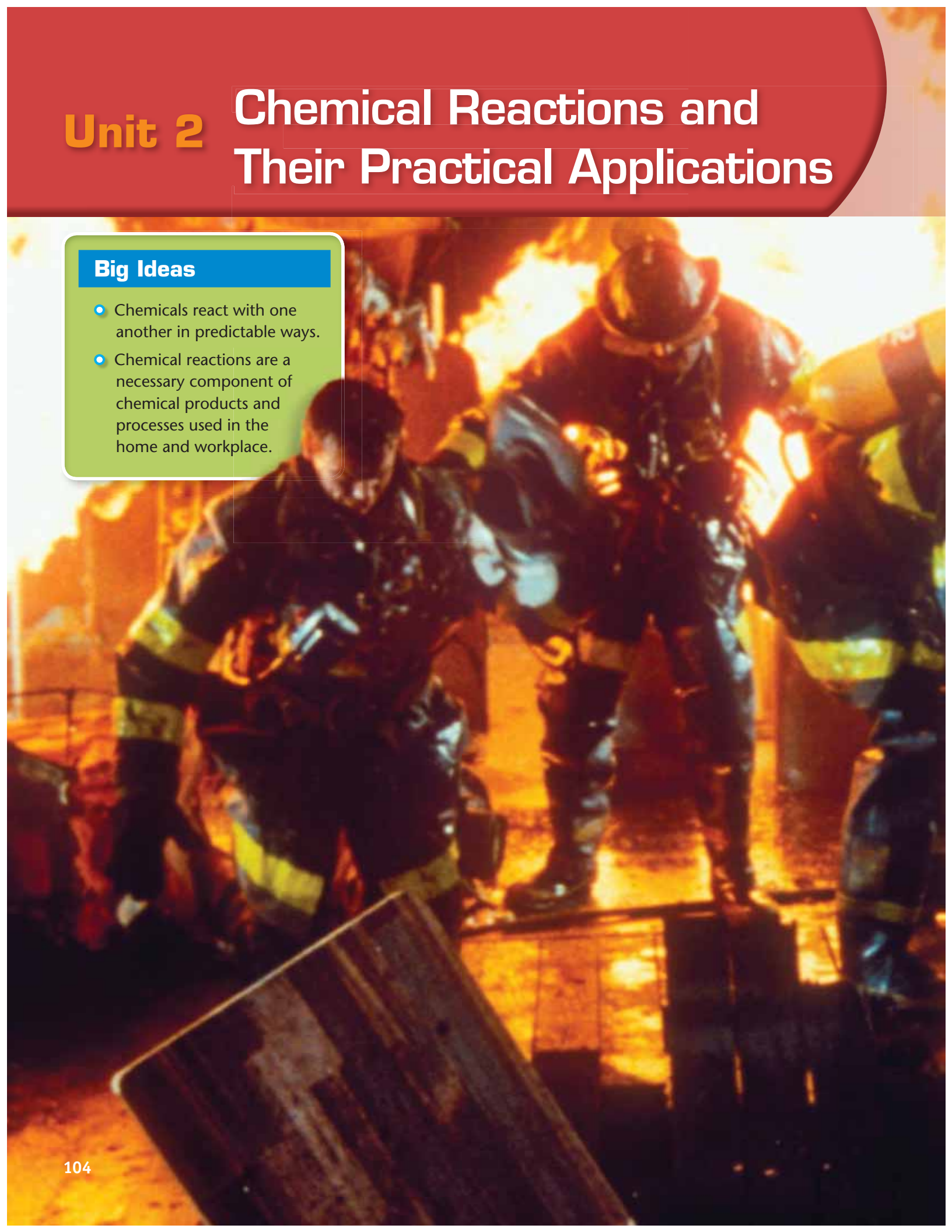



# Unit 2 Chemical Reactions and Their Practical Applications

## 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.





In the movie *Backdraft*, fire is described as if it is alive. In fact, one character in the movie calls fire, “The Animal.” Fuelled by oxygen, wood, and other flammable materials, fire does indeed seem to take on a life of its own. It can creep and slither low to the ground like a stealthy python on the hunt. It can erupt with ferocious intensity like a cornered lion. Starve it of oxygen, though, and fire withers, smoulders, and eventually dies.

The people who fight fire—in cities, in forests, on windswept terrain—are like the knights of legend confronting the dragon. Outfitted with special protective garb, firefighters are trained to understand and combat fire and other chemical reactions that pose a risk to the lives and property of others.

***How is fire linked to chemical reactions? Why do firefighters need special clothing and equipment to battle fires? Who else works with chemicals in their jobs? What special clothing and equipment do they use, and why do they need it?*** ?

## Unit 2 At a Glance

In this unit you will learn that many of the products and processes used in the home and in the workplace are the result of chemical reactions. You will also use the fact that chemical compounds react with one another in certain, predictable ways to learn how to name compounds, write their formulas, and write chemical equations to describe their reactions.

*Think about answers to each question as you work through the topic.*

### Topic 2.1: How do chemical reactions affect your daily life?



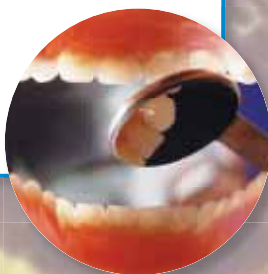
#### Key Concepts

- Chemical reactions support our lives and assist us at home and at work.
- Chemical compounds require safe handling to minimize their hazards.

