

# Unit 2

## Unit 2 Chemical Reactions and Their Practical Applications

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# Unit 2 Chemical Reactions and Their Practical Applications

## BIG IDEAS

- Chemicals react with one another in predictable ways.
- Chemical reactions are a necessary component of chemical products and processes used in the home and workplace.

### Overall Expectations

- **C1** analyse how chemical reactions are employed in common products and processes, and assess the safety and environmental hazards associated with them
- **C2** investigate, through inquiry, the characteristics of simple chemical reactions
- **C3** demonstrate an understanding of simple chemical reactions and the language and ways to represent them

### Materials

Please see pages TR-32 to TR-37 for a list of the materials required for this unit and other units.

### Overview

In this unit, students will learn that chemical reactions are an important part of the production of common products and an integral part of many processes. They will also explore the positive and negative aspects of chemical reactions on the environment and personal safety. Students will learn the language of chemistry and the rules associated with the formation of compounds. Through inquiry activities, students will learn to recognize the characteristics of chemical reactions and to describe chemical reactions using word and chemical equations.

### Using the Unit Opener (Student textbook pages 104-107)

- **DI** Introduce the unit by showing a clip from the movie *Backdraft* to engage students in the topic.
- Distribute **BLM 2-1 Unit 2 Anticipation Guide** to encourage students to determine what they know about chemicals, chemical reactions, and their usefulness.
- **ELL** Provide students, especially English language learners, with **BLM 2-4 Fire Triangle** to discuss the components shown in the opener photograph on pages 104 and 105.
- Discuss a career as a firefighter and the prerequisite skills needed for the job.
- Ask students to make a list of the positive aspects of being a firefighter (for example: saving people) and a list of negatives (for example, personal danger).
- Post the unit questions on pages 106 and 107 at the front of the room. Have students add answers to the questions as they progress through the unit.
- Students can use **BLM 2-3 Key Terms in Unit 2** to review the meanings of Key Terms.

### Preparing for the Unit Projects

- Read Looking Ahead to the Unit 2 Projects, on page 107, to the class. Then allow students to read the projects themselves, on pages 180 and 181, including the assessment checklists.
- For the Inquiry Project, discuss how chemistry is important in the kitchen (for example, making bread dough rise, flavouring food, and cooking food to make it digestible) and the consequences of not storing food properly (for example, food rotting or getting stale, flavours changing).
- Ask students if they have drank from a can of soda pop that had been left out for a few days. Ask if they know why that pop tasted the way it did. Open a can and pour it into a beaker. Ask students to make some observations about the pop (bubbles, colour, and so on). Use pH paper to test its acidity and record the pH. Leave the beaker of pop at the front of the room and tell students that later in the unit, more data will be collected.
- Activity 2.12 on page 151 prepares students to write the balanced chemical equation for pop going flat.
- Activity 2.17 on page 171 prepares students to choose appropriate tools and methods to find the pH of a substance.
- To introduce the An Issue to Analyze project, discuss the pros and cons of chemical reactions. Ask students to brainstorm in small groups at least two positive results and two negative results of chemistry. You could prompt them with words like *technology*, *factories*, *waste*, *pollution*, and so on. Ask each group to share one point with the class. Hopefully one group will bring up the problem of e-waste. Discuss the initiative described in the Issue to Analyze project.

## Get Ready (Student textbook pages 108-109)

### Concepts

- Students should describe compounds as substances made of more than one type of element (question 1).
- Students should determine that atoms are made of electrons, protons, and neutrons. They should also describe traits of each subatomic particle (question 2).
- Students should be able to determine the properties of an element by examining the periodic table. Descriptions should include the atomic number, chemical symbol, mass, and atomic structure of an atom of an element (question 3).
- Students should be able to differentiate between a physical property and a chemical property of a chemical and state if the physical property is qualitative or quantitative (question 4).
- Students should be able to determine the element composition of a substance by examining its chemical formula. They will also be able to provide the chemical name for each formula (questions 5 and 6).

### Skills

- Student should be able to determine the density of material by dividing its mass by its volume (question 7).
- Students should be able to identify safety icons that they may see when working with chemicals or tools in the lab (question 8).
- Students should be able to state the main ideas of chemical reactions (question 9).

Students can review some of these skills using **BLM 2-2 Skills for Unit 2**.

## Get Ready Answers

1. **a)** element  
**b)** compound  
**c)** period  
**d)** group

2.

