

McGraw-Hill Ryerson

# DISCOVERING SCIENCE 7

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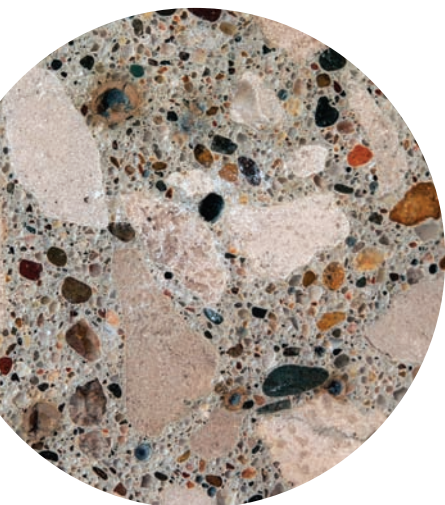


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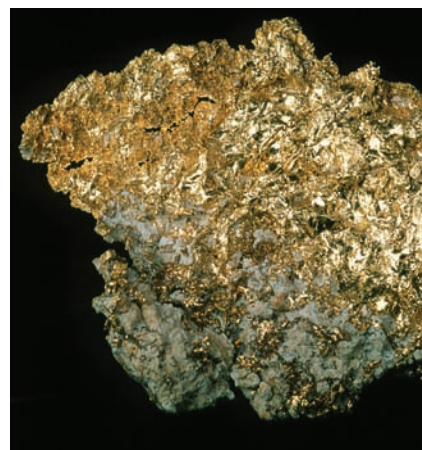
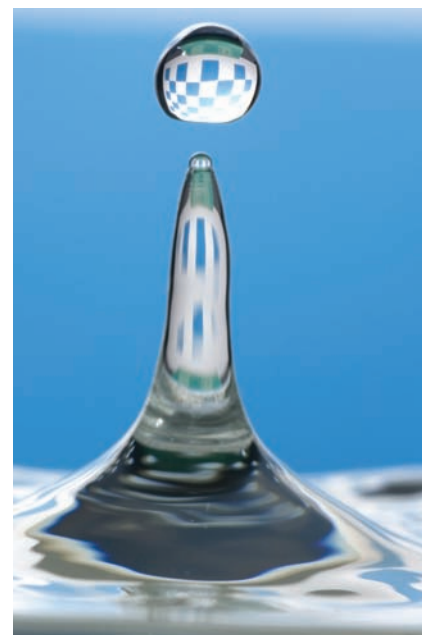




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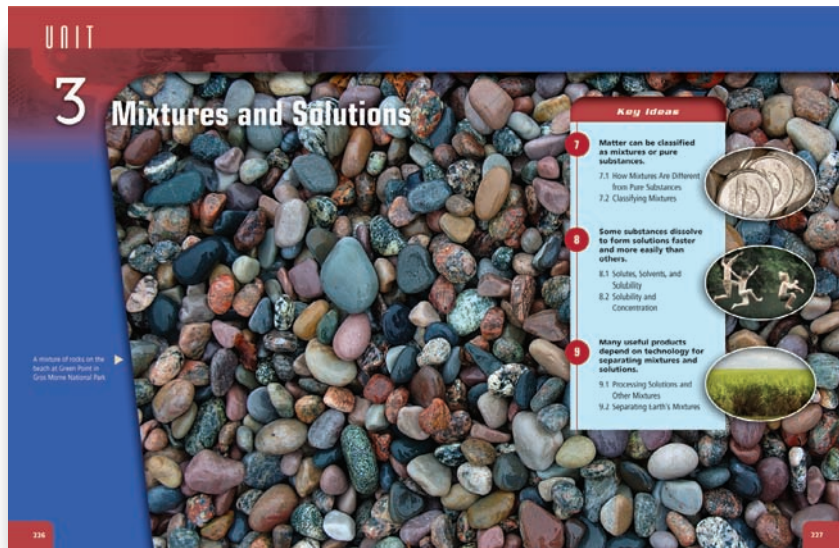
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# A Tour of Your Textbook

Welcome to *Discovering Science 7*. This textbook introduces you to the wonders of ecosystems, heat and temperature, mixtures, and Earth's crust. To understand your book and how to use it, begin by taking a brief tour on the following pages. Then do the Scavenger Hunt on page xvii.

## Unit Opener

- *Discover Science 7* has four major units: Interactions within Ecosystems, Heat, Mixtures and Solutions, and Earth's Crust.
- Each unit opener photo is a window into the world of the Key Ideas you will study in the unit. The caption explains the photo.
- The unit opener identifies each of the unit's Key Ideas. These are the chapter titles.
- The small photos next to the Key Ideas are from the beginning of each chapter.



