



## 3.5 Acids

### LEARNING OBJECTIVES

1. Define *acid*.
2. Name a simple acid.

There is one other group of compounds that is important to us—acids—and these compounds have interesting chemical properties. Initially, we will define an **acid** as an ionic compound of the  $\text{H}^+$  cation dissolved in water. (We will expand on this definition in [Chapter 12 "Acids and Bases"](#).) To indicate that something is dissolved in water, we will use the phase label (aq) next to a chemical formula (where aq stands for “aqueous,” a word that describes something dissolved in water). If the formula does not have this label, then the compound is treated as a molecular compound rather than an acid.

Acids have their own nomenclature system. If an acid is composed of only hydrogen and one other element, the name is *hydro-* + the stem of the other element + *-ic acid*. For example, the compound  $\text{HCl}(\text{aq})$  is hydrochloric acid, while  $\text{H}_2\text{S}(\text{aq})$  is hydrosulfuric acid. (If these acids were not dissolved in water, the compounds would be called hydrogen chloride and hydrogen sulfide, respectively. Both of these substances are well known as molecular compounds; when dissolved in water, however, they are treated as acids.)

If a compound is composed of hydrogen ions and a polyatomic anion, then the name of the acid is derived from the stem of the polyatomic ion’s name. Typically, if the anion name ends in *-ate*, the name of the acid is the stem of the anion name plus *-ic acid*; if the related anion’s name ends in *-ite*, the name of the corresponding acid is the stem of the anion name plus *-ous acid*. [Table 3.9 "Names and Formulas of Acids"](#) lists the formulas and names of a variety of acids that you should be familiar with. You should recognize most of the anions in the formulas of the acids.

Table 3.9 Names and Formulas of Acids

Formula	Name

Formula	Name
$\text{HC}_2\text{H}_3\text{O}_2$	acetic acid
$\text{HClO}_3$	chloric acid
$\text{HCl}$	hydrochloric acid
$\text{HBr}$	hydrobromic acid
$\text{HI}$	hydriodic acid
$\text{HF}$	hydrofluoric acid
$\text{HNO}_3$	nitric acid
$\text{H}_2\text{C}_2\text{O}_4$	oxalic acid
$\text{HClO}_4$	perchloric acid
$\text{H}_3\text{PO}_4$	phosphoric acid
$\text{H}_2\text{SO}_4$	sulfuric acid
$\text{H}_2\text{SO}_3$	sulfurous acid
<b>Note: The “aq” label is omitted for clarity.</b>	

## EXAMPLE 10

Name each acid without consulting [Table 3.9 "Names and Formulas of Acids"](#).

1.  $\text{HBr}$
2.  $\text{H}_2\text{SO}_4$

## Solution

1. As a binary acid, the acid's name is *hydro- + stem name + -ic acid*. Because this acid contains a bromine atom, the name is hydrobromic acid.
2. Because this acid is derived from the sulfate ion, the name of the acid is the stem of the anion name + *-ic acid*. The name of this acid is sulfuric acid.

## *Test Yourself*

Name each acid.

1. HF
2.  $\text{HNO}_2$

## *Answers*

1. hydrofluoric acid
2. nitrous acid

All acids have some similar properties. For example, acids have a sour taste; in fact, the sour taste of some of our foods, such as citrus fruits and vinegar, is caused by the presence of acids in food. Many acids react with some metallic elements to form metal ions and elemental hydrogen. Acids make certain plant pigments change colors; indeed, the ripening of some fruits and vegetables is caused by the formation or destruction of excess acid in the plant. In [Chapter 12 "Acids and Bases"](#), we will explore the chemical behavior of acids.

Acids are very prevalent in the world around us. We have already mentioned that citrus fruits contain acid; among other compounds, they contain citric acid,  $\text{H}_3\text{C}_6\text{H}_5\text{O}_7(\text{aq})$ . Oxalic acid,  $\text{H}_2\text{C}_2\text{O}_4(\text{aq})$ , is found in spinach and other green leafy vegetables. Hydrochloric acid not only is found in the stomach (stomach acid) but also can be bought in hardware stores as a cleaner for concrete and masonry. Phosphoric acid is an ingredient in some soft drinks.

## KEY TAKEAWAYS

- An acid is a compound of the  $\text{H}^+$  ion dissolved in water.
- Acids have their own naming system.
- Acids have certain chemical properties that distinguish them from other compounds.

## EXERCISES

1. Give the formula for each acid.

- perchloric acid
- hydriodic acid

2. Give the formula for each acid.

- hydrosulfuric acid
- phosphorous acid

3. Name each acid.

- $\text{HF}(\text{aq})$

- b.  $\text{HNO}_3(\text{aq})$
- c.  $\text{H}_2\text{C}_2\text{O}_4(\text{aq})$

4. Name each acid.

- a.  $\text{H}_2\text{SO}_4(\text{aq})$
- b.  $\text{H}_3\text{PO}_4(\text{aq})$
- c.  $\text{HCl}(\text{aq})$

5. Name an acid found in food.

6. Name some properties that acids have in common.

## ANSWERS

1. a.  $\text{HClO}_4(\text{aq})$   
b.  $\text{HI}(\text{aq})$

3. a. hydrofluoric acid  
b. nitric acid  
c. oxalic acid

5. oxalic acid (answers will vary)

