Section 4

Safety in the Science Laboratory

Reading Preview

Key Concepts

- Why is preparation important when carrying out scientific investigations in the lab and in the field?
- What should you do if an accident occurs?

Target Reading Skill

Outlining As you read, make an outline about science safety that you can use for review. Use the red headings for the main ideas and the blue headings for supporting ideas.

Safety in the Science Laboratory
I. Safety During Investigations
A. Preparing for the lab
B.
C.
D.
II. In Case of an Accident

Lab zone **Discover Activity**

Where Is the Safety Equipment in Your School?

1. Look around your classroom or school for any safety-related equipment.
2. Draw a floor plan of the room or building and clearly label where each item is located.

Think It Over

Predicting Why is it important to know where safety equipment is located?

You and your family have just arrived at a mountain cabin for a vacation. The view of the mountaintops is beautiful, and the fresh scent of pine trees fills the air. In the distance, you can glimpse a lake through the pines.

You put on a bathing suit and head down the trail toward the lake. The sparkling, clear water looks inviting. You're tempted to jump in and swim. However, you wait for the rest of your family to join you. It isn't safe for a person to swim alone.

Safety During Investigations

Just as when you go swimming, you have to take steps to be safe during any scientific investigation. **Good preparation helps you stay safe when doing science activities.** Do you know how to use lab equipment? What should you do if something goes wrong? Thinking about these questions ahead of time is an important part of being prepared.

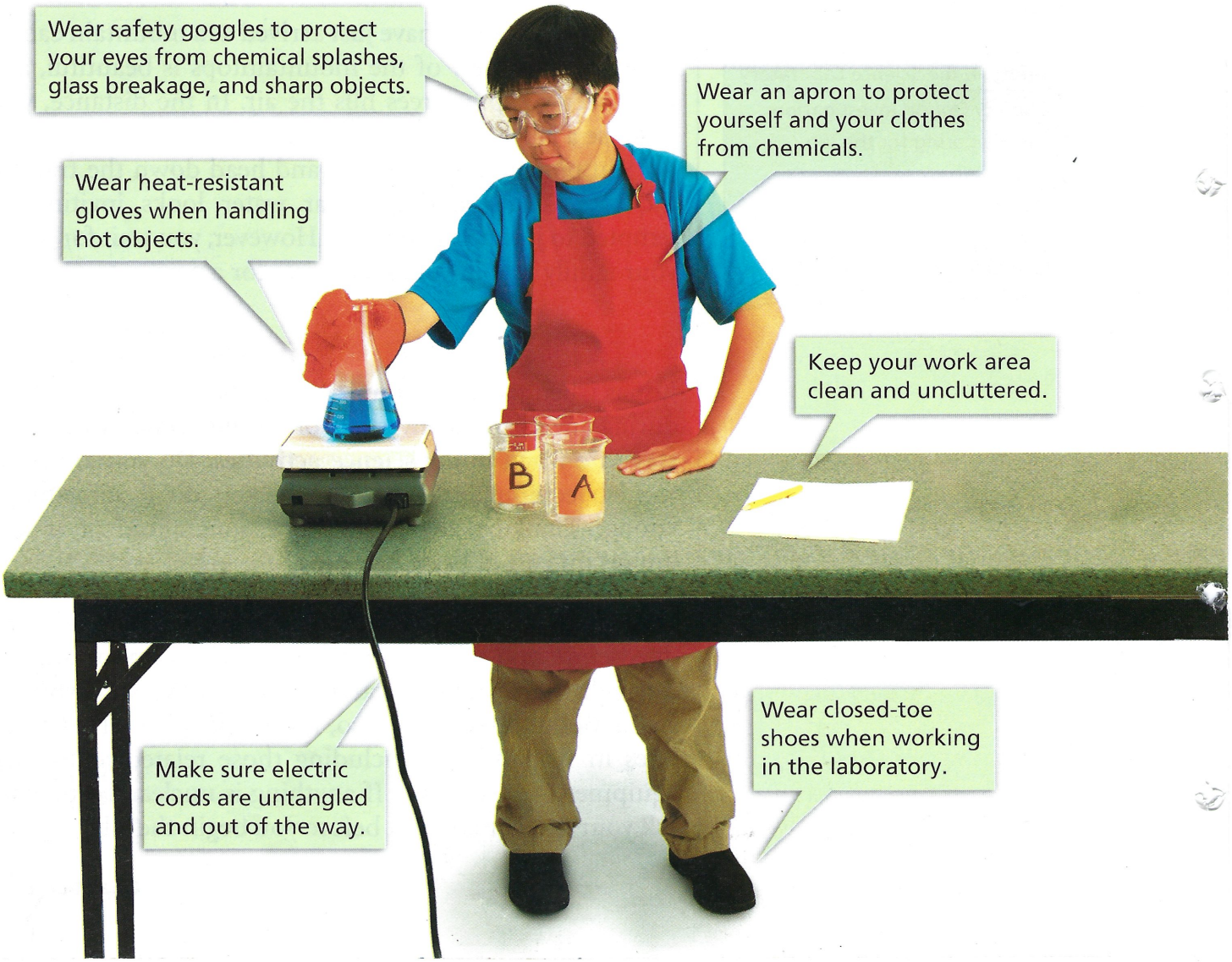
Preparing for the Lab Preparing for a lab should begin the day before you will perform the lab. It is important to read through the procedure carefully and make sure you understand all the directions. Also, review the general safety guidelines in Appendix A, including those related to the specific equipment you will use. If anything is unclear, be prepared to ask your teacher about it before you begin the lab.

