (blue) stars
- **b.** cool (red) stars
- **c.** dim stars
- **d.** bright stars

THE AGING OF MASSIVE STARS

Use the terms from the following list to complete the sentences below.

pulsar	supernova
black hole	neutron star

17. A huge explosion in which a large star collapses is called a(n) _____.

18. A star that collapses into a small and dense ball of neutrons is a(n) _____.

19. A spinning neutron star that sends out beams of radiation is a(n) _____.

20. An object so massive and dense that light cannot escape its gravity is a(n) _____.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Galaxies (pp. 450–453)

Write the letter of the correct answer in the space provided.

_____ **1.** What are large groups of stars, dust, and gas held together by gravity?
- **a.** planetary systems
- **b.** supernovas
- **c.** asteroids
- **d.** galaxies

TYPES OF GALAXIES

Match the correct description with the correct term. Write the letter in the space provided.

_____ **2.** galaxy type with a bulge at the center and spiral arms

_____ **3.** spiral galaxy where the sun and Earth are located

_____ **4.** round or oval galaxies; called "cosmic snowballs"

_____ **5.** galaxy type without a definite shape; stars form slowly

a. elliptical
b. irregular
c. spiral
d. Milky Way

CONTENTS OF GALAXIES

Gas Clouds

Write the letter of the correct answer in the space provided.

_____ **6.** What is a large cloud of gas and dust where stars are born?
- **a.** spherical halo
- **b.** nebula
- **c.** cluster
- **d.** planetary system

Star Clusters

_____ **7.** What is a tight group of stars that looks like a ball?
- **a.** spherical halo
- **b.** nebula
- **c.** globular cluster
- **d.** open cluster

_____ **8.** What is a relatively close group of stars along the disk of a spiral galaxy?
- **a.** spherical halo
- **b.** nebula
- **c.** globular cluster
- **d.** open cluster

QUASARS

_____ **9.** What is a starlike source of energy in the center of a galaxy?
- **a.** a nebula
- **b.** a quasar
- **c.** a cluster
- **d.** a Magellanic Cloud

_____ **10.** What do some scientists think caused quasars?
- **a.** massive explosions
- **b.** massive black holes
- **c.** massive nebulas
- **d.** massive supernovas

ORIGIN OF GALAXIES

_____ **11.** Why is looking through a telescope like looking back in time?
- **a.** Galaxies travel in time.
- **b.** Light takes time to travel.
- **c.** Stars travel in time.
- **d.** Galaxies change over time.

_____ **12.** What do scientists study to learn about the early universe?
- **a.** nearby galaxies
- **b.** far galaxies
- **c.** spiral galaxies
- **d.** the sun

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Formation of the Universe (pp. 454–457)

Write the letter of the correct answer in the space provided.

_____ **1.** What is the study of the universe called?
- **a.** planetology
- **b.** cosmography
- **c.** astronomy
- **d.** cosmology

THE BIG BANG THEORY

_____ **2.** What have scientists learned by studying the movement of galaxies?
- **a.** The universe is not moving.
- **b.** Galaxies are moving apart.
- **c.** Galaxies are moving together.
- **d.** The universe is getting smaller.

_____ **3.** What standard model do scientists use to explain the expansion of the universe?
- **a.** the big bang theory
- **b.** the theory of universe expansion
- **c.** the theory of cosmology
- **d.** the theory of fundamental forces

A Tremendous Explosion

_____ **4.** According to the big bang theory, how did the universe begin?
- **a.** as a cloud of gases
- **b.** as a sea of gases
- **c.** with a small explosion
- **d.** with a big explosion

_____ **5.** According to the big bang theory, how long ago did the universe begin?
- **a.** about 100 billion years ago
- **b.** about 14 billion years ago
- **c.** about 10 billion years ago
- **d.** about 1 million years ago

Cosmic Background Radiation

_____ **6.** What is the energy in space left over from the big bang called?
- **a.** cosmic background radiation
- **b.** cosmic background energy
- **c.** space background radiation
- **d.** background radio noise

_____ **7.** Where in space did the big bang send cosmic background radiation?
- **a.** only to the solar system
- **b.** only to the closest galaxies
- **c.** in every direction
- **d.** only to the center of the universe

GRAVITY AND THE UNIVERSE

_____ **8.** After the big bang, what caused matter to form galaxies?
- **a.** random chance
- **b.** magnetism
- **c.** gravity
- **d.** nuclear fusion

_____ **9.** How does gravity control the size and shape of the universe?
- **a.** Gravity pulls galaxies together.
- **b.** Gravity pushes galaxies apart.
- **c.** Gravity makes hydrogen explode.
- **d.** Gravity makes atoms unstable.

