Chapter

8

Acids and Bases

In this chapter, you will be able to

- experimentally determine the empirical properties, including pH, of acids and bases;
- design and conduct an experiment to determine the effect of dilution on pH;
- explain acids and bases, using both Arrhenius and Brønsted-Lowry theories;
- describe and explain the difference between strong and weak acids and bases;
- use the terms: ionization, dissociation, strong acid/base, weak acid/base, hydronium ion, proton transfer, conjugate acid/base, titration, titrant, and endpoint;
- write balanced chemical equations for reactions involving acids and bases;
- develop the skills involved in titration and solve stoichiometry problems using titration evidence;
- describe examples of solutions for which the concentration must be known and exact.

Acid indigestion, commercial antacid remedies for indigestion, pH-balanced shampoos—you don't have to look far in a drugstore to find labels referring to acids or acidity. Many people think that all acids are corrosive, and therefore dangerous, because solutions of acids react with many substances. Yet boric acid is used as an eyewash. Can this be as dangerous as it sounds?

References in the popular media offer no insight into what acids and bases are, or what they do. In fact, such references usually emphasize only one perspective, such as the environmental damage caused by an acid or the cleaning power of a base. As a result, popular ideas are often confusing. An amateur gardener who has just read an article describing the destruction of conifer forests by acid rain may be puzzled by instructions on a package of evergreen fertilizer stating that evergreens are acid-loving plants (**Figure 1**).

This chapter takes a historical approach, presenting evidence and following the development of theories about the substances we call acids and bases. These theories are used to explain and predict the behaviour of acids and bases.

Reflect on your Learning

1. What are some properties of acids?
2. How can you explain these properties of acids?
3. What are some properties of bases?
4. How can you explain these properties of bases?
5. How do your explanations in questions 2 and 4 account for the evidence that acids react with bases?

Try This Activity

Consumer Products

Look at home or in a store and read the labels on a variety of cleaning products such as drain, oven, wall, floor, window, and toilet bowl cleaners. Find the lists of ingredients as well as any caution notes.

For each product:

(a) Record the product name and the list of ingredients.
(b) Underline the ingredients on the list that you think are active. Give reasons for your choices.
(c) Classify as many of the active ingredients as you can as acids or bases.
(d) Record any warnings about mixing the product with other substances.
(e) Referring to your list in (d), state which combinations represent mixtures of acids and bases.

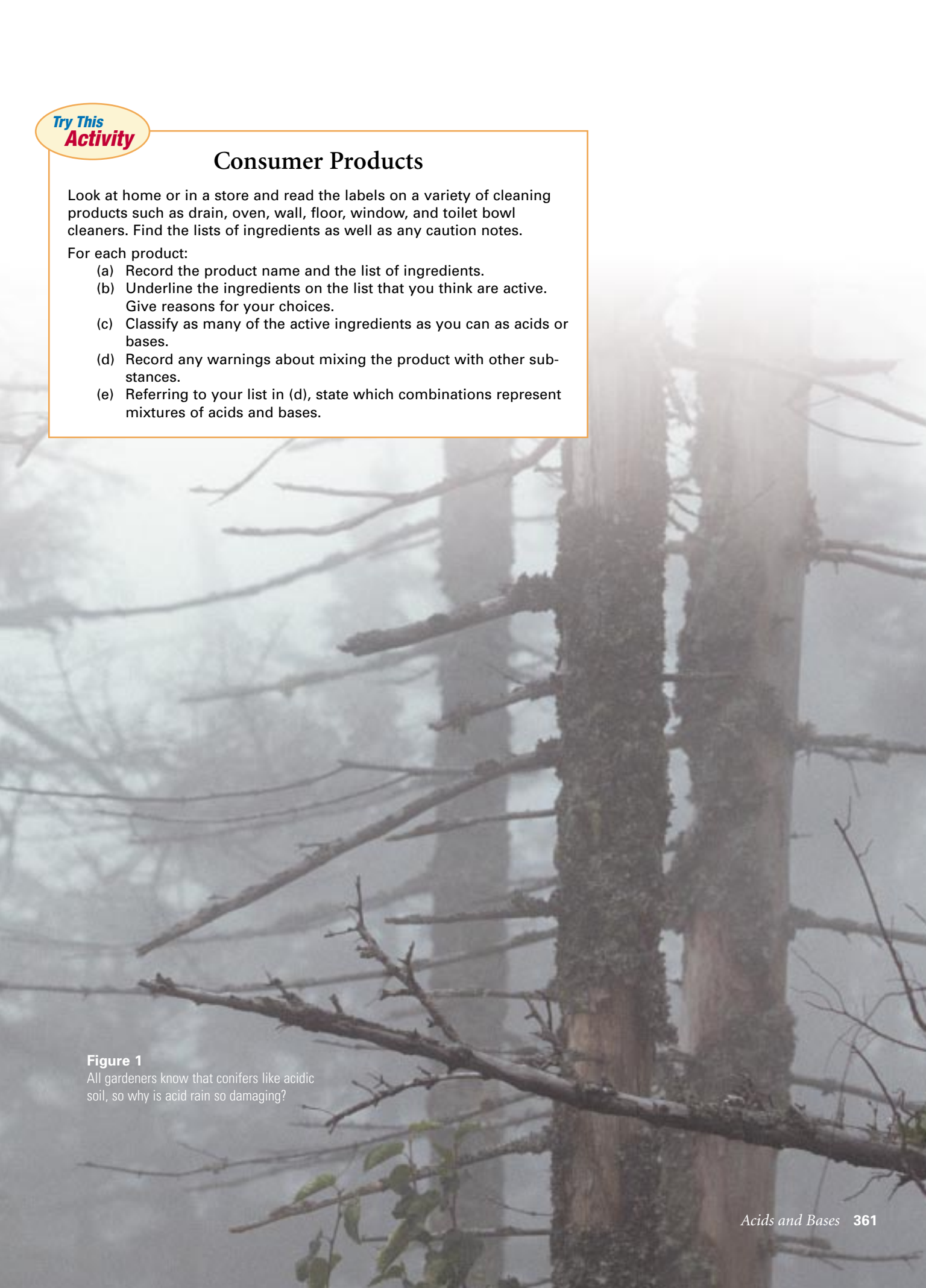

Figure 1
All gardeners know that conifers like acidic soil, so why is acid rain so damaging?