TOPIC 2.1

How does matter affect your life?

Key Concepts

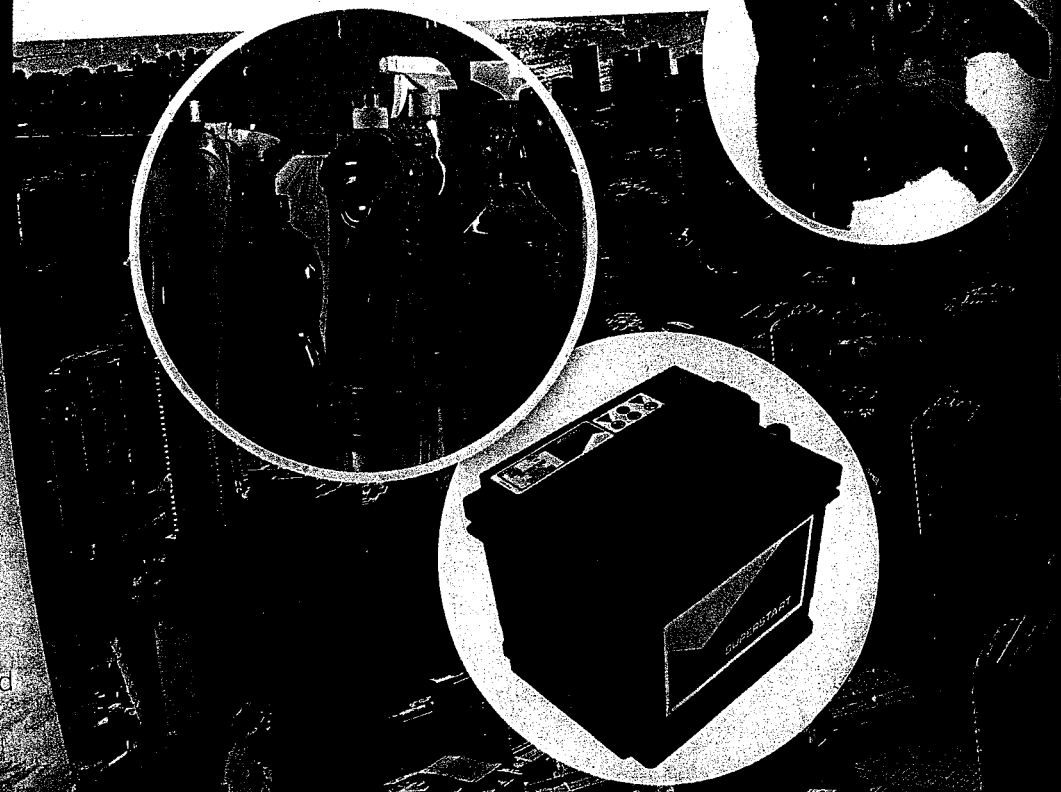
- Everything—including you—is made up of chemicals.
- Chemicals in your daily life have characteristics that make them useful, hazardous, or both.
- Handling chemicals and equipment safely is important at school and at work.

Curricular Competencies

- Ensure that safety and ethical guidelines are followed in your investigations.
- Experience and interpret the local environment.
- Consider social, ethical, and environmental implications of the findings from your own and others' investigations.
- Contribute to care for self, others, community, and world through personal or collaborative approaches.

What does the word "chemical" mean to you? Do you think of preservatives in food? Or bubbling liquids in beakers and flasks? These are chemicals, but a chemical is not necessarily dangerous or made in a laboratory—"chemical" means the same as the word "matter." Everything you eat, everything you wear, the air you breathe, a cell phone, a bicycle, a tree, a cat, the Sun, the planets—even you are made up of matter.