## Getting Started

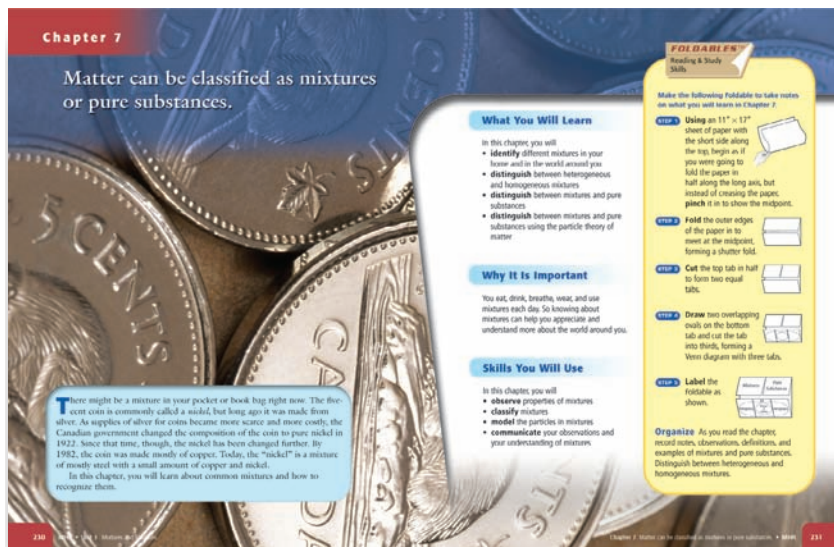
- The Getting Started helps you recall what you might already know about the Key Ideas in the unit.
- It helps you prepare for studying the unit by giving you the following:



- a short reading about an interesting topic related to the unit
- an **Internet Connect** feature to take you to [www.discoveringscience.ca](http://www.discoveringscience.ca) to learn more about the topic
- a short **Find Out Activity** so you can explore an idea related to the unit

## Chapter Opener

- The sentence of the chapter title is the Key Idea that you will study in this chapter.
- The chapter opener outlines What You Will Learn, Why It Is Important, and Skills You Will Use in the chapter.
- The **Foldables** exercise is a fun way to develop your study skills. Look for a Foldables exercise at the beginning of every chapter.



## Section Opener

- A number and a short title identify each new section in a chapter.
- The shaded light brown box below the section title contains a summary of the science concepts you will study in the section.
- The list of Key Terms in the margin identifies important new science terms that you will learn in the section.
- The **Did You Know?** margin feature is an interesting bit of information related to the section's topic.
- Each section opener includes a **Find Out Activity** or a **Think About It Activity**.

**7.1 How Mixtures Are Different from Pure Substances**

Matter can be either mixtures or pure substances. Mixtures may be either homogeneous or heterogeneous. Homogeneous mixtures have the same properties throughout. Heterogeneous mixtures have different visible parts with different properties. All matter is made up of particles. We can classify something as a mixture or as a pure substance based on the types of particles that it is made of.

**Key Terms**  
 heterogeneous mixture  
 homogeneous mixture  
 mixture  
 pure substance

Many of the objects that you have at home come with labels that tell you what they contain. You can see these labels on foods, clothes, and cleaning products. Figure 7.1 shows some examples you may have seen.  
 The labels list all the ingredients in these products. If the label shows more than one ingredient, the product is a mixture. Most of the types of matter that you use every day are mixtures. A mixture contains two or more different types of matter.  
 Most objects that you see or use have an ingredient list. Is a beach a mixture? Is an ocean a mixture? What about air, or even a simple glass of water? How can you tell that something is a mixture, if it does not have an ingredient list?

Figure 7.1 What evidence do you see that each of these products is a mixture?

**7-1A Now You See It... Find Out Activity**

Is it possible to make a mixture in which you cannot detect the different parts? Use sugar and water to find out.

**Safety**  
 Do not taste, eat, or drink the sugar and water.

**Materials**  
 • beaker or plastic cup  
 • tap water  
 • white sugar  
 • measuring spoon

**What to Do**

1. Prepare a table of observations like the one below. Give your table a title.

Observable Properties	Sugar	Water	Sugar-Water Mixture (Initial Appearance)	Sugar-Water Mixture (After 24 h)
Colour				
State (solid, liquid, or gas)				
Transparency (clear, cloudy, or opaque)				

2. Observe the three properties of sugar and water that are listed in the table. Record your observations.
3. Add water to the cup until it is about three-quarters full. Let it sit for a few seconds until the water is still.
4. Carefully pour 5 mL (one teaspoon) of sugar into the water. Observe the appearance of the water and the sugar. Record your observations in your table.
5. Place the cup where it can stay undisturbed for about 24 h.
6. Observe the contents of the cup after 24 h. Record your observations in your table.

**What Did You Find Out?**

1. The three statements below compare the properties of the sugar and water mixture with the properties of the sugar and the properties of the water. Choose the statement that you think is the most accurate. Record it, and give reasons for your choice.
  - The mixture has all the properties of water and only these properties of the water.
  - The mixture has all the properties of sugar and only these properties of the sugar.
  - The mixture has a some of the properties of sugar and some of the properties of water.
2. You know that the mixture you made has two parts: sugar and water. However, the mixture looks like it has only one part. Think about what you have learned about the particle model. (Review Section 5.1.1) Make a sketch to show what you think the particles in the sugar-water mixture look like. Add labels and a caption to explain your sketch.