A Cosmic Repetition

_____ **10.** What is every object in the universe a part of?
- **a.** a larger system
- **b.** a smaller system
- **c.** a solar system
- **d.** a planetary system

_____ **11.** What is one other system the Milky Way galaxy contains?
- **a.** the Andromeda galaxy
- **b.** a galaxy cluster
- **c.** our solar system
- **d.** an elliptical galaxy

HOW OLD IS THE UNIVERSE?

_____ **12.** What kind of stars are the oldest in the Milky Way galaxy?
- **a.** blue stars
- **b.** yellow stars
- **c.** white dwarfs
- **d.** protostars

_____ **13.** How old are the oldest white dwarf stars?
- **a.** between 12 and 13 thousand years
- **b.** between 12 and 13 million years
- **c.** between 12 and 13 billion years
- **d.** between 12 and 13 trillion years

A FOREVER-EXPANDING UNIVERSE?

_____ **14.** What makes up most of the total universe?
- **a.** matter
- **b.** dark matter
- **c.** dark energy
- **d.** cosmic background radiation

_____ **15.** What does dark energy seem to be doing?
- **a.** helping the universe get smaller
- **b.** helping the universe expand
- **c.** helping the universe stay the same size
- **d.** helping a new universe begin

_____ **16.** What do scientists think will happen if the universe expands forever?
- **a.** Stars will never age.
- **b.** New stars will always be born.
- **c.** More galaxies will form.
- **d.** The universe will become cold and dark.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Stars

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. spectrum

2. apparent magnitude

3. absolute magnitude

4. light-year

5. parallax

SECTION SUMMARY

Read the following section summary.

- The color of a star depends on the temperature of the star. Blue stars are hottest. Red stars are coolest.
- The spectrum of a star shows which elements make up a star's atmosphere.
- Apparent magnitude is the brightness of a star as seen from Earth. Absolute magnitude is a measure of how bright a star would be if the star were 32.6 light-years from Earth.
- Astronomers use parallax and trigonometry to measure distances to stars that are close to Earth. They use light-years to describe those distances.
- Stars appear to move because of Earth's rotation. The actual motion of stars is hard to see because stars are so distant.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

The Life Cycle of Stars

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. main sequence

2. H-R diagram

3. supernova

SECTION SUMMARY

Read the following section summary.

- New stars form from gas and dust, which are pulled into a sphere by gravity.
- Some types of stars include main-sequence stars, giants, super giants, and white dwarfs.
- Most stars, including the sun, are main-sequence stars.
- The H-R diagram shows the brightness of a star relative to the temperature of the star. It also shows the life cycle of stars.
- Massive stars can explode in a large, bright flash called a *supernova*. Their cores can change into neutron stars or black holes.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Galaxies

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. galaxy

_____

_____

_____

2. nebula

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Astronomers classify galaxies by shape. The three types of galaxies are spiral galaxies, elliptical galaxies, and irregular galaxies.
- Some galaxies contain nebulas and star clusters.
- A nebula is a cloud of gas and dust. A globular cluster is a highly concentrated group of stars. An open cluster is a group of stars that are relatively close together.
- Scientists look at distant galaxies to see what early galaxies looked like.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Formation of the Universe

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. big bang theory

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- According to the big bang theory, the universe began with a tremendous explosion about 14 billion years ago.
- The presence of cosmic background radiation helps support the big bang theory.
- Scientists use white dwarfs to estimate the age of the universe.
- The universe is composed of matter, dark matter, and dark energy.
- Scientists think that the universe may expand forever.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: A Solar System Is Born (pp. 472–479)

Write the letter of the correct answer in the space provided.

_____ **1.** What do the planets of the solar system orbit around?
- **a.** many moons
- **b.** many stars
- **c.** the solar nebula
- **d.** the sun

THE SOLAR NEBULA

_____ **2.** What are clouds in space called?
- **a.** planetesimals
- **b.** black holes
- **c.** protons
- **d.** nebulas

_____ **3.** What are nebulas made up of?
- **a.** gases and planets
- **b.** energy and light
- **c.** gases and dust
- **d.** minerals and rock

_____ **4.** What are the gases of a nebula made up of?
- **a.** hydrogen and helium
- **b.** hydrogen and oxygen
- **c.** carbon dioxide and helium
- **d.** carbon dioxide and oxygen

Gravity Pulls Matter Together

_____ **5.** What are the gas and dust of a nebula made of?
- **a.** solids
- **b.** liquids
- **c.** matter
- **d.** air

_____ **6.** What does gravity do to a nebula's matter?
- **a.** It holds the matter together.
- **b.** It pulls the matter apart.
- **c.** It makes the matter drift away.
- **d.** It makes the matter stronger.

