UNIT 2

# Atoms, Elements, and Compounds

# BIG IDEAS

- The use of elements and compounds has both positive and negative effects on society and the environment.
- Elements and compounds have specific physical and chemical properties that determine their practical uses.

One of the most familiar and essential substances on Earth is water. In Canada, we are lucky to have safe drinking water straight from the tap. But more and more, for convenience or due to safety concerns, people are reaching for bottled water. In 2005, Canadians drank on average 60 L of bottled water per person. Worldwide, people consumed over 189 000 000 000 L of bottled water in 2007.

What is the problem with bottled water? For one thing, resources are used to make the bottles, fill them, and transport them. The bottles then become waste that must either be dumped in a landfill or recycled. There is another option: you could use a refillable container to make your own "bottled water."

In this unit, you will learn how the properties of substances determine how they are used, as well as the risks and benefits of using them.

***How do the chemical and physical properties of water and plastic affect their uses and their interaction with the environment?***

### *Chapter 4*
Properties of Elements and Compounds

### *Chapter 5*
Understanding the Properties of Elements

### *Chapter 6*
Understanding the Properties of Compounds

# Get Ready for Unit 2

## Concept Check

1. In two minutes, jot down all the words you can think of that describe matter. Share your list with a partner and exchange words that you did not have on your individual lists.

2. Examine the beach scene shown in the illustration below and write one example of each of the following in your notebook:
   - **a.** matter in its solid state
   - **b.** matter in its liquid state
   - **c.** matter in its gas state
   - **d.** fusion (melting)
   - **e.** evaporation
   - **f.** a reversible physical change
   - **g.** an irreversible chemical change

3. Use the words below to complete each sentence. Write the complete sentences in your notebook.

| | | |
|---|---|---|
| fruit punch | pure substance | solution |
| rocky road ice cream | helium | mechanical mixture |

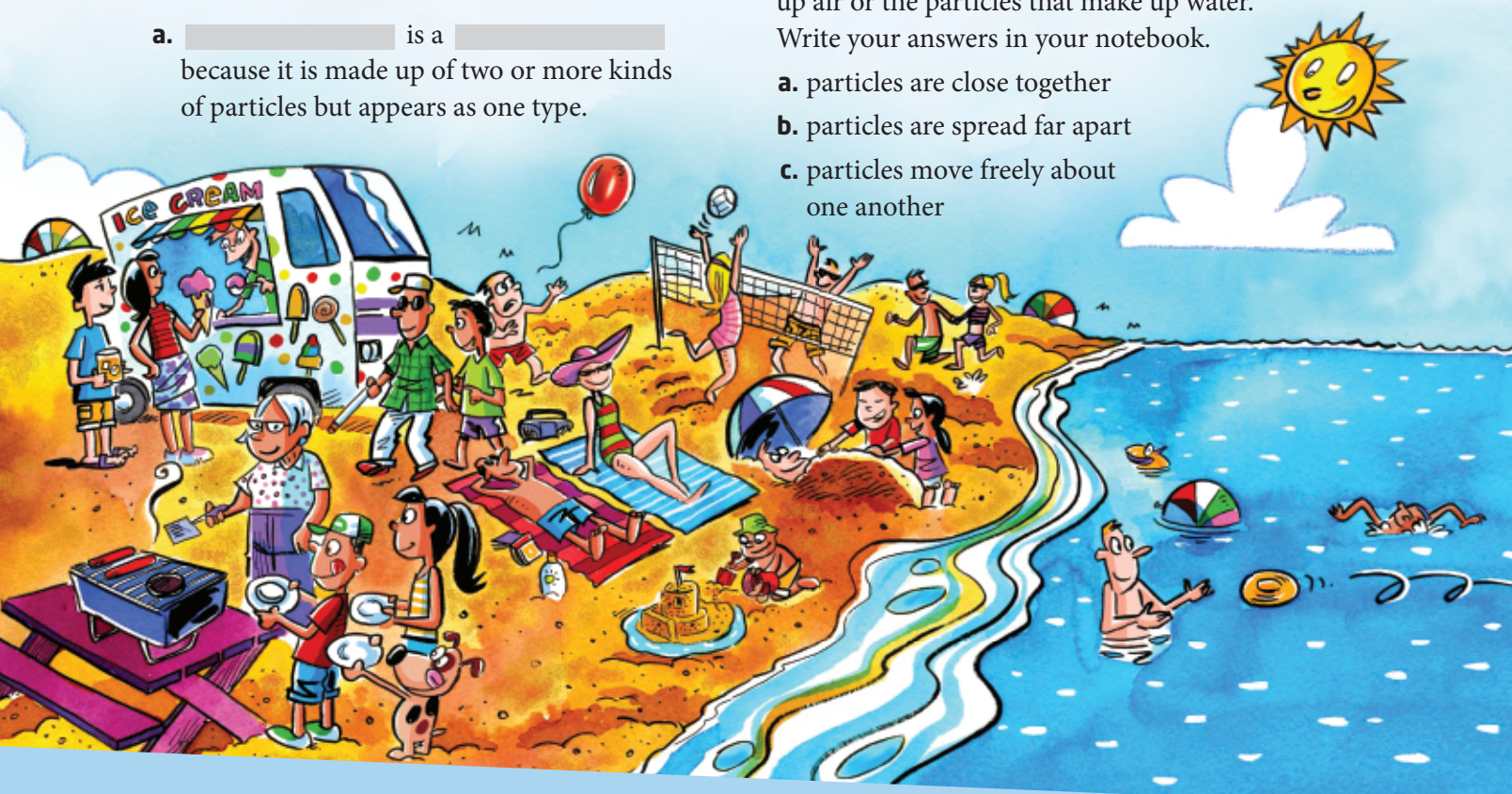
   - **a.** _____ is a _____ because it is made up of two or more kinds of particles but appears as one type.
   - **b.** _____ is a _____ because it is made up of two or more kinds of particles that can be seen as separate.
   - **c.** _____ is a _____ because it is made up of only one type of particle.

