Name _____ Date _____ Class _____

1.1 CHEMISTRY

Section Review

Objectives

- Identify five traditional areas of study in chemistry
- Relate pure chemistry to applied chemistry
- Identify reasons to study chemistry

Vocabulary

- matter
- chemistry
- organic chemistry
- inorganic chemistry
- biochemistry
- analytical chemistry
- physical chemistry
- pure chemistry
- applied chemistry
- technology

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Matter is anything that has __1__ and occupies __2__. Chemistry is the study of the __3__ of matter and the __4__ that matter undergoes. Chemistry has traditionally been divided into __5__ areas of study. Organic chemistry is the study of chemicals that contain __6__, while inorganic chemistry is primarily the study of chemicals that do not contain __7__. Biochemistry is the study of the processes that take place in __8__. __9__ is focused on the composition of matter, while __10__ deals with the mechanism, the rate, and the __11__ that occurs when matter undergoes a change. A chemist is likely to be working in __12__ areas of chemistry at the same time.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

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Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

_____ 13. Organic chemistry is the study of chemicals that do not contain carbon.

_____ 14. The goal of chemistry is to accumulate knowledge.

_____ 15. Biochemistry involves the study of living organisms.

_____ 16. An organic chemist uses analytical chemistry.

_____ 17. Applied chemistry is used to attain specific goals.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ 18. chemistry	a. anything that has mass and occupies space
_____ 19. pure chemistry	b. study of essentially all chemicals that contain carbon
_____ 20. organic chemistry	c. study of the composition of substances
_____ 21. inorganic chemistry	d. study of essentially all chemicals that do not contain carbon
_____ 22. technology	e. study of the chemistry of living organisms
_____ 23. physical chemistry	f. study of the composition of matter and the changes it undergoes
_____ 24. analytical chemistry	g. study of the mechanism, the rate, and the energy transfer that occurs when matter undergoes a change
_____ 25. matter	h. the means by which a society provides its members with those things needed and desired
_____ 26. biochemistry	i. the pursuit of chemistry knowledge for its own sake
_____ 27. applied chemistry	j. research that is directed toward a practical goal or application

Part D Questions and Problems

Answer the following questions in the space provided.

28. Match each activity below to one of the five branches of chemistry.

a. determining the energy transfer when water boils _____

b. finding out how much nitrogen is in a sample of air _____

c. studying the process of photosynthesis in plants _____

d. manufacturing nylon, which contains carbon _____

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1.2 CHEMISTRY FAR AND WIDE

Section Review

Objectives

- Identify some areas of research affected by chemistry and describe examples of research in chemistry
- Distinguish between macroscopic and microscopic views

Vocabulary

- macroscopic
- microscopic
- biotechnology
- pollutant

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Chemists design materials to fit __1__ needs. Objects that can be seen only under magnification are part of the __2__ world.

Chemistry is important in the production and conservation of __3__. One of the easiest ways to __4__ energy is through the use of insulation. New kinds of __5__ for the storage of energy are also being developed.

Chemistry plays a role in efforts to increase the __6__ of farmland and to protect __7__ from insect pests. The trend is toward chemicals that treat __8__ problems.

Astronomy and __9__ exploration also benefit from chemistry. For example, a robotic vehicle delivered to the surface of Mars can determine the __10__ of Mars rocks.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

_____ **9.** Insulin can be produced when genes from bacteria are inserted into humans.

_____ **10.** World energy demand is decreasing.

_____ **11.** Some human genes have been inserted into bacteria.

_____ **12.** Low levels of lead in the blood can permanently damage the nervous system of a growing child.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ **13.** macroscopic	**a.** material found in air, water, or soil that is harmful to humans or other organisms
_____ **14.** pollutant	**b.** describes objects that can be seen only under magnification
_____ **15.** biotechnology	**c.** applies science to the production of biological products or processes
_____ **16.** microscopic	**d.** describes objects that are large enough to see with the unaided eye
_____ **17.** fossil fuels	**e.** determined the sequence of genes in human DNA
_____ **18.** Human Genome Project	**f.** materials formed from the remains of ancient plants and animals

Part D Questions and Problems

Answer the following questions in the space provided.

19. Describe two ways biotechnology can help treat diseases.

20. Name three factors that decrease crop productivity.

21. Explain how scientists know that water once existed on the surface on Mars.

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1.3 THINKING LIKE A SCIENTIST

Section Review

Objectives

- Explain how alchemy laid the groundwork for chemistry
- Describe how Lavoisier transformed chemistry
- Identify three steps in the scientific method
- Explain why collaboration and communication are important in science

Vocabulary

- scientific method
- observation
- hypothesis
- experiment
- manipulated variable
- responding variable
- theory
- scientific law

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Before there were chemists, ___1___ were studying matter. 1. _____

They developed ___2___ and ___3___ for working with chemicals. 2. _____

Lavoisier helped make chemistry a science of ___4___. 3. _____

A logical, ___5___ approach is the best way to solve a difficult 4. _____

problem. One logical approach to solving scientific problems is the 5. _____

___6___. This method may begin with an observation, followed 6. _____

by ___7___, or a proposed explanation for what is observed. You can 7. _____

conduct an ___8___ to test a hypothesis. If a hypothesis meets 8. _____

the test of repeated experimentation, it may become a ___9___, 9. _____

which is a well-tested explanation for a broad set of observations. 10. _____

A ___10___ is a concise statement that summarizes the results

of many observations and experiments.