## Find Out Activity

- This short, informal inquiry activity involves hands-on exploration, using simple materials and equipment.
- In these activities and in the investigations, you will use important science process skills, such as predicting, estimating, and hypothesizing.

## Science Skill

- This box directs you to one of nine Science Skills sections at the back of the textbook. The Science Skills sections can help you with graphing, writing a hypothesis, using a microscope, and other skills.

## Think About It Activity

- These activities look similar to Find Out Activities in the book but you do them at your desk. They do not require any special equipment.
- For these activities, you think about a particular idea related to the concepts you are studying in the section.
- You work on your own, with a partner, or in a group, and share your thoughts with your group or class.

## Section Text and Activities

- The text of each section is divided into “chunks” to help you understand the content. Each chunk has a title.
- Each picture has a caption that explains what the picture is about.
- Key Terms and other terms you need to know are boldfaced in the text. Each boldfaced term is defined in the text and in the **Glossary** at the back of the textbook.

- **Reading Checks** contain questions that help you test your understanding of what you have just read.
- Find Out and Think About activities may appear throughout the each section of a chapter as well as at the end of a section.

**Did You Know?**  
How small are molecules? A small drop of water has about 1 sextillion (1 followed by 21 zeros!) water molecules.

**The Particle Model of Matter**  
Why can certain materials slip and slide past other materials? The answer can be explained by looking at tiny particles of matter. In further studies, you will learn about atoms and molecules. These atoms and molecules are the tiny particles of which matter is made (see Figure 7.2).

In earlier studies, you may have learned about the particle model of matter:

1. All matter is made up of very small particles. The particles are much too small to observe with the naked eye or with a light microscope.
2. There are spaces between the particles. The amount of space between the particles is different for different states of matter. For example, gases have much more space between particles than solids do.
3. The particles that make up matter are always moving.
4. The particles are attracted to one another. The strength of the attraction depends on the type of particle.

**The Kinetic Molecular Theory**  
Kinetic energy is the energy of motion. All particles in every solid, liquid, and gas are always moving, so they have kinetic energy. Scientists have expanded the particle model and developed the kinetic molecular theory to explain what happens to matter when the kinetic energy of particles changes. A model in science is a way to think about and interpret natural events and objects. A theory provides a scientific explanation based on the results of experimentation.

The main points of the kinetic molecular theory include:

1. All matter is made up of very small particles (atoms and molecules).
2. There is empty space between particles.
3. Particles are constantly moving. The particles are colliding with each other and the walls of their container.

(a) Particles of a solid are so tightly packed together they cannot move around freely. They can only vibrate.

(b) Particles of a liquid are farther apart and they can move by sliding past each other.

(c) Particles of a gas are very far apart and they move around quickly.

4. Energy makes particles move. The more energy the particles have, the faster they can move and the farther apart they can get.

**Reading Check**

1. How is a solid different from a liquid in shape and volume?
2. How are liquids and gases similar in shape and volume?
3. How are liquids and gases different in the amount of space between particles?
4. How does the behaviour of particles change as energy is added to them? How does the behaviour change as energy is lost?
5. How does the space between particles change as energy is added to them? How does the space change as energy is lost?

**Suggested Activity**  
Find Out Activity 7-2 on page 258.

Chapter 7 Kinetic molecular theory explains the characteristics of solids, liquids, and gases. • MHR 249

**Reading Check**

1. What is a mixture?
2. Write a definition for the term **heterogeneous mixture**. Include two examples in your definition.
3. Write a definition for the term **homogeneous mixture**. Include two examples in your definition.

**Suggested Activity**  
Conduct an Investigation 7-11 on page 238.

**7-18 Mixture Match-Up** **Find Out Activity**

Your task is to examine five items from a kitchen and five items from a bathroom or laundry room. From the kitchen, you could select ketchup, prepared mustard, spices, soft drinks, dishwashing liquid, cereal, jam, molasses, or bread. From the bathroom or laundry room, you could select shampoo, conditioner, soap, toothpaste, shaving cream, a plastic vase, an empty board, hand lotion, hair gel, or detergent.

**Safety**

- In this activity, you will be choosing a variety of household products to examine. The suggested products have been chosen as safe for you to examine. Do not use any products other than those listed here. Wash your hands after handling each product.

**What to Do**

1. Prepare a table of observations like the one below. Give your table a title.

Product	Classification (Heterogeneous, Homogeneous, or Other)	Reasons

2. In the first column, list each product you examine. In the second column, say whether the product is a heterogeneous mixture or a homogeneous mixture. If you can't decide, or if you think the product is some other kind of mixture, record your choice as "Other." In the third column, give reasons for your choice.

**What Did You Find Out?**

1. What properties did you think were most useful for helping you decide what type of mixture each product is?
  - (a) Which products did the class agree about?
  - (b) Which products did the class disagree about?
  - (c) Explain why the class disagreed.

Chapter 7 Matter can be classified as mixtures or pure substances. • MHR 251

## Suggested Activity

- These small margin features indicate where your teacher may have you do one of the activities from the end of the section.