4. Copy the table below into your notebook. Identify each property as physical or chemical. Find examples of matter in the illustration of the beach scene below that have these properties (you can use the same example more than once).

**Examples of Physical and Chemical Properties**

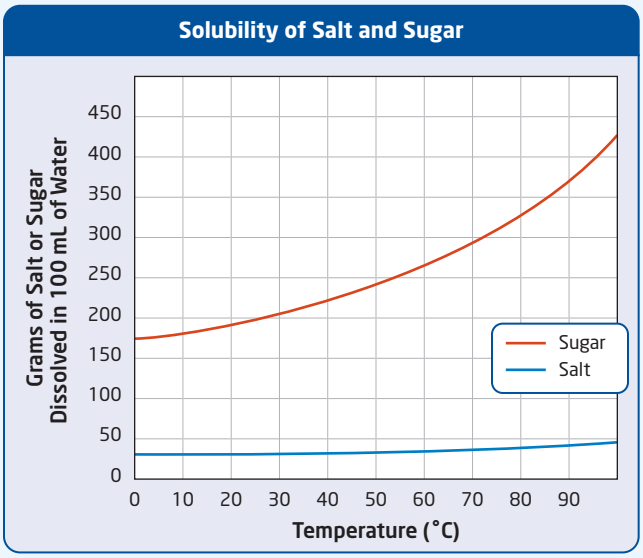
| Clue | Physical or Chemical Property? | Substance |
|---|---|---|
| **a.** Smells sweet | | |
| **b.** Does not react with water | | |
| **c.** Feels rough | | |
| **d.** Is red | | |

5. Read each statement below and determine whether it describes the particles that make up air or the particles that make up water. Write your answers in your notebook.
   - **a.** particles are close together
   - **b.** particles are spread far apart
   - **c.** particles move freely about one another



## Inquiry Check

An investigation was conducted to demonstrate the effect of temperature on the solubility of salt and sugar. The results are shown in this graph.




**6. Analyze** How many grams of (a) sugar and (b) salt will dissolve in water at 50°C?

**7. Interpret** Which substance showed a greater change in solubility as the temperature increased?

## Numeracy and Literacy Check

The table below compares the mineral content of bottled water and tap water.

**Mineral Content of Bottled Water Compared to Tap Water**

| Type of Water and Source | Mineral Content (in mg/L) | | |
|---|---|---|---|
| | Sodium | Calcium | Magnesium |
| Bottled spring water from Guelph, Ontario | 33 | 100 | 37 |
| Tap water in Toronto, Ontario | 12 | 40 | 9 |

**8. Unit Conversions** Mineral concentrations are typically measured in mg/L, but you can convert these measurements to other units if required.

**a.** Convert the calcium content in bottled spring water from Guelph, Ontario from mg/L to g/L.

**b.** Convert the sodium content in tap water in Toronto from mg/L to mg/mL.

**9. Writing** What criteria do you use when you choose the type of water that you drink? Write a brief article for your school newsletter justifying your choice of bottled water or tap water.

### Looking Ahead to the Unit 2 Project

At the end of this unit, you will have an opportunity to apply what you have learned in an inquiry or research project. Read the Unit 2 Projects on pages 258–259. Start a project folder now (either paper or electronic). Store ideas, notes, news clippings, websites, and lists of materials that might help you to complete your project.

**Inquiry Project**
Investigate how the chemical properties of other materials could prevent iron from rusting.

**An Issue to Analyze**
Take a position on whether the benefits of metal mining justify the costs.