Chapter 1 Aqueous Solutions

Think back to the last time you were in a swimming pool. Was it for swimming lessons, swim-team practice, or having a fun time with your friends? If you have ever been in a pool for more than an hour, you know about the reactions that can occur because your body was exposed to the chemicals in the pool water: sore eyes, itchy skin, and hair that can feel like straw. For athletes playing water polo or training with swim teams, the effects of these chemical reactions may require taking preventative action.

Goggles prevent pool water from coming into contact with the sensitive tissues of the eye, since the plastic lens forms a water-tight boundary between the swimmer's eyes and the water. Similarly, a swim cap helps reduce the contact between a swimmer's hair and the water. This is particularly important for swimmers with blonde hair, as high concentrations of copper in the water have been known to leave a green film that can be noticeable on light-coloured hair.

Another way to reduce these problems is to go to a pool that uses salt water instead of a chlorination system. Many people find that saltwater pools have fewer of the unwanted side effects on eyes, hair, and skin.

A swimming pool is just one place where the properties of solutions are dependent upon the elements and compounds dissolved in them. In this chapter you will look at the building blocks of matter and explore how they connect with each other. You will study how many of the methods developed by scientists to disassemble and reassemble basic parts of matter involve solutions. These methods are used to produce many of the consumer goods you use today.

Try This Activity

Observing Properties

When a product is designed and manufactured, the raw materials are selected based upon their physical and chemical properties and other factors, such as availability and cost.

Science Skills

✓ Performing and Recording

Purpose

You will observe the properties of a number of different substances: aluminium foil, rock salt, and a strip of hard plastic.

Materials and Equipment

- large crystal of halite (or other rock salt)
- piece of vinyl (or other hard plastic)
- piece of aluminium foil
- conductivity meter
- Bunsen burner (or hot plate)
- tongs
- ice
- beaker

CAUTION!

Safety glasses are required for this activity.

Procedure

Read through this entire procedure. Set up a table to record your observations.

step 1: Describe each substance (rock salt, plastic, and aluminium foil). Include a description of the colour, texture, lustre, state, and hardness of each substance.

step 2: Bend each substance. How does each substance react to and recover from the stress of being bent?

step 3: Test the response of each substance to a change in temperature. Pick up a sample of each substance with tongs and carefully bring it near, but not touching, a source of heat (such as a Bunsen burner or a high-temperature hot plate). Take a cool sample of each substance and place it in your hand. Place an ice cube on the upper surface of the substance. Record the time it takes for you to feel the coldness from the ice on your hand.

step 4: Test the electrical conductivity of each substance. Connect a sample of each substance to a conductivity probe, and note if it conducts electricity.

step 5: Test how each substance reacts with water. Place a sample of each substance into a beaker with 50 mL of water for 3 min. Note any changes you observe.

Analysis

1. Looking at the properties you recorded, determine which substance (rock salt, plastic, or metal) would be best suited for each of the following products. Provide a reason for your choice.
   - **a.** lightweight sports gear
   - **b.** diving board
   - **c.** framing material of a building
   - **d.** a cable to conduct electricity
   - **e.** a protective covering for a cable that conducts electricity
   - **f.** heating tiles for a barbecue
   - **g.** the head of a hammer
2. Explain how a substance's properties can determine how you use that substance to make a tool.

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Legend: t = top, m = middle, b = bottom, l = left, r = right

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