	Electrons	Neutrons	Protons
Location	in shells	inside the nucleus	inside the nucleus
Charge	negative	no charge	positive
Relative Size	smallest of these particles	same as protons, large, 1	same as neutrons, large, 1

3. **a)** Be  
**b)** 2, or alkaline earth metals  
**c)** 4 protons  
**d)** 4 electrons  
**e)** 4  
**f)** alkali metals
4. **a)** physical (qualitative)  
**b)** chemical  
**c)** physical (quantitative)  
**d)** chemical

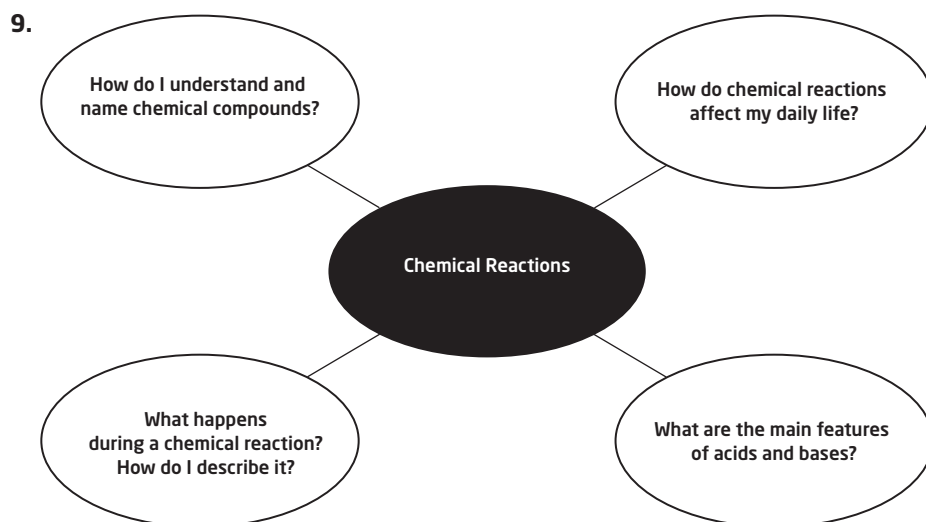
5. i) a) 2 atoms                      b) hydrogen  
 ii) a) 2 atoms                      b) chlorine  
 iii) a) 4 atoms                      b) phosphorus  
 iv) a) 8 atoms                      b) sulfur
6. i) a) hydrogen, oxygen    b) water                      c) 2 hydrogen atoms, 1 oxygen atom  
 ii) a) carbon, oxygen    b) carbon dioxide    c) 1 carbon atom, 2 oxygen atoms  
 iii) a) carbon, oxygen    b) carbon monoxide    c) 1 carbon atom, 1 oxygen atom  
 iv) a) sodium, chlorine    b) salt                      c) 1 sodium atom, 1 chlorine atom  
 v) a) hydrogen, oxygen    b) hydrogen peroxide    c) 2 hydrogen atoms, 2 oxygen atoms  
 vi) a) sodium, hydrogen, carbon, oxygen    b) baking soda  
 c) 1 sodium atom, 1 hydrogen atom, 1 chlorine atom, 3 oxygen atoms

$$7. D = \frac{m}{V}$$

$$= \frac{10 \text{ g}}{1.12 \text{ cm}^3}$$

$$= 8.9 \text{ g/cm}^3$$

Aluminum, atomic number 13



### Assessment OF Learning for Unit 2

Activity	Evidence of Learning	Supporting Learners
Unit 2 Inquiry Investigation, page 180	Students choose to use pH paper to find the pH of the soda pop. Students create a data table that has three columns with headings "Day", "Description", and "pH". Students create the balanced chemical equation from the description of the reaction ( $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ ).	<ul style="list-style-type: none"> <li>• Have students refer to Activity 2.7 in which they found the pH of a substance.</li> <li>• Provide an example of a data table.</li> <li>• Read the description of the carbonation of soda pop and write the chemical equation together. Then ask students to think about what the reverse would look like.</li> </ul>
Unit 2 An Issue to Analyze Project, page 181	Students brainstorm safety issues and discuss the pros and cons of e-mining.	<ul style="list-style-type: none"> <li>• Refer to Topic 2.4 on pages 166 and 167 and remind students about the safety icons. Students can also check the safety icons on page xv.</li> <li>• Provide research for students to analyze.</li> </ul>

### Assessment FOR Learning for Unit 2

Tool	Evidence of Learning	Supporting Learners
Get Ready, question 1, page 108	Students differentiate between a compound and an element, and a group and a period.	<ul style="list-style-type: none"> <li>• Have student work in pairs to review the terms. Students could write the terms on one set of cue cards and the definition on another set, and then match the terms and definitions.</li> </ul>
Get Ready, questions 2 and 3, page 108	Students identify the various properties of atoms, and an atom of an element using the information provided on the periodic table.	<ul style="list-style-type: none"> <li>• Review the various pieces of information in a cell on the periodic table. Students should select an element of their choice and make a cue card with detailed explanations for each part.</li> </ul>
Get Ready, questions 5 and 6, page 109	Students identify the elements and number of atoms of each, that make up a compound.	<ul style="list-style-type: none"> <li>• Review the periodic table with students. Students can be given cue cards with terms such as <i>element</i>, <i>group</i>, <i>period</i>, <i>atomic number</i>, and so on. Students identify each term on the table.</li> </ul>
Get Ready, question 9, page 109	Students draw an idea web about chemical reactions.	<ul style="list-style-type: none"> <li>• Have students use <b>BLM G-45 Main Idea Web</b>.</li> </ul>