

Section 3

Safety in Science

Key Concept To conduct a careful investigation, you must take care to keep yourself and others safe.

What You Will Learn

- You can take responsibility for your own safety in the laboratory.
- Following directions, taking safety precautions, and following proper cleanup procedures help keep you safe.
- If an accident happens in the laboratory, first make sure that you are safe and then tell your teacher about the accident.

Why It Matters

Following safe practices in scientific investigations will protect you and those around you.

Accidents can happen to anyone. But taking responsibility for your safety by taking some simple safety precautions makes accidents much less likely.

Keeping Yourself Safe

When you are working in a science lab, taking responsibility for your safety is very important. You should take every precaution to prevent accidents. You must wear appropriate safety equipment. And you should use all lab materials, such as those shown in **Figure 1**, safely and correctly.



Figure 1 When you work in a science lab, your lab materials can include chemicals, heat sources, animals, and plants. All must be handled safely.

Avoiding Accidents

You can help avoid accidents by being aware of what is going on around you. Pay attention, and follow directions. Watch what you are doing. When you put materials on the lab bench, be sure that they are placed securely and will not tip or fall over. If you walk around the lab area, avoid bumping into anyone and watch for anyone who might bump into you.

Reporting Accidents

No matter how careful we try to be, accidents sometimes happen anyway. If you have an accident, no matter how minor it may seem, you should let your teacher know about the accident immediately.



Elements of Safety

Safety precautions help prevent accidents at home, at school, or at play. But working in a science lab sometimes requires working with special materials and equipment. So, you need to know what special precautions to take to ensure your safety when you are in the science lab. In this section, some of the special precautions that apply to working in the lab will be discussed.

Understanding Safety Symbols

Scientists use symbols that quickly alert them to the particular dangers that they face when performing experiments and doing activities in science. These symbols are shown in **Figure 2**. You will see these symbols in experiments in this book. Learn to recognize these symbols and to understand what they mean. When you see one of these symbols, you will know that specific precautions should be taken when you do that lab or activity. Take those precautions!

Figure 2 Safety Symbols



Following Safety Symbols

Your teacher will explain in detail the meaning of each safety symbol and the precautions that each symbol requires. For example, imagine that you see the symbol for heating safety. You know to clear your work area of flammable materials. You should be careful with long sleeves and should tie back long hair. If you see the symbol for animal safety, you should follow your teacher's instructions on how to handle small animals properly. This includes wearing gloves and washing your hands thoroughly afterward. **Figure 3** shows the care that you should use when handling animals in the laboratory.



Figure 3 The handling of animals in the science laboratory always requires special care so that neither animals nor students are injured.

Standards Check What role do safety symbols have in helping you plan a scientific investigation?

□

Following Directions

The most common cause of accidents in the laboratory is the failure to read and follow directions carefully. Be sure to follow procedures exactly. The directions given by your teacher have been carefully worked out to produce the best results in the safest possible way. You should always read directions before beginning a lab activity. Ask your teacher to explain anything that you do not understand about the activity. And ask your teacher to approve anything that you want to do differently from what the directions say.

Be sure to gather all of the materials that you will need before doing an experiment. Measure chemicals precisely. Never use a greater amount

of a chemical than your directions call for. And always pay special attention to safety symbols.

Neatness

As **Figure 4** shows, neatness is important when you work in a science lab. Working in a cluttered area is both awkward and unsafe. Before beginning any activity, be sure to clear your work area of unnecessary objects, such as books, backpacks, hats, and coats. Neatness is also important when you are doing your experiment. Clean up any spills of solid chemicals or liquids as soon as they happen. Keep flammable objects away from Bunsen burners and other heat sources.



Figure 4 You can keep your lab area neat by removing unnecessary objects, such as books that you aren't using. Personal neatness, including tying back long hair, also helps keep you safe.

Standards Check What are some of the procedures that you should follow to make your laboratory work area neat?



Using Proper Safety Equipment

Being safe in the science laboratory requires using protective safety equipment. Note how different pieces of safety equipment are being used by the students in **Figure 5**. Even if you think that you are going to do a short experiment, be sure to use all of the safety equipment that you need.



Figure 5 Proper safety equipment should be used in a science laboratory. **Why are safety gloves being used in the experiment shown in this picture?**

Don't forget to wear safety goggles. And be sure to use the type of safety goggles required by your school. Goggles should fit snugly over your eyes. If your goggles are scratched or cloudy or if they fit improperly, tell your teacher.

Not everything you encounter in the laboratory will harm your skin, but you need to wear gloves if you are handling plants, small animals, or chemicals. When handling warm objects or when using a hot plate or an open flame, you may need to use special heat-resistant gloves.