Pressure Pushes Matter Apart

Use the terms from the following list to complete the sentences below.

pressure temperature

7. A measure of the energy of motion of the particles in an object is _____.

8. In a nebula, _____ balances the inward gravitational pull and keeps the cloud from collapsing.

UPSETTING THE BALANCE

Write the letter of the correct answer in the space provided.

_____ **9.** Which of the following describes the solar nebula?
- **a.** boulders and asteroids
- **b.** the cloud that formed our solar system
- **c.** fused hydrogen atoms
- **d.** the four planets closest to the sun

HOW THE SOLAR SYSTEM FORMED

_____ **10.** What caused the solar system to form?
- **a.** Gravity became weaker.
- **b.** Pressure became weaker.
- **c.** The solar nebula collapsed.
- **d.** The solar nebula exploded.

From Planetesimals to Planets

_____ **11.** How did particles in the nebula make planetesimals?
- **a.** They collided.
- **b.** They became solid.
- **c.** They expanded from heat.
- **d.** They formed a sphere.

_____ **12.** What are planetesimals?
- **a.** small nebulas
- **b.** small bodies
- **c.** light gases
- **d.** new stars

_____ **13.** What did the protoplanets eventually become?
- **a.** the solar nebula
- **b.** stars
- **c.** the sun
- **d.** planets and moons

_____ **14.** Which of the following describes the sun, the planets, and most moons?
- **a.** spherical
- **b.** square
- **c.** rectangular
- **d.** triangular

The Birth of a Star

_____ **15.** What formed at the center of the solar nebula?
- **a.** planetesimals
- **b.** Earth
- **c.** moons
- **d.** the sun

_____ **16.** What happened when hydrogen atoms began to fuse to form helium?
- **a.** The nebula exploded.
- **b.** The gas left the nebula.
- **c.** The gas stopped collapsing.
- **d.** The helium atoms divided.

THE STRUCTURE OF THE SUN

_____ **17.** Which of the following is NOT part of the sun's interior?
- **a.** the corona
- **b.** the core
- **c.** the radiative zone
- **d.** the convective zone

_____ **18.** Which of the following is NOT part of the sun's atmosphere?
- **a.** the corona
- **b.** the convective zone
- **c.** the chromosphere
- **d.** the photosphere

ENERGY PRODUCTION IN THE SUN

_____ **19.** According to Einstein's formula, what can matter change into?
- **a.** pressure
- **b.** temperature
- **c.** gravity
- **d.** energy

Nuclear Fusion

_____ **20.** Which of the following is the process by which the sun generates energy?
- **a.** nebula collision
- **b.** star illumination
- **c.** nuclear fusion
- **d.** rotating clouds

Conditions Required for Fusion

_____ **21.** What condition in the center of the sun allows fusion to happen?
- **a.** The temperature and pressure are very high.
- **b.** Gravity and pressure interact.
- **c.** The nuclei are negatively charged.
- **d.** There is no balance between gravity and pressure.

Fusion in the Sun

_____ **22.** Which of the following is released during fusion of hydrogen of the sun?
- **a.** dust
- **b.** gravity
- **c.** energy
- **d.** clouds

MEASURING INTERPLANTETARY DISTANCES

Match the correct description with the correct term. Write the letter in the space provided.

_____ **23.** the average distance between the sun and Earth

_____ **24.** the distance that light travels in a minute

- **a.** light-minute
- **b.** astronomical unit

THE INNER AND OUTER SOLAR SYSTEMS

Match the correct description with the correct term. Write the letter in the space provided.

_____ **25.** the four planets that are farthest from the sun

_____ **26.** the four planets that are closest to the sun

- **a.** inner solar system
- **b.** outer solar system

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: The Inner Planets (pp. 480–485)

Write the letter of the correct answer in the space provided.

_____ **1.** Why are the inner planets called *terrestrial planets?*
- **a.** because they are very hot
- **b.** because they can support life
- **c.** because most are gas giants
- **d.** because they are very dense and rocky

_____ **2.** What three words could you use to describe the inner planets?
- **a.** hot, dry, and dense
- **b.** small, dense, and rocky
- **c.** large, light, and gaseous
- **d.** small, light, and solid

MERCURY: CLOSEST TO THE SUN

_____ **3.** Which of the following planets is located closest to the sun?
- **a.** Mars
- **b.** Venus
- **c.** Earth
- **d.** Mercury

_____ **4.** What is Mercury's interior composed of?
- **a.** hot gases
- **b.** a large, iron core
- **c.** oceans
- **d.** ice

Days and Years on Mercury

_____ **5.** Why is Mercury's day equal to 59 Earth days?
- **a.** because Mercury's period of rotation is fast
- **b.** because Mercury's period of rotation is slow
- **c.** because Mercury's period of revolution is slow
- **d.** because Mercury's period of revolution is fast

_____ **6.** How long does it take Mercury to revolve once around the sun?
- **a.** 55 Earth days
- **b.** 150 Earth days
- **c.** 88 Earth days
- **d.** 220 Earth days

Match the correct description with the correct term. Write the letter in the space provided.