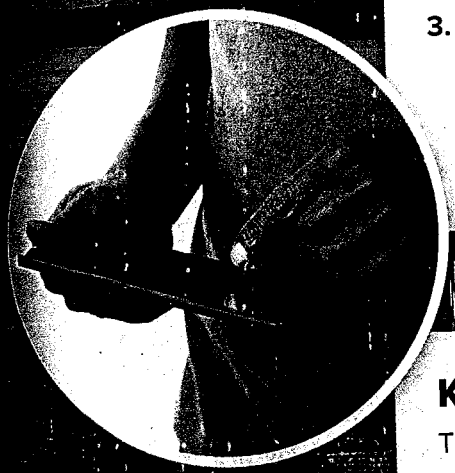
Most of the matter that you handle and come in contact with every day is safe. However, many types of matter, even things that are useful or familiar, can be hazardous. To stay safe when working with matter, it is important to know about those hazards and how to avoid them. We do this by learning how to read information labels and how to properly handle the matter we work with.



Starting Points

Choose one, some, or all of the following to start your exploration of this Topic.

1. **Identifying Preconceptions** List five examples of matter that you relied on today. For each one, explain why you think it is matter. Based on your answers, come up with your own definition of matter.
2. **Evaluating** Most kitchens at home today have at least some products made with plastics. Think about containers, for example. Plastic products for the home began to become widely available during the 1950s. Before then, people used materials such as glass, paper, and metal to wrap or hold food.
   a) What characteristics make glass, paper, and metal suitable for containers?
   b) What characteristics make plastic a desirable substitute for these materials?
   c) What are some undesirable characteristics of plastic?
3. **Communicating** Assume you have been asked to interview a member of the health and safety committee in your school about how hazardous materials are handled in the school and what safety practices are in place. Make a list of questions you want to ask this person.



Key Terms

There is one key term that is highlighted in bold type in this Topic:

- matter

Flip through the pages of this Topic to find this term. Add it to your class Word Wall along with its meaning. Add other terms that you think are important and want to remember.

CONCEPT 1

Everything—including you—is made up of chemicals.

Activity

Is It Really Chemical-Free?

Consider the statements below.

- A company that makes environmentally friendly products makes a cleaning cloth that kills bacteria and other germs. The cloth contains tiny bits of silver. The company says, "Silver is a metal, not a chemical."
- Many gardeners proclaim their lawns and gardens are chemical-free. Their results depend on methods that include the use of natural fertilizers such as manure and nutrient-rich compost.

Now work together in small groups to answer the following questions.

1. What do you think "chemical-free" means, according to these statements?
2. Is it possible for any product to be chemical-free? Explain.

Do you think of yourself as being chemical-free? Think again. **Figure 2.1** shows that you are made up mostly of four types of chemicals called elements, with smaller amounts of many, many others.

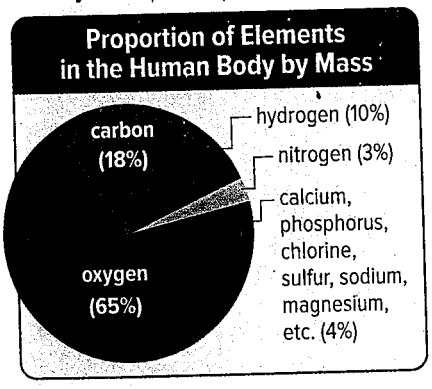


Figure 2.1 All people are made up mostly of oxygen, carbon, hydrogen, and nitrogen. **Where do we get the chemicals we need for our bodies?**

Often the term "chemical" is used to refer to certain substances or mixtures of substances, such as oxygen or salt water. However, the word "chemical" does not have a specific scientific meaning. That's because everything in the world that isn't energy is a chemical or contains chemicals. When people use the word "chemical," they are really talking about matter. Anything that takes up space and has mass is called **matter**.

matter anything that has mass and takes up space

Before you leave this page . . .

1. In your own words, define the term "matter."
2. What kinds of misunderstanding can result when people use the word "chemical" when talking about issues involving health and the environment?

AT ISSUE

What's the Issue?

Household cleaners are big business. Every year, consumers spend billions of dollars on laundry and dishwasher detergents alone. While people have been cleaning their clothes and dishes the same way for decades—using detergent and water—manufacturers are always coming up with new ways to try to make their products stand out.