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Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

_____ 11. A theory can be easily proved.

_____ 12. Scientific laws explain observations.

_____ 13. A well-planned experiment will disprove a hypothesis.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ 14. scientific method	a. variable that one changes during an experiment
_____ 15. observation	b. information obtained through one's senses
_____ 16. manipulated variable	c. a logical approach to the solution of scientific problems
_____ 17. hypothesis	d. a means to test a hypothesis
_____ 18. experiment	e. a proposed explanation for an observation
_____ 19. responding variable	f. variable that is observed during an experiment

Part D Questions and Problems

Answer the following questions in the space provided.

20. Classify each step in the following application of the scientific method as an observation, a hypothesis, an experiment, or a scientific law.

a. An iron ball falls to the ground when you drop it.

_____

b. Earth is a giant magnet, which attracts iron objects.

_____

c. An iron ball and a piece of wood are dropped from the same height.

_____

d. The iron ball and wood fall at the same rate.

_____

e. Gravity attracts every object in the universe to every other object.

_____

21. What two processes practiced by scientists increase the likelihood of a successful outcome in science?

_____

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1 INTRODUCTION TO CHEMISTRY

Practice Problems

In your notebook, solve the following problems.

SECTION 1.1 CHEMISTRY

1. Match the project to the appropriate field of chemistry (inorganic chemistry, organic chemistry, biochemistry, analytical chemistry, or physical chemistry).
   a. Determine the composition of a moon rock sample.
   b. Do research on making a new medicine to treat high blood pressure.
   c. Investigate ways to regulate the rate of gasoline burning in an automobile engine.
   d. Develop a plastic that can be decomposed by bacteria.
   e. Improve the method for extracting iron from iron ore.
2. Classify the following examples as examples of pure chemistry or applied chemistry.
   a. developing a shampoo to be used with dry or damaged hair
   b. determining the conditions required for materials to burn
   c. figuring out the general structure of materials such as cotton and silk
   d. designing a large-scale method for producing nylon
   e. explaining why water expands when it freezes

SECTION 1.2 CHEMISTRY FAR AND WIDE

1. Identify three areas of energy research that scientists are working on today.
2. The following statements are all concerned with the work chemists do. Write T for each *true* statement and F for each *false* statement.
   a. Chemists design materials to meet specific needs.
   b. Oil from the soybean plant is used to make biodiesel.
   c. As the world's population increases, the amount of land available to grow food increases.
   d. Many drugs are effective because they interact in a specific way with chemicals in cells.
   e. The trend in crop protection is toward chemicals that are less specific.
   f. The use of lead paint in houses was banned in 1978.
   g. Chemists are doing research to improve batteries.
   h. To study the universe, chemists gather data from afar and analyze matter that is brought back to Earth.
   i. Chemists have developed a plastic "skin" that can heal itself when it cracks to help patients with burns.

SECTION 1.3 THINKING LIKE A SCIENTIST

1. One cold morning your car does not start. Make two hypotheses about why the car will not start.
2. Suppose you try several experiments with your car. You try a battery jump, which does not work. There seems to be enough gas in the car. You wiggle a wire in the engine, and the car starts on the next try. Explain how these tests help you decide what was wrong with the car.
3. The following is a list of observations from everyday experiences:

   Hummingbirds have long beaks.
   Moisture forms on the outside of a cold glass.
   Ice cubes float.
   Oil and water don't mix.
   There are fewer fish in a particular creek this year.

   a. Propose one hypothesis for each observation.
   b. Select one of the hypotheses and describe an experiment that you could do to test it.
4. Discuss the statement "No theory is written in stone."

SECTION 1.4 PROBLEM SOLVING IN CHEMISTRY

1. Apples are selling for $1.50 a pound. Each apple weighs, on average, 0.50 pounds. You have $6.00. How many apples can you purchase?
   a. ANALYZE (List the knowns and unknown.)

   Knowns:
   cost of apples =
   weight of an apple =
   dollars available =

   Unknown:
   number of apples purchased = ?

   b. CALCULATE (Solve for the unknown.)
   Use an expression that converts cost per pound to cost per apple.

   $$\text{cost per apple} = 0.50 \cancel{\text{pound}} \times \frac{\$1.50}{1 \cancel{\text{pound}}}$$

   cost per apple =

   Use an expression that relates cost per apple to dollars available.

   $$\text{number of apples purchased} = \frac{\$6.00}{\$0.75}$$

   number of apples purchased =
2. Describe an alternate way to solve Problem 1.