_____ **7.** the time that an object takes to complete an orbit around another body

_____ **8.** the motion of a body orbiting another body in space

_____ **9.** the time that a planet takes to go around the sun once

_____ **10.** the amount of time that an object takes to rotate once

a. period of rotation
b. year
c. revolution
d. period of revolution

VENUS: EARTH'S TWIN?

Write the letter of the correct answer in the space provided.

_____ **11.** Why is the planet Venus sometimes called Earth's twin?
- **a.** Venus was born at the same time as Earth.
- **b.** Venus shares Earth's orbit.
- **c.** Venus has almost the same size, mass, and density as Earth.
- **d.** Venus rotates in the same direction as Earth.

_____ **12.** Why does the sun rise in the west and set in the east on Venus?
- **a.** Venus has a retrograde rotation.
- **b.** Venus has a prograde rotation.
- **c.** Venus spins the same way as the sun.
- **d.** Earth has a counterclockwise spin.

Match the correct description with the correct term. Write the letter in the space provided.

_____ **13.** A planet appears to spin in a clockwise direction when viewed from above its North Pole.

_____ **14.** A planet appears to spin in a counterclockwise direction when viewed from above its North Pole.

a. prograde rotation
b. retrograde rotation

The Atmosphere of Venus

Write the letter of the correct answer in the space provided.

_____ **15.** Which terrestrial planet has the densest atmosphere?
- **a.** Earth
- **b.** Mars
- **c.** Mercury
- **d.** Venus

_____ **16.** Which of the following make up Venus's atmosphere?
- **a.** mainly oxygen and nitrogen
- **b.** mainly carbon dioxide and acid
- **c.** mainly hydrogen and helium
- **d.** mainly water vapor and acids

Mapping Venus's Surface

_____ **17.** What technology was used to map Venus?
- **a.** survey tools
- **b.** video
- **c.** sonar
- **d.** radar

_____ **18.** Which of the following physical features were NOT found on Venus?
- **a.** mountains
- **b.** oceans
- **c.** lava plains
- **d.** volcanoes

EARTH: AN OASIS IN SPACE

A Constantly Changing Planet

_____ **19.** What makes Earth a suitable place for life?
- **a.** water and an energy source
- **b.** carbon dioxide in the air
- **c.** moving landmasses
- **d.** cold temperatures

Studying Earth from Space

_____ **20.** Which of the following is NOT part of Earth's interrelated global system?
- **a.** the oceans
- **b.** the stars
- **c.** the atmosphere
- **d.** ice

MARS: THE RED PLANET

The Atmosphere of Mars

_____ **21.** What makes Mars a cold planet?
- **a.** It has a thin atmosphere.
- **b.** It is too close to the sun.
- **c.** It has polar icecaps.
- **d.** It has high air pressure.

_____ **22.** What is an important effect of Mars's low temperature and low air pressure?
- **a.** Volcanoes on Mars are active.
- **b.** Mars's weather is always hot.
- **c.** There is no liquid water on Mars.
- **d.** The icecaps are made of carbon dioxide.

Water on Mars

_____ **23.** What evidence suggests that Mars once had liquid water?
- **a.** polar icecaps
- **b.** features that look like water erosion
- **c.** its thick atmosphere
- **d.** mountains and volcanoes

Where Is the Water Now?

_____ **24.** Besides the polar icecaps, where might liquid water exist on Mars?
- **a.** in rivers on top of the soil
- **b.** in the mountains
- **c.** frozen beneath Mars's surface
- **d.** in Mars's volcanoes

Volcanoes on Mars

_____ **25.** What is the name of the largest volcanic system on Mars?
- **a.** Mauna Kea
- **b.** Olympus Mons
- **c.** Sojourner
- **d.** Tharsis Montes

_____ **26.** Why is Olympus Mons so high?
- **a.** It has erupted for a long period of time.
- **b.** It is a shield volcano.
- **c.** It is made of ice.
- **d.** It has never erupted.

