Assuming 100% dissociation, a solution that contains 1 mol of sodium chloride contains 1 mol of Na^+ ions and 1 mol of Cl^- ions. In this book, you can assume 100% dissociation for all soluble ionic compounds. The dissociation of NaCl can be represented as follows.

$$\underset{1\text{ mol}}{NaCl(s)} \xrightarrow{H_2O} \underset{1\text{ mol}}{Na^+(aq)} + \underset{1\text{ mol}}{Cl^-(aq)}$$

A solution that contains 1 mol of calcium chloride contains 1 mol of Ca^{2+} ions and 2 mol of Cl^- ions—a total of 3 mol of ions.

$$\underset{1\text{ mol}}{CaCl_2(s)} \xrightarrow{H_2O} \underset{1\text{ mol}}{Ca^{2+}(aq)} + \underset{2\text{ mol}}{2Cl^-(aq)}$$

SAMPLE PROBLEM A

Write the equation for the dissolution of aluminum sulfate, $Al_2(SO_4)_3$, in water. How many moles of aluminum ions and sulfate ions are produced by dissolving 1 mol of aluminum sulfate? What is the total number of moles of ions produced by dissolving 1 mol of aluminum sulfate?

SOLUTION

1 ANALYZE

Given: amount of solute = 1 mol $Al_2(SO_4)_3$
solvent identity = water

Unknown: **a.** moles of aluminum ions and sulfate ions
b. total number of moles of solute ions produced

2 PLAN

The coefficients in the balanced dissociation equation will reveal the mole relationships, so you can use the equation to determine the number of moles of solute ions produced.

$$Al_2(SO_4)_3(s) \xrightarrow{H_2O} 2Al^{3+}(aq) + 3SO_4^{2-}(aq)$$

3 COMPUTE

a. 1 mol $Al_2(SO_4)_3 \rightarrow$ 2 mol Al^{3+} + 3 mol SO_4^{2-}
b. 2 mol Al^{3+} + 3 mol SO_4^{2-} = 5 mol of solute ions

4 EVALUATE

The equation is correctly balanced. Because one formula unit of $Al_2(SO_4)_3$ produces 5 ions, 1 mol of $Al_2(SO_4)_3$ produces 5 mol of ions.

PRACTICE

Answers in Appendix E

1. Write the equation for the dissolution of each of the following in water, and then determine the number of moles of each ion produced as well as the total number of moles of ions produced.
   a. 1 mol ammonium chloride
   b. 1 mol sodium sulfide
   c. 0.5 mol barium nitrate

extension
Go to **go.hrw.com** for more practice problems that ask you to calculate moles of ions produced in dissociation.
Keyword: HC6IONX