Chapter 5 Classifying Chemical Reactions

Materials

Please see the teaching notes for each activity for a list of the materials required. Please see page TR-31 for a summary of the materials required in this chapter and other chapters.

Advance Preparation

- Purchase aluminum foil and steel wool.
- Prepare class set of dropper bottles for 0.02 mol/L copper(II) chloride solution and saturated sodium phosphate solution.
- Gather sets of 15 cm magnesium ribbon, fine copper(II) sulfate crystals, calcium chloride crystals, sodium carbonate crystals; copper(II) carbonate solution, dilute sulfuric acid, saturated calcium hydroxide solution, calcium chloride, sodium carbonate, ammonium carbonate solution, 60 mL 3% hydrogen peroxide solution, yeast, universal indicator, molecular modelling kits, and spoons.

In this chapter, students will learn the signs of a chemical change as a way to describe chemical reactions, classify them, and predict the products of single displacement, double displacement, synthesis, and decomposition reactions.

Using the Chapter Opener

- Ask what features of hydrogen make it a good fuel source. For example, it is a plentiful resource available in our oceans and lakes, and causes little pollution. Examine the physical and chemical properties of hydrogen gas.
- Turn to page 181 and have students note that the space shuttle is powered by the reaction of hydrogen and oxygen.
- Survey the class for concerns related to hydrogen power such as ability to refuel, or explosive reactions.
- Students can review the Key Terms in Chapter 5 using **BLM 5-1 Chapter 5 Key Terms.**

Alternative Context

- Show a video clip of the Hindenberg zeppelin fire to illustrate potential hazards because of a chemical's properties. Helium was not used because it was both more expensive and restricted to military use during this pre-World War II time. For video clips of the Hindenburg, visit **www.scienceontario.ca**.

Activity 5-1 Foiled Again! (Student textbook page 177)

Pedagogical Purpose

Making accurate observations without inference is a critical skill in scientific inquiry. Recognizing the signs of chemical change is integral to understanding the reactions explored in this chapter. In this activity, students reactivate observation skills and understanding of the signs of a chemical reaction from previous science courses.

Planning		
Materials	50 mL saturated copper(II) chloride solution Two 250 mL beakers Water A few weeks before, begin gathering materials.	Spoon or other hard object 10 × 10 cm aluminum foil Paper towel
Time	20 min	
Safety	Wear goggles and an apron. Materials can become hot. Avoid touching the hot liquid or glass.	

Background

In the single displacement reaction carried out, the aluminum replaces the copper in the blue copper(II) chloride solution. At first, black dots appear on the foil. Then, as copper is displaced from the solution, it becomes visible as a red solid in the beaker. The reaction is complete when there is no copper(II) chloride solution left to react and the liquid becomes colourless. Excess aluminum foil may remain if it is not all used up in the reaction.

Activity Notes and Troubleshooting

- Alternative materials—Use hydrogen chloride and magnesium ribbon.
- Set up materials at two stations to reduce congestion.
- Summarize observation skills to be used before, during, and after the reaction. You may wish to provide **BLM G-36 Observation Skills** to students for this and future activities.
- You may wish to use **BLM A-1 Making Observations and Inferences Checklist** to assess this activity.
- Ensure all students are wearing goggles and understand the safety precautions.
- Have students work in pairs.
- Direct students to gently stir the mixture to speed up the reaction.
- Explain that the reaction is complete when the solution has lost all colour.
- Link back to the previous chapter by having the class develop the balanced equation for this reaction, shown on page 191 of the student textbook.

Additional Support

- ELL Encourage students to use coloured pencils to draw their observations.
- DI Have interpersonal learners describe what they see to a partner, as if they are on the phone and cannot see it.
- Record the reaction, then play it back on a large screen while the class states their observations.

Answers

1. The solution turned colourless because the copper (blue) separated from the solution and formed a precipitate.
2. The aluminum replaced the copper in the solution.

Study Toolkit

Strategy	Page Reference	Supporting Learners
Identifying Cause and Effect	As students read the Sample Problem on page 187, have them watch for the clue word *therefore*. In this instance, the arrow in the equation represents the "cause" of the decomposition. An understanding of the cause is beyond the scope of this course.	Refer students to the Study Toolkit Overview, in particular the Cause-and-Effect Map in Organizing Your Learning: Using Graphic Organizers, on page 566 of the student textbook. You may wish to have students use **BLM G-41 Cause-and-Effect Map** for this activity.
Monitoring Comprehension	Students can use a K-W-L chart to monitor their understanding of displacement reactions as they read page 191.	Refer students to Study Toolkit 2, on page 563 of the student textbook. You may wish to have students use **BLM G-48 K-W-L Chart** for this activity.
Creating a Word Map	Students can construct a word map for *catalyst* using information on page 201.	Refer students to the Study Toolkit Overview, in particular the word map portion of the Word Study section on page 561 of the student textbook. Work with English language learners to identify everyday analogies of catalysts. For example, a whisk speeds up scrambling of an egg, but does not become part of the mixture.