Missions to Mars

_____ **27.** What are the *Mars Express Orbiter's* instruments searching for?
- **a.** volcanoes
- **b.** traces of water
- **c.** the polar icecaps
- **d.** mountains

_____ **28.** What did the *Spirit* and *Opportunity* find in 2004?
- **a.** two large volcanic systems
- **b.** the polar icecaps
- **c.** evidence that water once existed
- **d.** Olympus Mons

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: The Outer Planets (pp. 486–491)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of the following describes a gas giant?
- **a.** planets that have hard surfaces
- **b.** planets that have snow and ice
- **c.** planets that have massive gas atmospheres
- **d.** planets that have no atmospheres

_____ **2.** Which outer body could NOT be called a gas giant?
- **a.** Neptune
- **b.** Pluto
- **c.** Saturn
- **d.** Uranus

JUPITER: A GIANT AMONG GIANTS

_____ **3.** Which is the largest planet in our solar system?
- **a.** Jupiter
- **b.** Earth
- **c.** Saturn
- **d.** Neptune

_____ **4.** What is Jupiter made of?
- **a.** mainly oxygen
- **b.** mainly methane
- **c.** mainly hydrogen
- **d.** mainly carbon dioxide

_____ **5.** What is Jupiter's Great Red Spot?
- **a.** thick clouds
- **b.** colorful compounds
- **c.** metallic hydrogen
- **d.** a huge storm

_____ **6.** What is unusual about Jupiter's energy supply?
- **a.** It gets energy from the Great Red Spot.
- **b.** It gives off more energy than it takes in.
- **c.** It gets energy from its moons.
- **d.** It gets energy from a neutron star.

The Exploration of Jupiter

_____ **7.** What information did the Galileo mission's atmospheric probe send back about Jupiter?
- **a.** details about its weather
- **b.** facts about its gases
- **c.** images of its Great Red Spot
- **d.** facts about its moons

SATURN: THE RINGED WORLD

_____ **8.** Which of the following is the second-largest planet in the solar system?
- **a.** Pluto
- **b.** Neptune
- **c.** Jupiter
- **d.** Saturn

_____ **9.** Which of the following is true of Saturn's density?
- **a.** Saturn's density is higher than Jupiter's.
- **b.** Saturn's density is more than the density of water.
- **c.** Saturn is the least dense of all the planets.
- **d.** Saturn is the most dense of all the planets.

The Rings of Saturn

_____ **10.** What are Saturn's rings made of?
- **a.** rocks and dust
- **b.** iron and metals
- **c.** water ice and dust
- **d.** organic compounds

The Exploration of Saturn

_____ **11.** Which spacecraft reached Saturn in 2004 to study its rings and northern polar region?
- **a.** *Cassini*
- **b.** *Galileo*
- **c.** *Pioneer*
- **d.** *Voyager*

URANUS: A SMALL GIANT

_____ **12.** What affect does the methane in its atmosphere have on Uranus?
- **a.** It causes Uranus to have rings.
- **b.** It gives Uranus a greenish tinge.
- **c.** It causes Uranus to have clouds.
- **d.** It makes Uranus look blue.

A Tilted Planet

_____ **13.** What is unusual about Uranus's axis?
- **a.** The planet is tipped on its side.
- **b.** The axis is tipped at an angle of 45°.
- **c.** The axis is tipped at an angle of 65°.
- **d.** The planet is straight up and down.

_____ **14.** What do scientists think may have caused Uranus's tilt?
- **a.** Uranus escaped Jupiter's gravity.
- **b.** Uranus's moons had a cosmic tug of war.
- **c.** Uranus was pulled by Saturn's gravity.
- **d.** Uranus was hit by a large object.

NEPTUNE: THE BLUE WORLD

_____ **15.** What causes Neptune's blue color?
- **a.** methane in the atmosphere
- **b.** rocks and ice
- **c.** helium in the atmosphere
- **d.** the Great Dark Spot

The Weather on Neptune

_____ **16.** What is the Great Dark Spot?
- **a.** gases in the atmosphere
- **b.** a storm the size of Earth
- **c.** a volcanic system
- **d.** a polar icecap

_____ **17.** How fast do Neptune's winds travel?
- **a.** more than 100 m/s
- **b.** less than 1,000 km/hr
- **c.** approximately 300 km/s
- **d.** more than 1,000 km/h

PLUTO: A DWARF PLANET

A Small World

_____ **18.** What is Pluto made of?
- **a.** hydrogen and helium
- **b.** mainly organic compounds and ice
- **c.** hydrogen and water
- **d.** rock and ice

_____ **19.** What is unusual about Pluto's moon?
- **a.** Its orbit is not regular.
- **b.** It is more than half the size of Pluto.
- **c.** It is about the same size as Pluto.
- **d.** It is denser than Pluto.

