



**FIGURE 5** Strong electrolytes, such as  $\text{NaCl}$ , yield only ions when they dissolve in aqueous solution. Weak electrolytes, such as  $\text{HF}$ , exist as both ions and unionized molecules in aqueous solution. Nonelectrolytes, such as sucrose,  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ , do not form any ions in aqueous solution.

## Strong and Weak Electrolytes

As discussed in Chapter 12, substances that yield ions and conduct an electric current in solution are electrolytes. Substances that do not yield ions and do not conduct an electric current in solution are nonelectrolytes. Hydrogen chloride is one of a series of compounds composed of hydrogen and the members of Group 17 (known as the halogens). The hydrogen halides are all molecular compounds with single polar-covalent bonds. All are gases, all are very soluble in water, and all are electrolytes. Hydrogen chloride, hydrogen bromide, and hydrogen iodide strongly conduct an electric current in an aqueous solution. However, hydrogen fluoride only weakly conducts an electric current at the same concentration. The strength with which substances conduct an electric current is related to their ability to form ions in solution, as shown in **Figure 5**.

### Strong Electrolytes

Hydrogen chloride, hydrogen bromide, and hydrogen iodide are 100% ionized in dilute aqueous solution. A **strong electrolyte** is any compound whose dilute aqueous solutions conduct electricity well; this is due to the presence of all or almost all of the dissolved compound in the form of ions. Hydrogen chloride, hydrogen bromide, and hydrogen iodide are all acids in aqueous solution. These acids, several other acids, and all soluble ionic compounds are strong electrolytes.

The distinguishing feature of strong electrolytes is that to whatever extent they dissolve in water, they yield only ions. For example, some strong electrolytes, such as  $\text{NaCl}$ , may be highly soluble in water and form ions in solution. Others may not dissolve much, but the amount that does dissolve exists solely as ions in solution.



**Module 8:** Strong and Weakly Ionized Species, pH, and Titrations