## Conduct an Investigation

- These formal labs give you the opportunity to develop science skills using various equipment and materials.
- In these investigations, you can ask questions about science, make observations, and obtain results.
- You then analyze your results to determine what they tell you about the topic you are investigating.
- Safety icons and safety warnings alert you to any special precautions you should take to help maintain a safe classroom environment.
- Each investigation has one of the following focusses: inquiry, decision-making, or problem-solving.
- At least once in every unit, you will see an activity or investigation that is identified as "Core", which means that it is an especially important topic of investigation.

**7-20 What Kind of Mixture? Conduct an Investigation Inquiry Focus**

**Shm Check**

• Planning  
• Predicting  
• Communicating  
• Analyzing/Concluding

**Safety**

• 4 miscarets  
• 4 beakers or jars  
• 4 pieces of filter paper  
• ring stand and ring clamp  
• funnel

**Materials**

• 4 miscarets  
• 4 beakers or jars  
• 4 pieces of filter paper  
• ring stand and ring clamp  
• funnel

**Procedure**

1. Prepare a table of observations like the one below.

Mixture	Prediction: Heterogeneous Mixture or Solution	Observations Before Filtering	Observations After Filtering	
			On Filter Paper	In Beaker
1				
2				
3				
4				

2. Your teacher will give you four mixtures of common substances.
3. Observe each mixture. Predict whether it is homogeneous or a solution. Write your prediction in your table. If you cannot decide, record your prediction as " unsure."
4. Set up the materials as shown in the diagram.
5. Pour each mixture through a clean filter.
6. For each mixture, observe the substance that went through the filter. Was anything left on the filter? Record your observations in your table.
7. Wipe up any spills. Clean up and put away the equipment you have used. Wash your hands thoroughly.

**Analyze**

1. Which of your observations matched your predictions? Did any observations surprise you? Explain why or why not.

**Conclude and Apply**

1. If you observe matter on the filter, can you state that the mixture is definitely heterogeneous? Explain your answer.
2. If you do not observe any matter on the filter, can you state that the mixture is definitely a solution? Explain your answer.

Chapter 7 Matter can be classified as mixtures or pure substances • MHR 247

## End-of-Section Features

- These features give you an opportunity to learn about applications or explorations of the topic you have studied in the section.
- The "www" in "www science" stands for "wild, weird, and wonderful." These features describe interesting and unusual science.
- **National Geographic Visualizing Science** features are exciting visual representations of a science topic.
- **Science Watch** features provide information on past and current scientific topics and research.
- **Science-Math Connect** features connect the science you learned in the section to math concepts.
- **Career Connect** features are interviews with people who have a career related to the unit.

**Wild, Weird, Wonderful** **www Science**

**What's the Metal in the Ice Man's Axe?**



In September 1991, hikers in the Alps, near the border between Austria and Italy, discovered the body of a man. But this was no ordinary discovery. The man had been trapped in a glacier for thousands of years. He was almost perfectly preserved. With him was an assortment of tools, including an axe with a metal blade.

Scientists were especially interested in the axe. At first, they thought that the metal axe blade was bronze, which is a mixture of copper and tin. This was not possible, though, the mummy and his clothing had been dated to be about 5200 years old. Scientists believe that bronze was invented only about 4000 years ago. So, the axe blade could not be bronze.

Scientists then hypothesized that the blade could be copper. People have been using copper for at least the past 6000 years. To test their hypothesis, scientists exposed the axe blade to x-ray radiation. When metals are exposed to high energy radiation, their particles vibrate very energetically. As the vibration of the particles slows down, the particles give off energy that can be examined with specialized equipment. Scientists use this "energy signature" to identify the type of particle that is giving off the energy.

Analysis using this technique confirmed the scientist's hypothesis. The metal of the axe blade was almost pure copper.

240 MHR • Unit 2: Matter and Mixtures

**Check Your Understanding**

**Checking Concepts**

1. Identify each of the following as a mixture or a pure substance, and give a reason to explain your choice. If you are not sure, write "unsure," and give a reason to explain why.
  - (a) oxygen gas
  - (b) air
  - (c) whipped cream
  - (d) bleach
  - (e) garden soil
  - (f) iron
  - (g) ranch dressing
  - (h) chocolate chip cookie
  - (i) pencil
  - (j) freshly squeezed orange juice
2. Classify each of the mixtures you identified in question 1 as homogeneous or heterogeneous. Explain your decision.
3. Make a sketch to show the particles that make up a pure substance. Add any labels that you think are needed to make your idea clear.
4. Make a sketch to show the particles that make up a mixture. Add any labels that you think are needed to make your idea clear.

**Understanding Key Ideas**

5. When you first open a bottle of pop, the liquid is filled with tiny bubbles.
  - (a) Is the pop homogeneous or heterogeneous? Explain your answer.
  - (b) If you let the pop sit for a day, what happens? Is the liquid homogeneous or heterogeneous now? Explain your reasoning.