Go Online
NSTA SCILINKS™
For: Links on laboratory safety
Visit: www.SciLinks.org
Web Code: scn-1624

Performing the Lab Whenever you perform a science lab, always follow your teacher's instructions and the textbook directions exactly. You should never try anything on your own without asking your teacher first. Keep your work area clean and organized. Also, do not rush through any of the steps. Finally, always show respect and courtesy to your teacher and classmates.

Labs and activities in this textbook include the safety symbols shown on the next page. These symbols alert you to possible dangers in performing the lab and remind you to work carefully. They also identify any safety equipment that you should use to protect yourself from potential hazards. The symbols are explained in detail in Appendix A. Make sure you are familiar with each safety symbol and what it means.

FIGURE 14
Safety in the Lab
Good preparation for an experiment helps you stay safe in the laboratory.
Observing *List three precautions each student is taking while performing the labs.*



End-of-Lab Procedures When you have finished a lab, clean your work area. Turn off and unplug equipment and return it to its proper place. Dispose of any wastes as your teacher instructs you to. Finally, wash your hands thoroughly.

Safety in the Field You work in the "field" whenever you work outdoors—for example, in a forest, park, or schoolyard. Always tell an adult where you will be. Never carry out a field investigation alone. Ask an adult or classmate to go with you.

Possible safety hazards outdoors include such things as severe weather, traffic, wild animals, and poisonous plants. Planning ahead can help you avoid some hazards. For example, the weather report can alert you to severe weather. Use common sense to avoid any potentially dangerous situations.

Reading Checkpoint **What should you do with equipment at the end of a lab?**

Safety Symbols

- Safety Goggles
- Lab Apron
- Breakage
- Heat-Resistant Gloves
- Plastic Gloves
- Heating
- Flames
- No Flames
- Corrosive Chemical
- Poison
- Fumes
- Sharp Object
- Animal Safety
- Plant Safety
- Electric Shock
- Physical Safety
- Disposal
- Hand Washing
- General Safety Awareness

In Case of Emergency

ALWAYS NOTIFY YOUR TEACHER IMMEDIATELY

Injury	What to Do
Burns	Immerse burns in cold water.
Cuts	Cover cuts with a clean dressing. Apply direct pressure to the wound to stop bleeding.
Spills on Skin	Flush the skin with large amounts of water.
Foreign Object in Eye	Flush the eye with large amounts of water. Seek medical attention.

In Case of an Accident

Good preparation and careful work habits can go a long way toward making your lab experiences safe ones. But, at some point, an accident may occur. A classmate might accidentally knock over a beaker or a chemical might spill on your sleeve. Would you know what to do?

When any accident occurs, no matter how minor, notify your teacher immediately. Then, listen to your teacher's directions and carry them out quickly. Make sure you know the location and proper use of all the emergency equipment in your lab room. Knowing safety and first-aid procedures beforehand will prepare you to handle accidents properly. Figure 15 lists some first-aid procedures you should know.

Reading Checkpoint **What should you do when an accident occurs?**

FIGURE 15 First-Aid Tips
These first-aid tips can help guide your actions during emergency situations. Remember, always notify your teacher immediately if an accident occurs.

Section 4 Assessment

Target Reading Skill **Outlining** Use the information in your outline about science safety to help you answer the questions below.