Enter the detergent pod. These products were developed to make it easier for consumers to use the proper amount of detergent, as well as avoid messy bottles of liquid or boxes of powder. So what's the problem?

These detergent pods are small, bright, colourful tablets that resemble candy—especially to young children. But detergents can be poisonous. Since these pods went on the market, there has been a large increase in detergent-related poisonings in children five years old and younger. Should manufacturers be allowed to continue producing colourful detergent pods?

Dig Deeper

Collaborate with your classmates to explore one or more of these questions—or generate your own questions of interest to explore.

1. Read the label of a detergent package. Record the ingredients and research the hazards of those substances. As a result of your research, will you change the way you handle or think about using detergent? Explain why or why not.
2. Pod-related harm to children began to be reported very soon after the pods were available.
   a) Find out about the increases in reports of detergent pod exposure to poison control centres.
   b) What harm to children has been reported?
   c) What have companies done to address safety concerns? Do you think the problem has been solved? Explain why or why not.
3. Some people argue that pods are helpful to consumers. Companies often rely on people using too much of a product than is actually needed, prompting them to buy more, sooner. Using a pod avoids that. However, many agencies that fight for consumer safety say detergent pods are health hazards and do not support their use. Where do you stand on this issue? Make sure to support your opinion in your answer.

CONCEPT 3

Handling chemicals and equipment safely is important at school and at work.

Activity

Know Your Safety Icons

What do you think these six safety icons mean? Make a prediction for each, and then read Safety in Your Science Classroom on pages xiv–xvii to find out.

WHMIS 2015

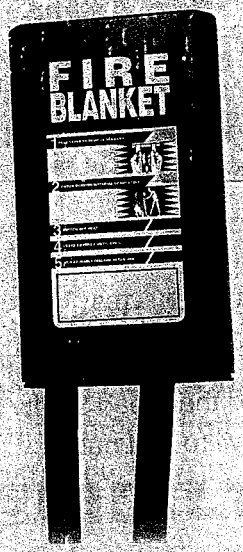
By law, everyone in the workplace, including at school, must be informed about the chemicals they use and how to handle them safely. In Canada, this is done through the Workplace Hazardous Materials Information System, or WHMIS. WHMIS provides detailed information about how to store, handle, and dispose of chemicals. It also provides first aid information.

Figure 2.3 lists the WHMIS symbols for hazardous products. In 2015, these symbols replaced an older set of WHMIS symbols. If you look in an older science book, you may see a different set of symbols. Each chemical also has a Safety Data Sheet (SDS) associated with it. The SDS contains information about the composition and properties of a hazardous substance, as well as steps to handle and store it safely.

Figure 2.3 The WHMIS 2015 safety symbols are used throughout Canada to identify dangerous materials. **Which WHMIS symbols would you find on a container that contains a flammable gas stored under pressure?**

 **Exploding bomb** (for explosion or reactivity hazards)	 **Flame** (for fire hazards)	 **Flame over circle** (for oxidizing hazards)
 **Gas cylinder** (for gases under pressure)	 **Corrosion** (for corrosive damage to metals, as well as skin, eyes)	 **Skull and Crossbones** (can cause death or toxicity with short exposure to small amounts)
 **Health hazard** (may cause or is suspected of causing serious health effects)	 **Exclamation mark** (may cause less serious health effects or damage the ozone layer)	 **Biohazardous infectious materials** (for organisms or toxins that can cause disease in people or animals)

Staying Safe in Your School Laboratory



1. Before you begin

- Inform your teacher if you have any allergies or medical conditions, or if there are other factors that could affect your work in the chemistry lab.
- Know the location of the nearest fire alarm, fire extinguisher, fire blanket, first-aid kit, safety shower (if there is one), and eye wash station. Know how to use them.
- Study your activity, investigation, or other lab assignment carefully before you start. Ask for help if you have questions.
- Be sure you understand the safety icons.