Beyond Pluto

_____ **20.** Which of the following is a region that contains small bodies made mostly of ice?
- **a.** Jupiter's interior
- **b.** Pluto's atmosphere
- **c.** the Kuiper belt
- **d.** the Great Dark Spot

_____ **21.** What did scientists discover in the Kuiper belt in 2003?
- **a.** 2003UB313
- **b.** Pluto
- **c.** Charon
- **d.** another sun

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Moons (pp. 492–499)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of these planets do not have moons?
- **a.** Mars and Mercury
- **b.** Neptune and Uranus
- **c.** Venus and Mars
- **d.** Venus and Mercury

Use the terms from the following list to complete the sentences below.

moons satellites

2. Natural or artificial bodies that revolve around larger bodies are called _____.

3. Most of the planets of our solar system have natural satellites called _____.

LUNA: THE MOON OF EARTH

Write the letter of the correct answer in the space provided.

_____ **4.** What is the approximate age of the lunar rocks brought back from the Apollo missions?
- **a.** 10 years old
- **b.** 20 million years old
- **c.** 4.5 billion years old
- **d.** 50 billion years old

The Surface of the Moon

_____ **5.** What is the moon's surface composed of?
- **a.** highlands and plains
- **b.** oceans and rivers
- **c.** volcanoes and highlands
- **d.** mountains and oceans

Lunar Origins

_____ **6.** What is the current theory about the birth of the moon?
- **a.** Earth's gravity trapped the moon.
- **b.** A Mars-sized body collided with Earth.
- **c.** A moon-sized body collided with Earth.
- **d.** A piece of Earth spontaneously broke off.

_____ **7.** What facts support this theory?
- **a.** The moon is covered with craters.
- **b.** The lunar maria are old lava flows.
- **c.** The moon's composition is similar to that of Earth's mantle.
- **d.** The impacting body has been identified.

_____ **8.** What caused the moon to become a sphere?
- **a.** gravity
- **b.** atmosphere
- **c.** gases
- **d.** orbit

Moonlight

_____ **9.** Why does the moon shine?
- **a.** because it waxes and wanes
- **b.** because of its period of revolution
- **c.** because it generates energy
- **d.** because it reflects the sun's light

Phases of the Moon

_____ **10.** What causes the moon to change its appearance each month?
- **a.** The moon reflects light from the sun.
- **b.** The moon changes position as it revolves around Earth.
- **c.** The moon orbits around the sun.
- **d.** The sun's shadow falls on the moon.

Use the terms from the following list to complete the sentences below.

waning phases waxing

11. The different appearances of the moon as seen from Earth are called _____.

12. When the moon is _____, the sunlit part of the moon that we see from Earth is getting larger.

13. When the moon is _____, the sunlit part of the moon that we see from Earth is getting smaller.

Eclipses

Write the letter of the correct answer in the space provided.

_____ **14.** What occurs when the shadow of one celestial body falls on another?
- **a.** waxing
- **b.** a collision
- **c.** an eclipse
- **d.** a phase

Match the correct description with the correct term. Write the letter in the space provided.

_____ **15.** The shadow of Earth falls on the moon.

_____ **16.** The shadow of the moon falls on part of Earth.

_____ **17.** A thin ring of the sun shows around the moon's outer edge.

_____ **18.** The disk of the moon completely covers the disk of the sun.

- **a.** solar eclipse
- **b.** lunar eclipse
- **c.** total solar eclipse
- **d.** annular eclipse

The Moon's Tilted Orbit

Write the letter of the correct answer in the space provided.

_____ **19.** Why don't we see eclipses every month?
- **a.** The moon's orbit is an ellipse.
- **b.** The moon's orbit is tilted.
- **c.** Earth's orbit around the sun changes.
- **d.** Half of the moon is always in sunlight.

THE MOONS OF OTHER PLANETS

_____ **20.** Which of the following statements about moons is incorrect?
- **a.** Some orbit backward.
- **b.** Many may be captured asteroids.
- **c.** Some have very elliptical orbits.
- **d.** None is as large as terrestrial planets.

The Moons of Mars

_____ **21.** What are the two moons of Mars?
- **a.** Ganymede and Io
- **b.** Deimos and Luna
- **c.** Phobos and Deimos
- **d.** Charon and Phobos

The Moons of Jupiter

_____ **22.** What are the four largest moons of Jupiter known as?
- **a.** Luna
- **b.** the Galilean satellites
- **c.** Terrae
- **d.** the Maria moons

_____ **23.** Ganymede is larger than which planet?
- **a.** Earth
- **b.** Mars
- **c.** Mercury
- **d.** Venus

_____ **24.** Which of the following is the most volcanically active body in the solar system?
- **a.** Jupiter
- **b.** Callisto
- **c.** Io
- **d.** Europa

_____ **25.** What suggests that Europa might contain life?
- **a.** Europa's surface is rocky.
- **b.** Europa has many craters.
- **c.** Europa has active geysers.
- **d.** Europa may have an ocean.