Reviewing Key Concepts

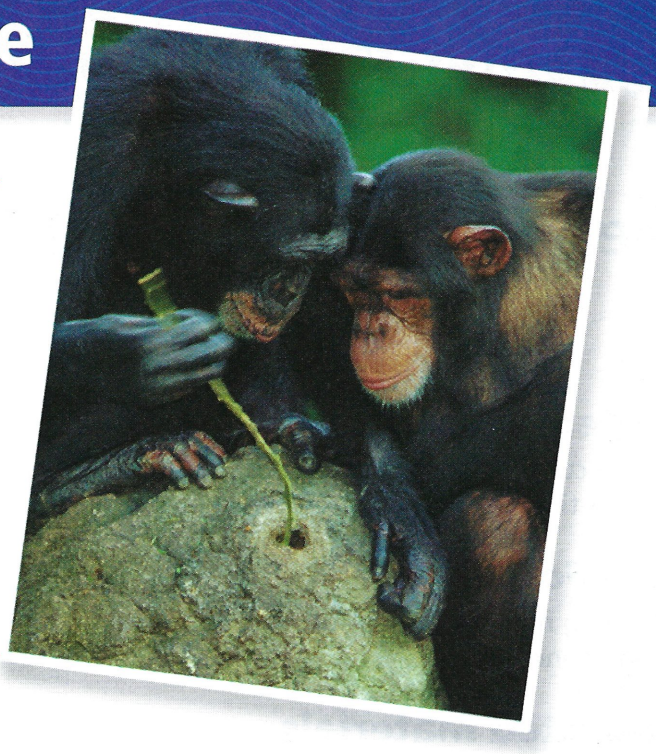
1. a. **Reviewing** Why is good preparation important in lab investigations?
   b. **Identifying** Identify two steps you should take to prepare for a lab.
   c. **Predicting** What might happen if you did not follow the steps you identified in Question (b)?
2. a. **Describing** What should you do immediately after any lab accident?
   b. **Applying Concepts** Your lab partner cuts herself and stops the bleeding with a tissue from her pocket. Did she follow the proper procedure? Explain.
   c. **Relating Cause and Effect** Explain how your partner might have prevented the accident if she had been more familiar with the safety symbols on page 25.

Writing in Science

Field Trip Safety Think of an outdoor area that you know, such as a park, field, or vacant lot, where you might observe wild plants. Write safety instructions that would help students prepare for a field trip to that place. You might add illustrations to help make the instructions clear.

Chapter 1

Study Guide



1 What Is Science?

Key Concepts

- Scientists use skills such as observing, inferring, predicting, classifying, and making models to learn more about the world.

Key Terms

science
observing
quantitative observation
qualitative observation
inferring
predicting
classifying
making models
life science

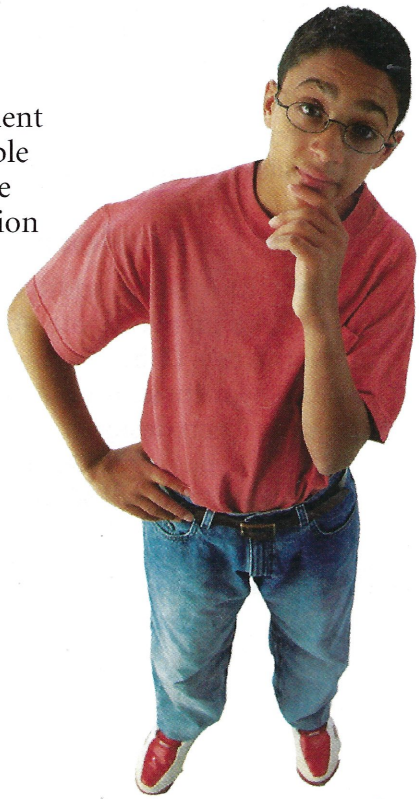
2 Scientific Inquiry

Key Concepts

- Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence they gather.
- In science, a hypothesis must be testable. This means that researchers must be able to carry out investigations and gather evidence that will either support or disprove the hypothesis.
- Successful scientists possess certain attitudes, or habits of mind, including curiosity, honesty, open-mindedness, skepticism, and creativity.

Key Terms

scientific inquiry
hypothesis
variable
controlled experiment
manipulated variable
responding variable
operational definition
data
communicating



3 Understanding Technology

Key Concepts

- The goal of technology is to improve the way people live.
- Science is the study of the natural world to understand how it functions. Technology, on the other hand, changes, or modifies, the natural world to meet human needs or solve problems.
- Technology can have both positive and negative consequences for individual people and for society as a whole.