**Pause and Reflect**

Think about your experiences so far in this chapter. At the time, do you think that most materials on Earth are homogeneous or heterogeneous? Explain why you think so.

Chapter 7 Matter can be classified as mixtures or pure substances • MHR 241

## Check Your Understanding

- These section review questions test your new knowledge.

## Pause and Reflect

- These features help you stop and think about what you now know about the topics explained in the chapter. They also make connections among ideas throughout your book.


**Chapter 8 Chapter Review**

**Prepare Your Own Summary**  
Create your own summary of the key ideas from this chapter. You may include graphic organizers or illustrations with your notes. (See Science Skill 9 for help with using graphic organizers.) Use the following headings to organize your notes:

- Solutes and Solvents
- Concentration
- Solubility
- Rate of Dissolving

**Checking Concepts**

- Identify the solute and the solvent in each of the following statements about solutions. Explain your reasoning.
  - A dentist prescribes a sodium fluoride solution to a patient who has severe tooth decay. The solution is 1.13 sodium fluoride in water.
  - Bronze is an alloy (a solid solution) of copper in tin.
  - There are 20 g of sugar in 1 L of Gatorade™ in water. (Hint: The solvent for Gatorade™ is water.)
  - Bubbly soda water comes from underground springs such as those found in the town of Spa in Belgium. Soda water is a solution of carbon dioxide gas in water.
  - Stainless steel may be made by dissolving carbon in iron.
  - One brand of apple juice, made from concentrate, has 100 g/L of sodium.
- Describe the difference between:
  - a saturated solution and an unsaturated solution
  - a dilute solution and a concentrated solution
  - a substance that is soluble in water and a substance that is insoluble in water
  - a substance that has a high solubility in water and a substance that has a low solubility in water
- Why must you include information about temperature when you state the solubility of a substance?
- Neatly sketch a line graph or a bar graph that shows what happens to the concentration of a solution (y-axis) as you add solute to it (x-axis).
- Ringer's solution is a fluid that doctors use for people and animals when they have lost too much water (are dehydrated). The solution contains some key salts in the same concentrations as they are in blood. These salts are sodium chloride (table salt), potassium chloride, and calcium chloride. Each 100 mL of Ringer's solution contains the following masses of these salts:
  - sodium chloride: 0.86 g
  - potassium chloride: 0.022 g
  - calcium chloride: 0.03 g
 Convert these values to concentration in units of g/L.



## Chapter Review

- At the end of each chapter, these two pages can help you study for a chapter test.
- The guide under the heading “Prepare Your Own Summary” can help you summarize what you have learned in the chapter.
- The review questions help you recall, think about, and apply what you have learned.

## Unit Summary

- This is a summary of the Key Ideas and Key Terms covered in the unit.
- The photographs next to the Key Terms are from the chapter openers to remind you of what you covered in that chapter.

**Unit Summary**

**7 Matter can be classified as mixtures and pure substances.**

- Matter can be either mixtures or pure substances.
- Mixtures may be either homogeneous or heterogeneous.
- Homogeneous mixtures (solutions) have the same properties throughout.
- Heterogeneous mixtures have different visible parts with different properties.
- Matter is either a mixture or a pure substance based on the types of particles that make it up.
- Each pure substance has its own type of particles, which is different from the kinds of particles that make up all other pure substances.



**Key Terms**

- alloy
- mixture
- heterogeneous mixture
- homogeneous mixture
- pure substance
- solution

**8 Some substances dissolve to form solutions faster and more easily than others.**

- In a solution, the substance that dissolves is the solute, and the substance in which the solute dissolves is the solvent.
- A substance is soluble in a solvent if it dissolves in the solvent. A substance is insoluble in a solvent if it does not dissolve in the solvent.
- A concentrated solution has a larger mass of solute for a certain volume of solvent. A dilute solution has a smaller mass of solute for a certain volume of solvent.
- Solution concentration may be expressed in units of grams of solute per liter of solvent (g/L).
- A solution is saturated when as much solute has dissolved in a solvent as it can, at a certain temperature.
- Different solutes have different solubilities, which may be increased by increasing the temperature.
- Stirring a solution increases the rate of dissolving but not the solubility of the solute.



**Key Terms**

- concentrated solution
- dilute solution
- dissolves
- insoluble
- saturated solution
- solubility
- soluble
- solvent
- solutes
- unsaturated solution

**9 Many useful products depend on technology for separating mixtures and solutions.**

- Homogeneous mixtures may be separated by methods that include sorting by hand, mechanical sorting, and filtration.
- Mechanical sorting of a mixture is based on properties such as particle size and magnetism.
- Heterogeneous mixtures may be separated by methods that include evaporation, distillation, and paper chromatography.
- Petroleum is a complex mixture that can be separated by fractional distillation.
- As one in a rock mixture that has one or more valuable substances.



**Key Terms**

- evaporation
- filtration
- fractional distillation
- mechanical sorting
- ore
- paper chromatography
- petroleum
- simple distillation

## End-of-Unit Project and Integrated Research Investigation

- Each **Project** lets you apply key concepts and skills from the unit. You complete the Project as part of a team.
- For the **Integrated Research Investigation**, you explore a unit-related topic. You have an opportunity to use current information that you have researched to do a report or presentation about that topic.

