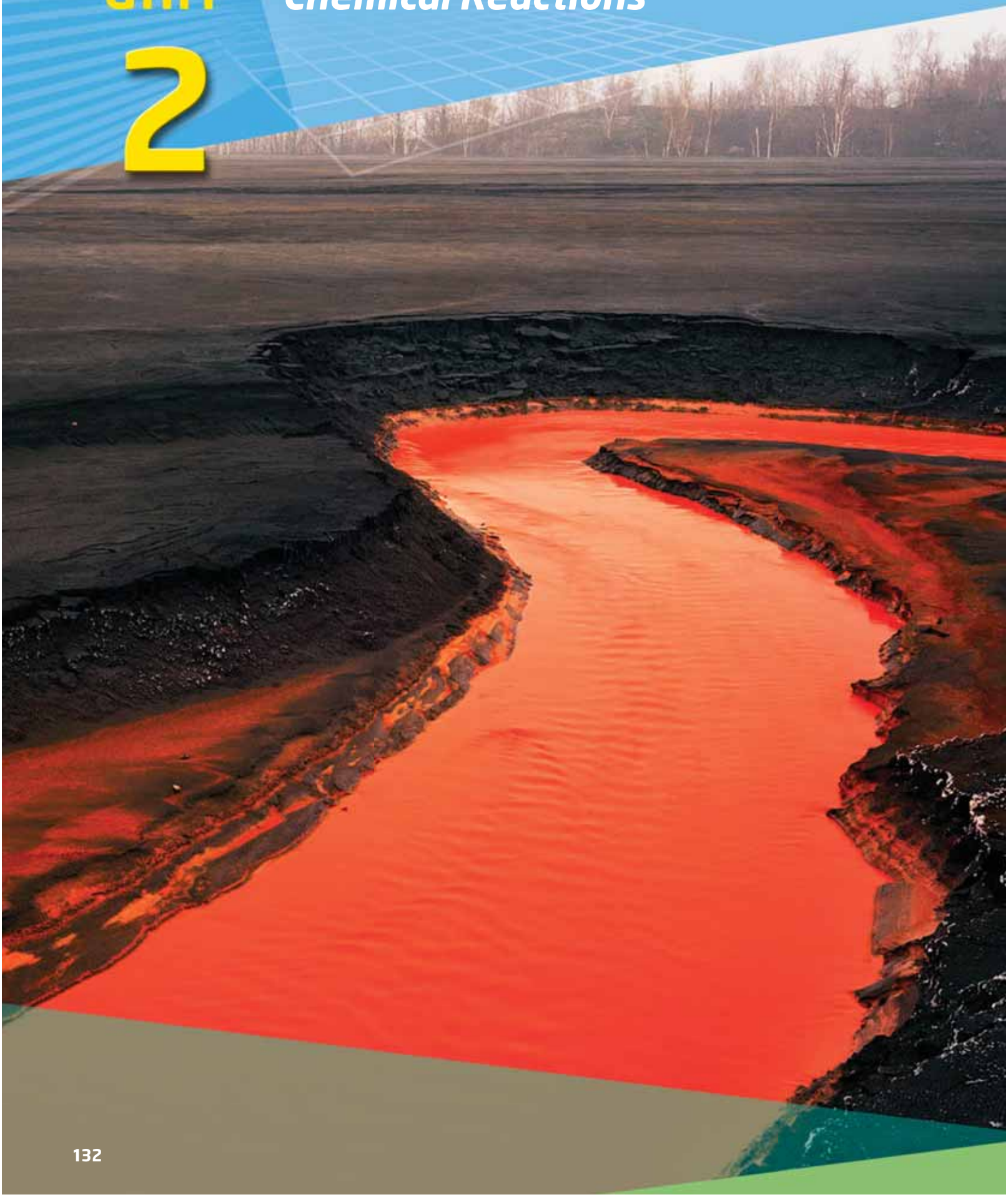
UNIT 2

Chemical Reactions



BIG IDEAS

- Chemical reactions may have a negative impact on the environment, but they can also be used to address environmental challenges.
- Chemicals react with each other in predictable ways.