### Topic 2.4: What are acids and bases, and how do they react?

#### Key Concepts

- Acids and bases are compounds with specific properties.
- An acid and a base react in a neutralization reaction to produce a salt and water.
- Chemical reactions involving acids, bases, and other compounds require safe handling to minimize hazards.



## Chemical Reactions and Their Practical Applications

## Topic 2.2: How can we understand, describe, and name chemical compounds?

### Key Concepts

- Chemical compounds are formed from elements in the periodic table.
- Chemical compounds are represented using chemical names and chemical formulas.
- Reactive elements can become more stable when they form compounds.
- Chemical compounds are described as either ionic or molecular.
- Ionic compounds are named with the metal ion first and then the non-metal ion ending in “ide.”
- Molecular compounds are named using numerical prefixes.



## Topic 2.3: What happens during a chemical reaction, and how can it be described?

### Key Concepts

- During a chemical reaction, chemical compounds are changed into different compounds with different properties.
- The four types of chemical reactions can be described using word equations.
- Chemical reactions can be described using chemical equations.
- Atoms and mass are conserved during a chemical reaction.



## Looking Ahead to the Unit 2 Projects

At the end of this unit you **will** have the opportunity to apply what you have learned. In your unit projects, you **will** investigate how the pH in soda pop changes over time, and you **will** consider the safety and environmental implications of a business plan to mine e-waste for gold.



# Get Ready for Unit 2

## Concept Check

1. Complete each sentence with a word from the box below.

compound element group period

- A(n)  is a pure substance that cannot be broken down further by physical or chemical means.
- A(n)  is a substance that can be broken down into elements by chemical means.
- A horizontal row of elements in the periodic table is called a .
- A vertical column (also called a family) of elements in the periodic table is called a .

2. Copy and complete the following table in your notebook.

### Facts about Subatomic Particles

	Electrons	Neutrons	Protons
Location		inside the nucleus	
Charge			positive (+)
Relative size	smallest of these particles		

1	1+																	2	0		
H	Hydrogen																	He	Helium		
1.0																	4.0				
2	1+	4	2+													10	0				
Li	Beryllium													Ne	Neon						
6.9	9.0													20.2							
3	1+	12	2+											17	1-	18	0				
Na	Mg											Cl	Chlorine	Ar	Argon						
23.0	24.3											35.5	39.9								
4	1+	20	2+	21	3+							32	4+	33	3-	34	2-	35	1-	36	0
K	Ca	Sc							Ge	Gallium	As	Arsenic	Se	Selenium	Br	Bromine	Kr	Krypton			
39.1	40.1	45.0							72.6	69.7	74.9	79.0	79.9	83.8							
5	1+	38	2+	39	3+						50	4+	51	3-	52	2-	53	1-	54	0	
Rb	Sr	Y						In	Tin	Sb	Antimony	Te	Tellurium	I	Iodine	Xe	Xenon				
85.5	87.6	88.9						114.8	118.7	121.8	127.6	126.9	131.3								
6	1+	56	2+	57	3+					82	2+	83	3+	84	2+	85	1-	86	0		
Cs	Ba	La					Pb	Lead	Bi	Bismuth	Po	Polonium	At	Astatine	Rn	Radon					
132.9	137.3	138.9					207.2	209.0	(209)	(210)	(222)										
7	1+	88	2+	89	3+				113	114	115	116	117	118	119	120	121	122			
Fr	Ra	Ac				Uub*	Uut*	Uuq*	Uup*	Uuh*	Uuo*										
(223)	(226)	(227)				(285)	(284)	(288)	(288)	(292)	(294)										

3. Identify the information listed below for the element beryllium. Refer to the periodic table below.

- symbol
- name of family
- number of protons
- number of electrons
- atomic number
- name of family of elements to its left

4. Determine whether each statement below describes a physical property or a chemical property of an element. If the statement describes a physical property, indicate whether it is a qualitative property or a quantitative property.

- It is a pale yellow gas at room temperature.
- It can burn or etch glass permanently.
- Its density is 1.695 g/L.
- It explodes when it reacts with water.

## Inquiry Check

- 5. Analyze** The chemical formulas of four molecules are shown below:
- $\text{H}_2$
  - $\text{Cl}_2$
  - $\text{P}_4$
  - $\text{S}_8$
- a)** How many atoms make up each molecule?  
**b)** What is the name of each molecule?
- 6. Analyze** The chemical formulas of six compounds are shown below.
- $\text{H}_2\text{O}$
  - $\text{CO}_2$
  - $\text{CO}$
  - $\text{NaCl}$
  - $\text{H}_2\text{O}_2$
  - $\text{NaHCO}_3$
- a)** Identify the name of the elements that make up each compound.  
**b)** Identify each compound.  
**c)** How many atoms of each element are there in each compound?

## Numeracy and Literacy Check

- 7. Calculate** The densities of three metals are given in the table below. Each of these metals is shown in an “exploded view” on the previous page.

Density of Three Metals

Name and Symbol	Density ( $\text{g}/\text{cm}^3$ )
aluminum (Al)	8.9
iron (Fe)	7.9
nickel (Ni)	2.7

One of these metals has a mass of 10 g and a volume of  $1.12 \text{ cm}^3$ . Determine the identity and atomic number of the metal. Show all your work.

- 8. Draw** Make a sketch of the icon(s) you would expect to see in an activity or an investigation that involves the use of a chemical that can cause burns to the skin.
- 9. Write** Skim the pages of Unit 2. Use a main idea web to record the three or four main ideas you will learn in this unit.