**Project**

### Purifying Mixtures

Each step of a separation may cost a company a great deal of money. This is why materials and products that are pure or nearly pure can be costly to buy. As companies develop methods that can separate a mixture more efficiently, the cost can come down.

**Problem**  
In this project, you will find the most effective manner to separate a mixture.

**Safety**

- Be careful if you use a hot plate. Unplug it when it is not in use.
- Wipe up any spills as soon as they occur.

**Materials**

- variety of mixtures prepared by your teacher
- cups or beakers of various sizes
- meagnet
- plastic wrap
- variety of filters
- funnels
- hot plate
- evaporating dishes
- water
- paper
- labels or grease pencil

**Criteria**

- In small groups, separate a mixture into its parts.
- Include the fewest number of separation steps as is needed to produce purified parts.
- Design a flowchart to show the steps and methods that you used in your final separation procedure.

**Procedure**

- With your group, identify as many substances in the mixture as you can. Record them in a list. Be alert to substances that might be present but not clearly visible. (For instance, salt and white sand can look alike.)
- Brainstorm the types of methods you could use to separate your mixture. As a group, decide on which methods you will use and in which order.
- Outline the steps in each method of separation and the substance that you plan to isolate at each step. You may need to revise your outline a few times before you come up with the best sequence of steps.
- Separate your mixture. Collect each part in a separate, labeled container. Note: If any parts are contaminated (and each is larger pieces of gravel, for instance), you must purify them further.
- Do several trials to come up with the procedure that will give you the best results in the fewest steps. Make a flowchart to record your final method.

**Report**

- How well did you obtain purified parts of the mixture? How did the order of steps affect how completely you were able to separate them?
- Which methods did you use to separate parts that were not clearly visible? How did you know that each method worked?
- How could you improve your methods of separation? What other equipment or methods might have helped you improve the quality and effectiveness of your separation?

**Integrated Research Investigation**

### Safe, Clean Water for Everyone

If you live in a large city or town, you may not realize that the water running down your sink or toilet eventually ends up in a river, a lake, or the ocean. What about the rain and snow that fall to the ground? On the ground, rain and snow carry oil from the roads and dissolved salt from melted snow in winter. Look along the gutters on every city street. Where does the run-off water go after it trickles down storm sewers and out of sight? What other substances might be carried in this way? In rural areas, how does the wastewater go?

**Background**  
Water is one of the most plentiful mixtures on Earth. It is also the most essential for all living things. Many different natural and human activities add substances to water that require us to treat it so that it is safe to drink and wash with. Many of these treatments involve separation methods that you have been studying.

**Find Out More**  
Unless you get your water from a well and this water has been tested to prove its safety, all the water in your community is treated in some way to make it safe. Use the Internet (start at [www.discoveringscience.ca](http://www.discoveringscience.ca)), books, magazines, and newspapers to find out the methods that are used to make water safe to drink and wash with in your community.

**Report**

- Create a poster to display the results of your research.
- Design an Internet page (such as a FAQ) that has additional information and links to sources for more information about water treatment.



## Unit Review

- At the end of each unit, these pages can help you study for a unit test.
- The review questions help you recall, think about, and apply what you have learned.

**Unit Review**

**Visualizing Key Ideas**

Copy the following spider map into your notebook. Beside each topic, fill in as many words as you can that are related to that topic. Do not look at your notebook. When you have completed the map, go back through this unit and look for other words that you could include. Add these words to your spider map in a different colour of pen.

**Mixtures and Solutions**

types of mixtures

solubility

soluble

insoluble

temperature

**Using Key Terms**

2. In your notebook, say whether the following statements are true or false. If a statement is false, rewrite it to make it true.

- A solution is a homogeneous mixture.
- The particles that make up a pure substance are the same types of particles that make up all other pure substances.
- Mechanical sorting may be done to separate the parts of a heterogeneous mixture.
- The concentration of a solution may be expressed as the volume of solvent that can dissolve in a certain mass of solute (g/L).
- A saturated solution cannot allow more solute to dissolve at a certain temperature.
- An unsaturated solution cannot allow more solute to dissolve at a certain temperature.
- All matter can be classified as either a mixture or a pure substance.
- Filtration is one method that can be used to separate a solution.
- Units of ppm tell you the concentration of a solution in grams per millilitre.
- There are very few examples of mixtures in the world around you.
- In a solution, the solute is the substance that does the dissolving and the solvent is the substance that dissolves.
- A solution of salt and water is a homogeneous solution because the salt will settle if it is left undisturbed.

