Chapter 4 Developing Chemical Equations

What You Will Learn

In this chapter, you will learn how to...

- **identify**, **name**, and **write** the formulas of ionic and molecular compounds
- **write** and **balance** chemical equations
- **describe** how balanced chemical equations demonstrate the law of conservation of mass

Why It Matters

A chemically literate society can make informed decisions about health issues and help to reduce our impact on the environment. A key part of chemical literacy is being able to interpret chemical names and formulas of compounds, as well as the reactions that chemicals undergo.

Skills You Will Use

In this chapter, you will learn how to...

- **investigate** the law of conservation of mass in chemical reactions
- **develop** chemical equations for reactions using appropriate symbols

Imagine what this crash test dummy would look like if an air bag had not been deployed on impact. Air bag inflation systems rely on a chemical reaction that, once triggered, rapidly produces a certain amount of gas. This gas inflates the air bag. The development of air bags is just one example of many technologies that rely on chemical reactions. Key to these applications is the ability to identify the best chemicals to generate the desired products in predictable amounts.

Activity 4-1

Making a Reaction Happen

For chemicals to react, they must come in contact. However, chemicals such as baking soda and citric acid do not appear to react when added together. Additional conditions must be present for a reaction to occur. What could one of these conditions be?

Reactions require the right conditions in order to occur.

Safety Precautions

- Wear safety goggles and a lab apron.

Materials

- 1 L resealable plastic bag
- 2 scoops
- baking soda
- citric acid
- water

Procedure

1. Make a data table using the headings "Before Mixing with Water" and "After Mixing with Water." Give your table a title.
2. Place one scoop of baking soda in one corner of a resealable plastic bag. Add one scoop of citric acid in the same corner of the bag. Observe the bag for signs of a chemical reaction, and record your observations.
3. Twist the corner of the bag that contains the baking soda and citric acid. This will keep them dry as you place several millilitres of water in the other corner of the bag.
4. Press the air out of the bag, and seal the bag.
5. Untwist the corner of the bag, and mix the water with the baking soda and citric acid. Record your observations.

Questions

1. What evidence that a reaction took place did you observe?
2. What one condition was required for the reaction to occur?
3. How would you expect the mass of the bag and its contents to compare before the reaction and after the reaction? Explain your reasoning.

Study Toolkit

These strategies will help you use this textbook to develop your understanding of science concepts and skills.
To find out more about these and other strategies, refer to the Study Toolkit Overview, which begins on page 560.

Reading Effectively

Skim, Scan, or Study

As you read a chapter, the speed at which you read a section of text is determined by your *purpose* for reading. The table below shows three different purposes for reading, each with a different approach.

Purpose	Reading Approach
Preview text to get a general sense of what it contains.	Read quickly (skim).
Locate specific information.	Read somewhat quickly (scan).
Learn a new concept.	Read slowly (study).

Sometimes, you can determine the reading approach by the placement, treatment, or features of the text. For example, text that is placed at the beginning of a chapter or unit is often meant to stimulate interest and may not include important concepts. Text with several **boldfaced** words should probably be read slowly.

Use the Strategy

Choose the reading approach that you think should be used for each task below, and explain why.

1. Find the definition of the word *anion*.
2. Learn how to balance chemical equations.
3. Get a general idea about what Section 4.3 contains.

Now complete each task, and decide whether the reading approach you chose was appropriate.

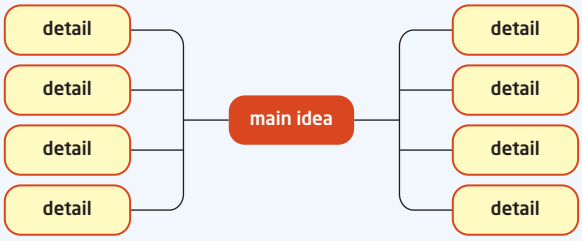
Organizing Your Learning

Identifying the Main Idea and Details

To identify the main idea in a chapter, section, or paragraph, use these strategies:

- Pay attention to titles, headings, and subheadings.
- Skim the text and visuals to get a general sense of the content.
- Note any terms that are boldfaced, italicized, or highlighted.

Facts and examples in the text provide details that help to support the main idea. A **spider map**, like the one below, is a visual way to organize the main idea and the supporting details.



Use the Strategy

Examine the section titled "Naming Binary Ionic Compounds" on page 142. Then draw a spider map to show the main idea and the supporting details in this section. Compare your spider map with a classmate's spider map, and discuss how you decided what to include.

Word Study

Base Words

A base is a word part that may or may not have another word part (such as a prefix or a suffix) added to it. To identify the base of a word, find the smallest word (usually a noun or a verb) within it. For example, in the word *polyatomic*, the base word is *atom*. You can use the meaning of the base word to understand the longer word.

Use the Strategy

Think about the word *reactant*. What is the base of this word? Use this base word to predict the meaning of *reactant*. Use a dictionary, or the Glossary at the end of the textbook, to check your prediction.