2. Dressing the part

- Wear protective clothing as appropriate and as directed, such as a lab apron, gloves, and safety glasses.
- Tie back long hair, and secure or remove scarves, caps, ties, or long necklaces.
- Wear footwear that covers your entire foot, including toes.

3. Acting responsibly

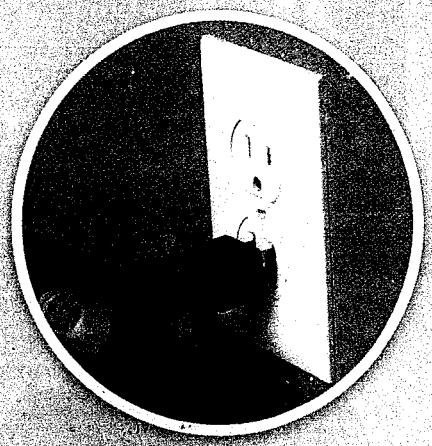
- Never chew gum, eat, or drink in the lab.
- Work carefully with your partner or group and make sure you keep your work area clear.
- Stay focused on what you are doing. Acting irresponsibly is dangerous in the lab.

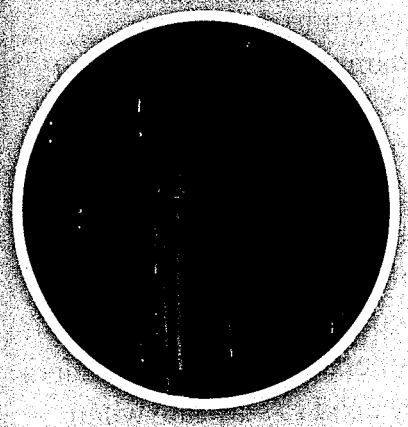
Safety in the Laboratory

Making sure that you know how to handle chemicals and equipment safely in the school laboratory is an essential part of your exploration of matter. You are responsible for the safety of everyone around you as well as your own. In addition to WHMIS, there are safety rules and icons you must know and follow. Some of these are shown in **Figure 2.4**. Also read Safety in Your Science Classroom on pages xiv–xvii of this book. Your teacher may give you additional safety rules to follow.

4. Using equipment

- When carrying equipment for an activity or investigation, hold it carefully. Carry only one object at a time.
- When working with electrical equipment, make sure your hands are dry, especially when touching electrical cords, plugs, or sockets. Pull the plug, not the cord.
- Report damaged equipment to your teacher immediately.
- Place electrical cords where people will not trip over them.





5. Working with heat

- If you use a laboratory burner, be sure you understand how to light and use it safely.
- Point the open end of a container being heated away from yourself and others.
- Do not allow a container to boil dry.
- Handle hot objects carefully. Remember that glassware and equipment looks the same hot as it does cold.
- Inform your teacher if you receive a burn. Apply cold water and then ice to the burned area immediately.

6. Working with chemicals

- Read and understand all safety labels, including WHMIS symbols.
- Never taste any substances you use in the lab.
- If any part of your body contacts a substance in the lab, inform your teacher. Immediately wash the area thoroughly with cold water. If you get anything in your eyes, wash them immediately and continuously for 15 minutes.
- Handle substances carefully. If you are asked to smell a substance, never smell it directly. Hold the container slightly in front of and beneath your nose, and waft the fumes toward your nostrils.

7. Cleaning up

- Clean up any spills according to your teacher's instruction.
- Clean equipment and glassware before you put it away.
- Dispose of all materials as directed by your teacher. Never discard materials in the sink or garbage unless your teacher directs you to.
- Wash your hands thoroughly after doing an activity or investigation.

Figure 2.4 These are just some of the safety rules to follow in the school laboratory. **For each category, describe a situation in a laboratory that would apply.**

Connect to Investigation 2-B on pages 108–109

Before you leave this page . . .

1. What is WHMIS and what role does it play in laboratory safety?
2. Why is it important to have a common set of safety labels and icons for hazardous chemicals in all workplaces and schools?