



# Study Guide

## BIG IDEA

### CHEMISTRY AS THE CENTRAL SCIENCE

Understanding chemistry helps you understand other areas of science. People in many kinds of jobs use chemistry. Understanding chemistry also helps you to become an informed citizen. Chemists solve problems by using scientific methodology. They develop theories about the world around us.

### 1.1 Matter: Science and Properties

Chemistry affects all parts of life as well as most things in nature. All living and nonliving things are composed of matter.

Five traditional areas of study are organic chemistry, inorganic chemistry, biochemistry, analytical chemistry, and physical chemistry.

Some big ideas in chemistry include chemistry as the central science; electrons and the structure of atoms; bonding and interactions; reactions; kinetic theory; the mole and quantifying matter; matter and energy; and carbon chemistry.

- matter (4)
- chemistry (4)
- organic chemistry (5)
- inorganic chemistry (5)
- biochemistry (5)
- analytical chemistry (5)
- physical chemistry (5)

### 1.2 Chemistry in the World

Chemistry helps explain the natural world, prepare people for careers, and produce informed citizens.

Modern research in chemistry leads to technologies that help the environment, conserve and produce energy, improve our lives, and help us learn more about the universe.

- technology (2)

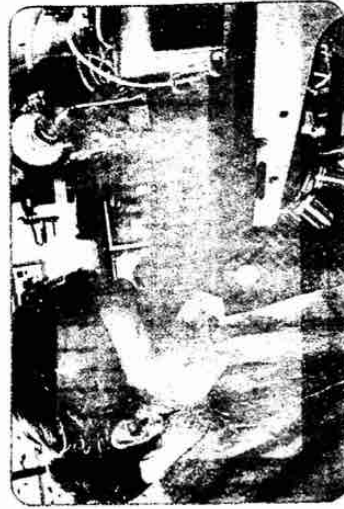
### 1.3 Thinking Like a Scientist

Lavoisier helped change chemistry from a science of observation to the science of measurement that it is today.

Scientific methodology involves making observations, proposing and testing hypotheses, and developing theories.

When scientists communicate and work together, a successful outcome is more likely.

- scientific methodology (12)
- observation (12)
- hypothesis (13)
- experiment (13)
- independent variable (13)
- dependent variable (13)
- model (13)
- theory (14)
- scientific law (14)



### 1.4 Problem Solving in Chemistry

Creating a plan and then following that plan helps you solve a problem effectively.

The steps for solving a numeric word problem are analyze, calculate, and evaluate.

The steps for solving a nonnumeric problem are analyze and solve.



## Lesson by Lesson

## 1.1 The Scope of Chemistry

- \*31. Explain why air is classified as matter.
- \*32. The Chinese characters for chemistry literally mean “change study.” Why are these appropriate characters to represent chemistry?

# 化学

33. Describe the main difference between inorganic chemistry and organic chemistry.

## 1.2 Chemistry and You

- \*34. Why would a firefighter or a reporter need to understand chemistry?
35. How do chemists help medical doctors treat patients?
- \*36. How can scientists study what distant stars are made of?

## 1.3 Thinking Like a Scientist

- \*37. What is the most powerful tool that any scientist can have?
38. What is the purpose of an experiment?
- \*39. Which of the following is not involved in scientific methodology?  
a. hypothesis    c. guess  
b. experiment    d. theory
40. How is an independent variable different from a dependent variable?
- \*41. You perform an experiment and get unexpected results. According to scientific methodology, what should you do next?
42. List two general reasons why scientists are likely to collaborate.

## 1.4 Problem Solving in Chemistry

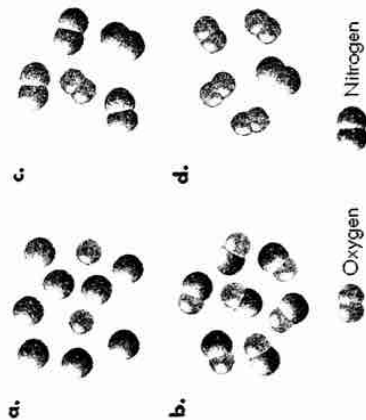
- \*43. Identify the statements that correctly describe good problem solvers.  
a. read a problem only once  
b. check their work  
c. look up missing facts  
d. look for relationships among the data
44. What do effective problem-solving strategies have in common?
45. In which step of the three-step problem-solving approach for numeric problems is a problem-solving strategy developed?
46. If your heart beats at an average rate of 72 times per minute, how many times will your heart beat in an hour? How many times will your heart beat in a day?
- \*47. How many days would it take you to count a million pennies if you could count one penny each second?

## Understand Concepts

- \*48. Match each area of chemistry with a numbered statement.  
a. physical chemistry    d. inorganic chemistry  
b. organic chemistry    e. biochemistry  
c. analytical chemistry
- (1) measure the level of lead in blood  
(2) study non-carbon-based chemicals in rocks  
(3) investigate changes that occur as food is digested in the stomach  
(4) study carbon-based chemicals in coal  
(5) explain the energy transfer that occurs when ice melts
49. Explain why chemistry might be useful in a career you are thinking of pursuing.
50. Describe a situation in which you used at least two steps in scientific methodology to solve a problem.

### Think Critically

- \*51. **Calculate** Four beakers have a total weight of 2.0 lb. Each beaker weighs 0.5 lb. Describe two different methods you could use to calculate the weight of two beakers. Then, try both methods and compare the answers.
- \*52. **Interpret Diagrams** The air you breathe is about 20 percent oxygen and 80 percent nitrogen. Use your problem-solving skills to decide which drawing best represents a sample of air and then explain your choice.



## FOUNDATIONS WISPIRE

### Stirring Up Chemistry

1. **Draw Conclusions** At the beginning of this chapter, you mixed food coloring into water. Explain what this activity had to do with chemistry.

### Concept Check

- Now that you have finished studying Chapter 1, answer these questions. Use your own words.
- What kind of chemist would test the water in a lake to see if it were polluted?
  - Why would you study chemistry if you wanted to be an astronaut?
  - You notice that sugar dissolves faster in hot tea than it does in iced tea. What step of the scientific method are you using?
  - Explain the steps you would take to solve a problem that uses numbers.

### Write About Science

53. **Explain** Pick one activity that you can do faster or with less effort because of technology. Write a paragraph in which you describe the activity, identify the technology, and explain how the technology affects the activity.
54. **Relate Cause and Effect** Write a paragraph that explains how you can learn about the research that is done by scientists. Then, explain how this information could help you be an informed citizen.

## CHEMISTRY

### Is Bio Better?

When you return home from the store, you go online to search for "bioplastics." You learn that the products you found at the store were most likely made from polylactic acid (PLA). You like that PLA products come from natural resources, such as corn, and that less energy is used in making PLA than other plastics. However, you are concerned that it would be difficult to find a facility that would be able to compost the cups and utensils when you and your friends are finished with them.

- \*55. **Relate Cause and Effect** What factors will affect your decision as to whether to purchase the picnic products made from PLA? Explain your answer.

56. **Connect to the Big Idea** How would a knowledge of chemistry help you make an informed decision?