The Moons of Saturn

_____ **26.** How many moons does Saturn have?
- **a.** more than 50
- **b.** 8
- **c.** 14
- **d.** 20

_____ **27.** Which of the following statements does NOT describe Titan?
- **a.** It has an atmosphere 700 km thick.
- **b.** Its atmosphere is mostly nitrogen.
- **c.** It is Saturn's largest moon.
- **d.** It has 100 active volcanoes.

The Moons of Uranus

_____ **28.** Which of Uranus's moons re-formed in a mixed-up state?
- **a.** Charon
- **b.** Callisto
- **c.** Miranda
- **d.** Phobos

The Moons of Neptune

_____ **29.** What is unusual about Neptune's largest moon, Triton?

a. It has oceans of water.
b. It revolves around Neptune in a retrograde orbit.
c. It has a thick atmosphere.
d. Its orbit is tilted.

The Moon of Pluto

_____ **30.** Why does one side of Pluto always face Charon?

a. Charon is large in comparison with Pluto.
b. Charon was a captured asteroid or comet.
c. Charon's period of revolution is equal to Pluto's period of rotation.
d. Pluto is sometimes eclipsed by Charon.

Name _____ Class _____ Date _____

Skills Worksheet

Directed Reading A

Section: Small Bodies in the Solar System (pp. 500–505)

Write the letter of the correct answer in the space provided.

_____ **1.** Which of these objects would NOT be described as a small body?
- **a.** asteroids
- **b.** meteoroids
- **c.** comets
- **d.** stars

_____ **2.** What can we learn by studying small bodies in the solar system?
- **a.** how to explore space in spacecraft
- **b.** whether life exists on Mars
- **c.** what the solar system is made of
- **d.** what the temperature is in space

COMETS

_____ **3.** What materials are comets made of?
- **a.** iron, nickel, and rock
- **b.** ice, rock, and cosmic dust
- **c.** lighter elements and water ice
- **d.** frozen gases and metals

_____ **4.** What is the spherical cloud of gas and dust surrounding the nucleus of a comet called?
- **a.** asteroid
- **b.** meteor
- **c.** coma
- **d.** planet

Comet Tails

_____ **5.** What causes the tail of a comet to form?
- **a.** Sunlight causes the comet's ice to change to gas.
- **b.** The comet orbits the sun.
- **c.** The gravity of a passing star disturbs the Oort cloud.
- **d.** Sunlight reflects off the tail.

_____ **6.** What is the ion tail of a comet made of?
- **a.** dust
- **b.** gas
- **c.** rock
- **d.** ice

Comet Orbits

_____ **7.** Where do most comets come from?
- **a.** Earth's atmosphere
- **b.** the asteroid belt
- **c.** the Oort cloud and the Kuiper belt
- **d.** just beyond Mercury's orbit

_____ **8.** What kind of orbit do comets follow?
- **a.** spherical
- **b.** circular
- **c.** gravitational
- **d.** elliptical

Long- and Short-Period Comets

Match the correct description with the correct term. Write the letter in the space provided.

_____ **9.** comets that take less than 200 years to orbit the sun

_____ **10.** comets that take more than 200 years to orbit the sun

a. short-term comets

b. long-terms comets

ASTEROIDS

Use the terms from the following list to complete the sentences below.

asteroid belt asteroid

11. A small, rocky body that revolves around the sun is called a(n) _____.

12. A region of space between the orbits of Mars and Jupiter is called the _____.

Composition of Asteroids

Write the letter of the correct answer in the space provided.

_____ **13.** What color are asteroids that are rich in carbon?
- **a.** black
- **b.** reddish brown
- **c.** dark gray
- **d.** light gray

Near-Earth Asteroids

_____ **14.** Which of the following statements describes near-Earth asteroids?
- **a.** They come from the Oort cloud.
- **b.** The have an ion tail and a dust tail.
- **c.** They are made of ice.
- **d.** Their orbits bring them close to Earth.

METEOROIDS

Match the correct description with the correct term. Write the letter in the space provided.

_____ **15.** rocky bodies that reach Earth's surface

_____ **16.** glowing trails that result when bodies burn up in Earth's atmosphere

_____ **17.** pieces of dust and debris from asteroids and comets

- **a.** meteors
- **b.** meteoroids
- **c.** meteorites

Composition of Meteorites

Match the correct description with the correct term. Write the letter in the space provided.

