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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__ area 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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1.3 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 INTERPRETING GRAPHICS

Use with Section 1.1

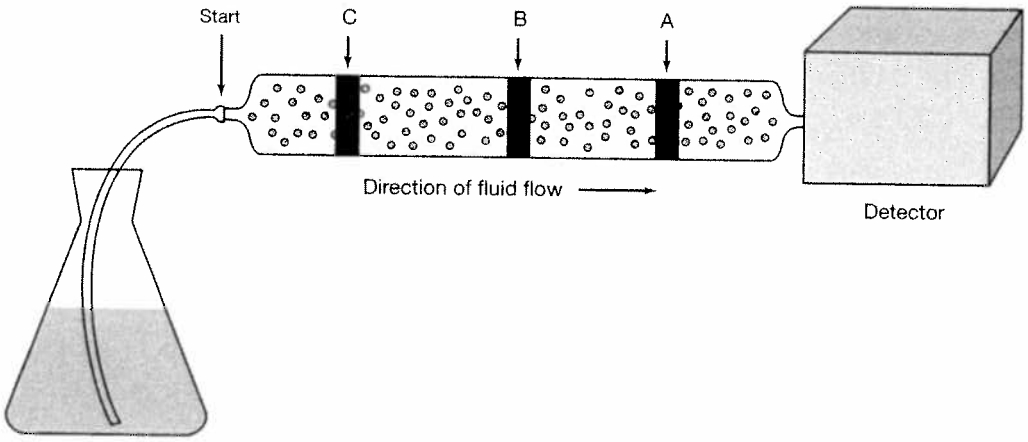

Figure 1 *Separation of a mixture of chemicals. Component A is moving along the column faster than Component B, which is moving faster than Component C.*

Liquid chromatography (LC) is a technique often used by analytical chemists to separate the components of a mixture. In liquid chromatography, a mixture is placed at one end of a long tube, or column, which is packed with microscopic beads. The components in the mixture move from one end of the column to the other by means of a liquid that is flowing through the column. Different components move along the column at different rates. Each component of a mixture has a characteristic *retention time*, or time it takes the component to cross the column.

When a component reaches the end of the column, it passes through a detector, which plots the amount of material exiting the column against time.

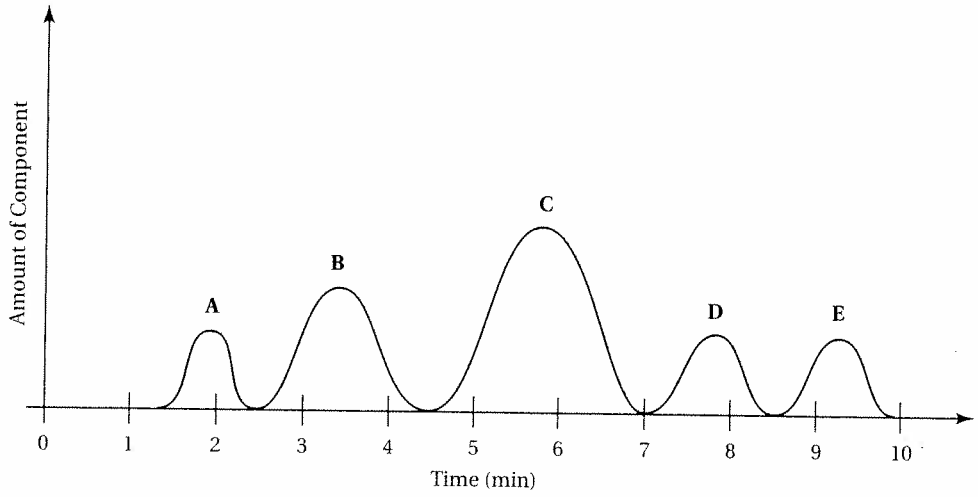

Figure 2 *A typical LC detector plot of a mixture of components.*

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1. How many components were present in the original mixture?

_____

2. Which component has a retention time of approximately 8 minutes?

_____

3. What is the approximate retention time of Component B?

_____

4. Which component crossed the column first (shortest retention time)?

_____

5. Which component crossed through the column last?

_____

6. Which of the components in the mixture was present in the greatest amount (greatest peak area in the detector plot)?

_____