Key Terms

technology
engineer

4 Safety in the Science Laboratory

Key Concepts

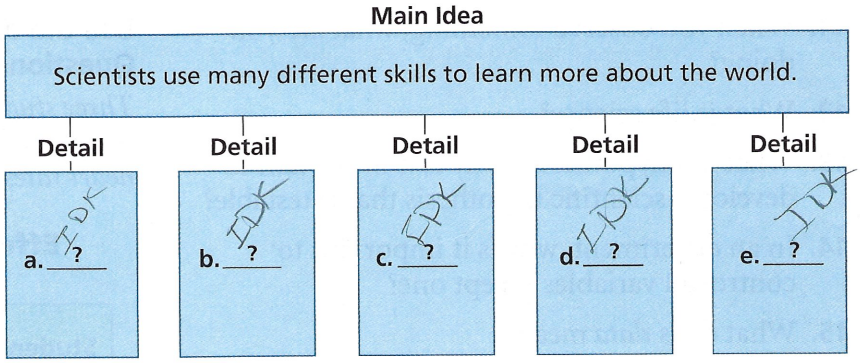
- Good preparation helps you stay safe when doing science activities.
- When any accident occurs, no matter how minor, notify your teacher immediately. Then, listen to your teacher's directions and carry them out quickly.

Review and Assessment

Go Online PHSchool.com
For: Self-Assessment
Visit: PHSchool.com
Web Code: cha-1010

Organizing Information

Identifying Main Ideas Copy the graphic organizer about scientific skills onto a separate sheet of paper. Then complete it and add a title. (For more on Identifying Main Ideas, see the Skills Handbook.)



Reviewing Key Terms

Choose the letter of the best answer.

1. When you note that a rabbit has white fur, you are making a
   a. quantitative observation.
   b. qualitative observation.
   c. prediction.
   d. model.

2. Music stores arrange CDs according to the type of music—rock, country, folk, and so on. This is an example of
   a. observation. **b.** inferencing.
   c. posing questions. **d.** classifying.

3. A statement that describes how to measure a variable or define a term is a(n)
   a. controlled variable.
   b. manipulated variable.
   c. hypothesis.
   d. operational definition.

4. Which of the following is NOT an example of technology?
   a. a teaspoon **b.** a computer
   c. a leaf **d.** a microscope

5. In labs in this book, which of the following indicates the danger of breakage?
   a.  **b.** 
   c.  **d.** 

If the statement is true, write *true*. If it is false, change the underlined word or words to make the statement true.

6. When you interpret what you have observed, you are <u>inferring</u>.

7. When you <u>pose questions</u>, you create representations of complex objects or processes.

8. The <u>responding variable</u> is changed to test a hypothesis.

9. <u>Technology</u> changes the natural world to meet human needs.

10. You should begin preparing for a lab <u>15 minutes</u> before you perform the lab.

Writing in Science

Description Think about the ways in which the police who investigate crimes act like scientists. In a paragraph, describe the scientific skills that police use in their work.

Discovery Channel School
What Is Science?
Video Preview
Video Field Trip
Video Assessment

Review and Assessment

Checking Concepts

11. When you observe something, what are you doing?
12. What is life science?
13. What is a hypothesis? Why is it important to develop a scientific hypothesis that is testable?
14. In an experiment, why is it important to control all variables except one?
15. What does *data* mean?
16. What does an engineer do?
17. Identify three things that you should do to prepare for a lab.

Thinking Critically

18. **Inferring** Suppose you come home to the scene below. What can you infer happened while you were gone?

19. **Problem Solving** Suppose you would like to find out which dog food your dog likes best. What variables would you need to control in your experiment?
20. **Making Judgments** You read an ad claiming that scientific studies prove that frozen fruit is more nutritious than canned vegetables. What questions would you want answered before you accept this claim?
21. **Applying Concepts** This textbook is an example of technology. What need does it meet? What practical problem does it solve?

Applying Skills

Use the data table below to answer Questions 22–26.

Three students conducted a controlled experiment to find out how walking and running affected their heart rates.

Effect of Activity on Heart Rate (in beats per minute)

Student	Heart Rate (at rest)	Heart Rate (walking)	Heart Rate (running)
1	70	90	115
2	72	80	100
3	80	100	120

22. **Controlling Variables** What is the manipulated variable in this experiment? What is the responding variable?
23. **Developing Hypotheses** What hypothesis might this experiment be testing?
24. **Predicting** Based on this experiment and what you know about exercising, predict how the students' heart rates would change while they are resting after a long run.
25. **Designing Experiments** Design a controlled experiment to determine which activity has more of an effect on a person's heart rate—jumping rope or doing push-ups.
26. **Drawing Conclusions** What do the data indicate about the increased physical activity and heart rate?

Lab zone Chapter Project

Performance Assessment Create a poster that summarizes your experiment for the class. Your poster should include the question you tested, how you tested it, the data you collected, and what conclusion you drew from your experiment. What problems did you encounter while carrying out your experiment? Is additional testing necessary?