Cleaning Up

Cleaning up is an important part of a science activity. After you finish a science experiment, return all materials and chemicals to their original locations. The lids should be tight on all containers of chemicals. Give any damaged glassware to your teacher. Dispose of all wastes as directed by your teacher. Check that all burners and hot plates are turned off. Finally, clean your work area by wiping it with a damp paper towel, and wash your hands thoroughly with soap and water.



Responding to Accidents

Accidents can happen in the lab, even when safety precautions are taken. Always tell your teacher if an accident happens.

Many labs have special emergency equipment, such as the equipment shown in **Figure 6**, that should be used in the event of an accident. Know where this equipment is located in your lab. After an accident happens, your teacher may need you to get emergency equipment. Learning to cope with accidents is one way to take responsibility for your safety.



Figure 6 Make sure that you can locate and use the first-aid supplies and special safety equipment in your science lab. Your teacher can help familiarize you with these supplies and equipment.

Proper Accident Procedures

The school lab is generally a very safe place to work. However, accidents that require immediate attention happen sometimes. If you see an accident happen, there are some procedures that you should follow.

First, make sure that you are safe. If someone has slipped on a spill, be careful not to slip yourself. If someone has been cut by broken glass, don't touch the glass.

Then, tell your teacher about the accident. Your teacher will know what to do. Your teacher may send the injured student to the school nurse or to a doctor. However, if an injury requires immediate attention, your teacher may have to perform first aid. **First aid** is emergency treatment for someone who is hurt or sick. First aid is *not* complete medical treatment for an injury. It is only temporary care to be given until more complete medical care can be given. You should not perform first aid unless you have received special training to do so.

Procedures for Accidental Injuries

The procedures for treating an accidental injury depend on the type of injury that happens. If someone gets a heat burn, the burned area should be held in cold water for at least 15 minutes, as shown in **Figure 7**. If someone gets a chemical burn, the chemical should be rinsed from the burned area. The burned area should then be held under cold, running water. Your classroom probably has an eye bath. If a chemical gets into someone's eyes, the eyes should be washed in an eye bath for 15 minutes. Then, the eyes should be covered with a clean cloth. If someone gets cut, the cut should be rinsed gently. Then, slight pressure should be applied to the cut with a clean paper towel.



Figure 7 If you burn your hand while in the lab, you should rinse the area in cold water.

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.

Chapter Summary

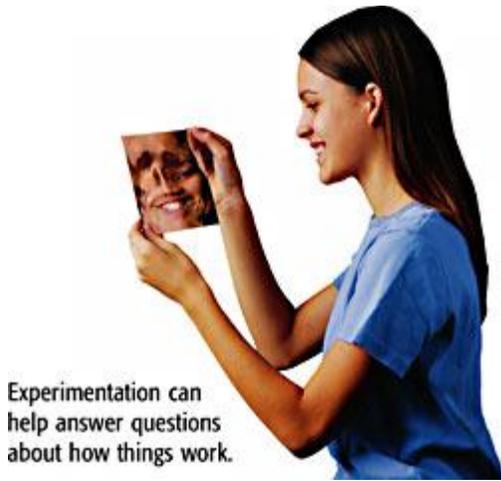
The Big Idea

Scientific progress is made by asking meaningful questions and conducting careful investigations.

Section 1 Science and Scientists

Key Concept Scientists benefit society in many ways by asking questions and carefully investigating to find the answers.

- Methods of scientific investigation include research, observation, and experimentation.
- The work of scientists benefits society in a number of different ways.
- Scientists work in all kinds of jobs.



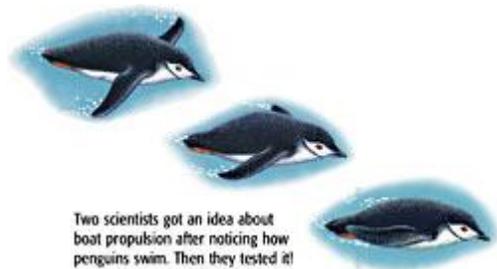
Experimentation can help answer questions about how things work.

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Section 2 Scientific Methods

Key Concept Scientists use scientific methods to answer questions and to solve problems.

- Scientific methods are based on six steps, which may be followed in different ways based on the kind of question being asked.
- Scientific investigations begin with a question and proceed by forming a hypothesis and then testing it.
- Scientists use a variety of methods to analyze and report their data.



Two scientists got an idea about boat propulsion after noticing how penguins swim. Then they tested it!

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