**Checking Concepts**

- Explain the difference between a mixture and a pure substance.
- What is a heterogeneous mixture? How is it different from a homogeneous mixture?
- Describe a homogeneous mixture using the particle theory of matter.
- What is an alloy?
- Is a solution a heterogeneous or a homogeneous mixture? How do you know?
- Connect a solute with a solvent.
- What is the difference between a saturated solution and an unsaturated solution?
- Use an example to explain what the term “solubility” means.
- Explain the difference between a dilute solution and a concentrated solution.
- What happens to the solubility of a gas in a liquid as temperature increases?
- Why are magnetism and flotation examples of mechanical sorting?
- Why is a filter not a type of filter?
- What is the name of the method that is used to separate the parts that make up petroleum?
- Is separating gold nuggets from crushed gravel a type of mechanical sorting? Why or why not?

**Understanding Key Ideas**

- Identify the following as a mixture or a pure substance, and give a reason to explain your choice.
  - cornmeal and raisin cookies
  - gold
  - petroleum
  - carbon dioxide gas
  - ink
  - instant coffee
- Classify each of the mixtures you identified in question 2 as heterogeneous or homogeneous. Explain your decisions.
- Explain how the particle theory of matter distinguishes between a mixture and pure substance.
- Agree or disagree with the following statement, and justify your answer: “Many mixtures are neither clearly heterogeneous nor clearly homogeneous. Instead, they are mixtures of mixtures.”
- Explain why pizza is a heterogeneous mixture, while clean air is a homogeneous mixture.
- Identify the solute and the solvent in each of the following solutions. (Note: There may be more than one solute in one or more of the solutions.)
  - soft water
  - vinegar
  - brass
  - sea tea
  - instant coffee
  - lemonade
- Draw sketches to show how the particle theory of matter could explain the difference between a concentrated solution of sugar and water and a dilute solution of sugar and water.

## Other Features

### Word Connect

- The Word Connect margin feature gives you additional information on scientific terms.

### Explore More

- You can “Explore More” by following the suggestions in these features to investigate further a topic you have studied.

### internet connect

- These features help you research more information about a topic.
- The *Discovering Science 7* web site links you to other web sites related to the topic you are researching.



- The safety icons are extremely important. They alert you to any safety precautions you should take, such as wearing safety glasses or a lab coat. Other safety icons used in *Discovering Science 7* are shown on page xxi.

# At the Back of Your Textbook

## Science Skills Guide

- At the back of *Discovering Science 7*, you will find the Science Skills appendix. It will help you review and develop the skills and knowledge that you need to be successful in this course.



## Index

- The Index at the back of the book helps you locate a particular topic in the book.
- The Index is organized alphabetically.



## Glossary

- Each boldfaced term in your textbook is defined in the Glossary at the back of the book.
- The Glossary is organized alphabetically.





# Exploring *Discovering Science 7*

## A Scavenger Hunt

Use your *Discovering Science 7* textbook to answer the following questions.

1. What is the web address for the textbook?
2. What four units will you study in *Discovering Science 7*?
3. How many Key Ideas are there in *Discovering Science 7*?
4. What is a Key Idea? How can the Key Ideas help you study?
5. Where can you find examples of the study tool called Foldables?
6. At the beginning of each section, there is a light brown shaded box containing text. What is the purpose of this shaded text?
7. Name four different margin features and describe what each one is about.
8. What is the purpose of the Reading Checks?
9. Activities have a green background. What are three different types of activities in this textbook?
10. What do the three w's stand for in "www science"?
11. If you needed information on how to make a graph, where would you look?
12. Where can you find the definitions for the bolded words in the text?
13. Before a unit test, what parts of the book could you use to review the concepts covered in the unit?
14. On a sheet of paper or in your notebook, sketch an outline of your classroom. Mark the location and types of safety equipment there. What pages in *Discovering Science 7* provide safety information?
15. Scan through *Discovering Science 7* to look for something you find interesting and did not know before you read it in this textbook.



# Safety in Your Science Classroom

Become familiar with the following safety rules and procedures. It is up to you to use them and your teacher's instructions to make your activities and investigations in *Discovering Science 7* safe and enjoyable. Your teacher will give you specific information about any other special safety rules that need to be used in your school.

## 1. Working with your teacher ...

- Listen carefully to any instructions your teacher gives you.
- Inform your teacher if you have any allergies, medical conditions, or other physical problems that could affect your work in the science classroom. Tell your teacher if you wear contact lenses or a hearing aid.
- Obtain your teacher's approval before beginning any activity you have designed for yourself.
- Know the location of the nearest fire exit, safety blanket, eyewash station, first-aid kit, and fire alarm.
- Know the evacuation procedure for the science laboratory.

## 2. Starting an activity or investigation ...

- Before starting an activity or investigation, read all of it. If you do not understand how to do any step, ask your teacher for help.
- Be sure you have checked the safety icons and have read and understood the safety precautions.
- Begin an activity or investigation only after your teacher tells you to start.

## 3. Wearing protective clothing ...

- When you are directed to do so, wear protective clothing, such as a lab coat and safety glasses. Always wear protective clothing when you are using materials that could pose a safety problem, such as unidentified substances, or when you are heating anything.
- Tie back long hair, and avoid wearing scarves, ties, or long necklaces.
- Avoid wearing loose or baggy clothing in the science lab.
- Shorts, short skirts, sandals, and open-toed shoes are not permitted in the science lab.