This river gets its astonishing red colour from nickel tailings—what is left after most of the nickel has been extracted from its ore. The colour comes from red, iron-containing compounds.

Sudbury, rich in nickel and other metals, supports industry that provides thousands of jobs and produces metal used to make countless useful items. But 100 years of metal processing has taken its toll on the area. By the late 1970s, over 100 000 ha of land in and around Sudbury had become barren due to pollution.

People in Sudbury have been working to reclaim this land. They have used one chemical—limestone—to help restore the soil to its natural levels of acidity. They have used other chemicals—fertilizers—to encourage the growth of trees and grass.

In this unit, you will learn how chemicals react. You will see how chemical reactions can result in useful products, while also sometimes damaging the environment. Chemical reactions, however, can also be used to reverse that damage.

What properties of limestone enable it to restore acidified soil?

Get Ready for Unit 2

Concept Check

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

compound	ion	valence
element	metal	

a. A(n) _____ is a pure substance that cannot be broken down further by physical or chemical means.

b. A(n) _____ is a substance that can be broken down into elements by chemical means.

c. Molecular compounds are formed when a non-metal bonds with a(n) _____.

d. _____ electrons are those found in an atom's outermost occupied energy level.

e. A(n) _____ is an atom that has lost or gained valence electrons.

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		

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

a. symbol

b. name of group

c. number of protons

d. number of electrons

e. atomic number

f. number of neutrons in an isotope with a mass number of 9

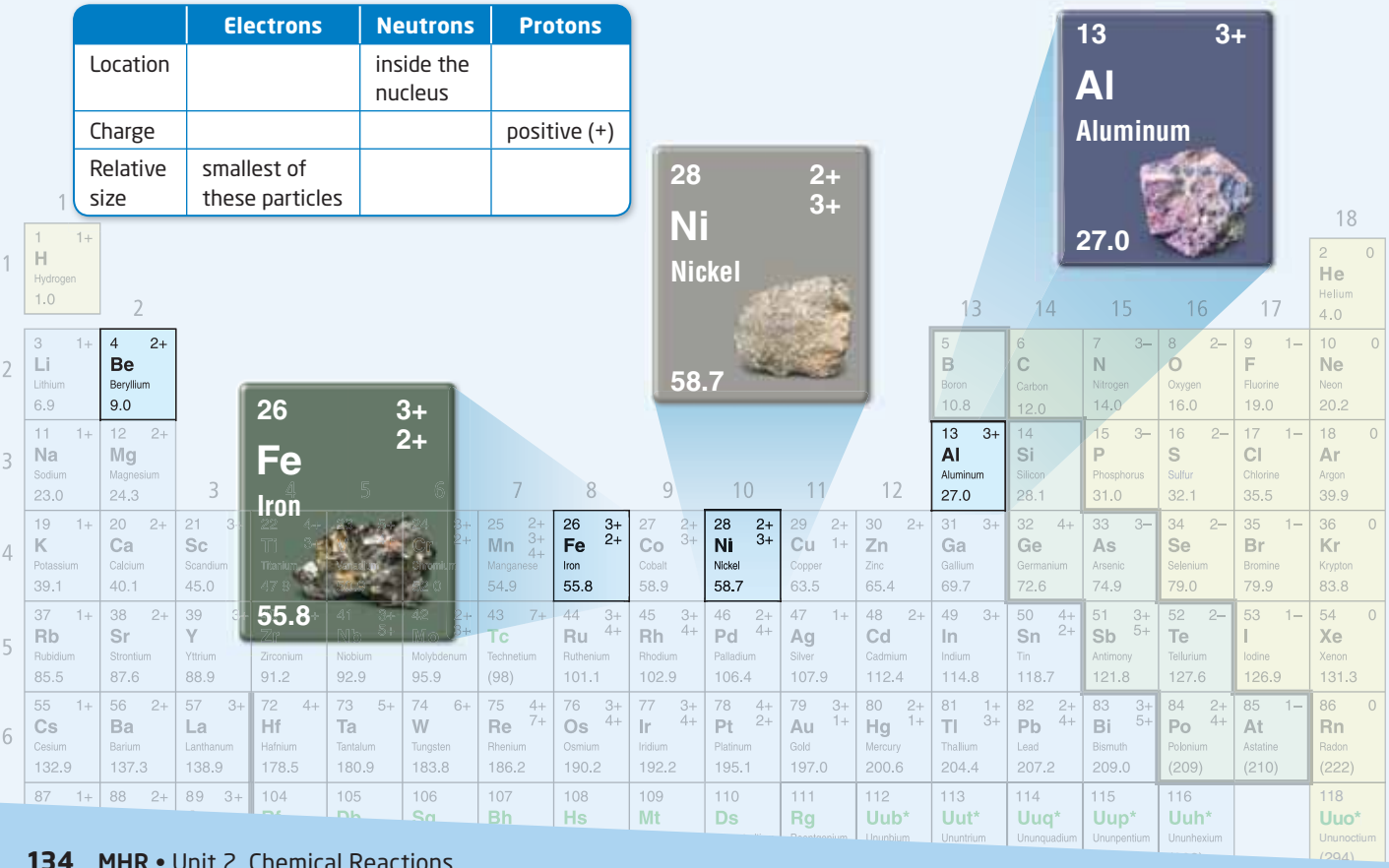
4. Determine whether each statement below describes a physical property or a chemical property of an element. If the statement describes a physical property, indicate whether it is a qualitative property or a quantitative property.