_____ **18.** may contain carbon-bearing compounds

_____ **19.** is rare and contains iron

_____ **20.** is distinctive and easy to find

- **a.** metallic meteorite
- **b.** stony meteorite
- **c.** stony-iron meteorite

Meteor Showers

Write the letter of the correct answer in the space provided.

_____ **21.** What causes meteor showers?
- **a.** small meteoroids entering Earth's atmosphere
- **b.** the gravity of a nearby star or planet
- **c.** water entering Earth's atmosphere from space
- **d.** the activity of the solar wind

Impacts on Earth

_____ **22.** How often does an impact large enough to cause a global catastrophe strike Earth's surface?
- **a.** every million years
- **b.** every 50 to 100 million years
- **c.** every 30 to 50 million years
- **d.** every few hundred years

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

A Solar System Is Born

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. nebula

2. solar nebula

3. astronomical unit

SECTION SUMMARY

Read the following section summary.

- For a nebula to be stable, outward pressure and the inward force of gravity must be balanced.
- The solar system formed out of a vast cloud of dust and gas called the *solar nebula.* The core of the nebula became the sun. Planets formed from material in the rotating disk.
- Energy is produced in the sun's core by the process of nuclear fusion.
- The sun consists of six layers: the core, the radiative zone, the convective zone, the photosphere, the chromosphere, and the corona.
- Distances in the solar system are measured in astronomical units, light-minutes, and light-hours.
- The inner solar system contains the planets closest to the sun. The outer solar system contains the planets farthest from the sun.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

The Inner Planets

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. terrestrial planet

2. prograde rotation

3. retrograde rotation

SECTION SUMMARY

Read the following section summary.

- The inner planets include Mercury, Venus, Earth, and Mars.
- The inner planets differ from each other and from other bodies in the solar system in size and composition.
- Mercury is the closest planet to the sun. Mercury is small and rocky and revolves around the sun every 88 days.
- Venus is much like Earth, but Venus's atmosphere is much denser than Earth's.
- Earth is the only planet in the solar system known to support life.
- Evidence suggests that Mars had liquid water in the past and that Mars was geologically active in the past.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

The Outer Planets

VOCABULARY

In your own words, write a definition of the following term in the space provided.

1. gas giant

_____

_____

_____

SECTION SUMMARY

Read the following section summary.

- Jupiter is the largest and most massive planet in the solar system.
- Saturn is the second-largest planet and the least dense planet in the solar system. The rings of Saturn are made of particles of water ice and dust.
- Uranus's axis of rotation is tilted 98°.
- The weather on Neptune includes storms and winds that travel at more than 1,000 km/h.
- Pluto is a dwarf planet. Its moon, Charon, is more than half Pluto's size.
- Hundreds of objects have been discovered in our solar system beyond Neptune's orbit.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Moons

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. satellite

2. phase

3. eclipse

SECTION SUMMARY

Read the following section summary.

- Scientists think that Earth's moon formed from debris that was ejected into space after a large body collided with Earth.
- Moons appear to shine because they reflect the light of the sun.
- As the moon revolves around Earth, the amount of sunlight on the side of the moon that faces Earth changes. Changes in the appearance of the moon are called *phases*.
- An eclipse occurs when the shadow of one celestial body falls on another.
- Mercury and Venus have no moons. Earth has one moon. Mars has two moons.
- Jupiter has more than 60 moons. The largest four are called the *Galilean moons*.
- Saturn has more than 50 moons. The largest, Titan, has an atmosphere that is 700 km thick.
- Uranus and Neptune each have several moons.
- Pluto has only one confirmed moon, Charon. One side of Pluto always faces its moon.

Name _____ Class _____ Date _____

Skills Worksheet

Vocabulary and Section Summary A

Small Bodies in the Solar System

VOCABULARY

In your own words, write a definition of the following terms in the space provided.

1. comet

2. asteroid

3. meteoroid

4. meteor

5. meteorite

SECTION SUMMARY

Read the following section summary.

- Comets are small bodies of ice, rock, and cosmic dust that follow elliptical orbits around the sun. Comets originate in the Oort cloud and the Kuiper belt.
- Asteroids are small, rocky objects that are located in a band between Mars and Jupiter. Asteroids have nearly circular orbits around the sun.
- Near-Earth asteroids have wide, elliptical orbits that bring them close to Earth.
- Meteoroids are dust and debris from asteroids and comets.
- Meteoroids that burn up in Earth's atmosphere are meteors. Bodies that reach Earth are called *meteorites*.