## 4. Acting responsibly ...

- Work carefully with a partner and make sure your work area is clear.
- Handle equipment and materials carefully.
- Make sure stools and chairs are resting securely on the floor.



- If other students are doing something that you consider dangerous, report it to your teacher.

#### 5. Handling edible substances ...

- Do not chew gum, eat, or drink in your science classroom.
- Do not taste any substances or draw any material into a tube with your mouth.
- Treat all substances in the lab as potentially dangerous or poisonous.
- This includes common household substances such as sugar and salt.



#### 6. Working in a science classroom ...

- Make sure you understand all safety labels on school materials or those you bring from home. Familiarize yourself, as well, with the WHMIS symbols and the special safety symbols used in this book, found on page xxi.
- When carrying equipment for an activity or investigation, hold it carefully. Carry only one object or container at a time.
- Be aware of others during activities and investigations. Make room for students who may be carrying equipment to their work stations.

#### 7. Working with sharp objects ...

- Always cut away from yourself and others when using a knife or razor blade.
- Always keep the pointed end of scissors or any pointed object facing away from yourself and others if you have to walk with such objects.
- If you notice sharp or jagged edges on any equipment, take special care with it and report it to your teacher.
- Dispose of broken glass in the glass disposal container as directed by your teacher.

#### 8. Working with electrical equipment ...

- Make sure your hands are dry when touching electrical cords, plugs, or sockets.
- Pull the plug, not the cord, when unplugging electrical equipment.
- Report damaged equipment or frayed cords to your teacher.
- Place electrical cords where people will not trip over them.



#### 9. Working with heat ...

- When heating an item, wear safety goggles and any other safety equipment that the text or your teacher advises.



- Always use heatproof containers.
- Point the open end of a container that is being heated away from yourself and others.
- Do not allow a container to boil dry.
- Handle hot objects carefully. Be especially careful with a hot plate that looks as though it has cooled down.
- If you use a Bunsen burner, make sure you understand fully how to light and use it safely.
- If you do receive a burn, inform you teacher, and apply cold water to the burned area immediately.

#### 10. Working with various chemicals ...

- If any part of your body comes in contact with a liquid substance, wash the area immediately and thoroughly with water. If you come in contact with dry or powdered chemicals, brush off as much of the substance as possible and then wash thoroughly with water.
- Always 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.
- Hold containers away from your face when pouring liquids.

#### 11. Working with living things ...

- Wash your hands after handling living organisms.

On a field trip:

- Try not to disturb the area any more than is absolutely necessary.
- If you move something, do it carefully, and always replace it carefully.
- If you are asked to remove plant material, remove it gently, and take as little as possible.

In the classroom:

- Treat living creatures with respect.
- Make sure that living creatures receive humane treatment while they are in your care.
- If possible, return living creatures to their natural environment when your work is complete.









#### 12. Cleaning up in the science classroom ...

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

# Safety

## Safety Symbols

The following safety symbols are used to alert you to possible dangers. Be sure you understand each symbol used in an activity or investigation before you begin.

	<b>Disposal Alert</b> This symbol appears when care must be taken to dispose of materials properly.
	<b>Thermal Safety</b> This symbol appears as a reminder to use caution when handling hot objects.
	<b>Sharp Object Safety</b> This symbol appears when a danger of cuts or punctures caused by the use of sharp objects exists.
	<b>Electrical Safety</b> This symbol appears when care should be taken when using electrical equipment.
	<b>Skin Protection Safety</b> This symbol appears when use of caustic chemicals might irritate the skin or when contact with micro-organisms might transmit infection.
	<b>Clothing Protection Safety</b> A lab coat must be worn when this symbol appears.
	<b>Fire Safety</b> This symbol appears when care should be taken around open flames.
	<b>Eye Safety</b> This symbol appears when a danger to the eyes exists. Safety goggles must be worn when this symbol appears.









### Instant Practice—Safety Symbols

Find four of the safety symbols in activities or investigations in this textbook. Record the page number and the title of the investigation or activity in which you found the symbol. What are the possible dangers in the activity or investigation you have identified that relate to each symbol?

## WHMIS Symbols

Look carefully at the WHMIS (Workplace Hazardous Materials Information System) safety symbols shown here. The WHMIS symbols are used throughout Canada to identify dangerous materials used in all workplaces, including schools.

Make certain you understand what these symbols mean. When you see these symbols on containers in your classroom, at home, or in a workplace, use safety precautions.

	
Compressed Gas	Flammable and Combustible Material
	
Oxidizing Material	Corrosive Material
	
Poisonous and Infectious Material Causing Immediate and Serious Toxic Effects	Poisonous and Infectious Material Causing Other Toxic Effects
	
Biohazardous Infectious Material	Dangerously Reactive Material

### Instant Practice—WHMIS

Find any two WHMIS symbols on containers in your school, or ask a parent or guardian to look for WHMIS symbols in a workplace. Record the name of the substance on which the symbols are used, and where you or your parent or guardian saw the containers stored. What dangers are associated with the substance in each container?