a. It is a pale yellow gas at room temperature.

b. It can burn or etch glass permanently.

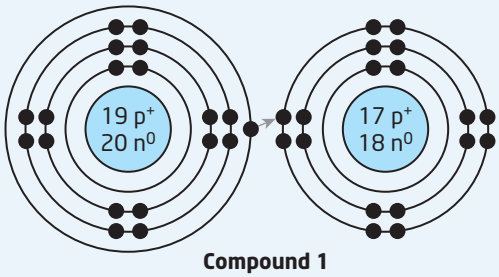
c. Its density is 1.695 g/L.

d. It explodes when it reacts with water.



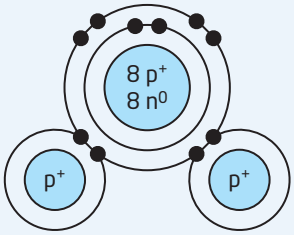
Inquiry Check

5. Analyze Bohr-Rutherford diagrams for two compounds, and their melting points and boiling points are shown below.



Compound 1

melting point = 775°C; boiling point = 1500°C



Compound 2

melting point = 0°C; boiling point = 100°C

a. What elements are represented in compound 1 and compound 2?

b. Determine which diagram shows an ionic compound and which shows a molecular compound. Justify your answer.

c. Determine the chemical formulas and names for the compounds.

Numeracy and Literacy Check

6. Balance Equations During a chemical reaction, atoms cannot be created or destroyed. Consider the blue and yellow spheres below as atoms. Is this equation balanced? If not, what is missing from which side?

7. Calculate The densities of three metals are given in the table below.

Density of Three Metals

Name and Symbol	Density (g/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 cm^3. Determine the identity and atomic number of the metal. Show all your work.

8. Write Complete a 3, 2, 1 organizer using the text on page 133. Include three interesting facts, two questions that you have, and one key idea in your organizer.

Looking Ahead to the Unit 2 Projects

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 256–257. Start a project folder now (either paper or electronic). Store ideas, notes, news clippings, website addresses, and lists of materials that might help you to complete your project.

Inquiry Project
Extract metallic copper from copper(II) carbonate.

An Issue to Analyze
Form an opinion about the retrieval of gold from e-waste.