CAREERS in Chemistry

Pharmacist

Pharmacists work in many areas of healthcare. Traditionally, they have dispensed medications in pharmacies. Today, pharmacists work with other health professionals to develop and implement customized drug treatment plans. They advise medical professionals on the side effects of and interactions between medicines. Increasingly, pharmacists are working in nontraditional settings, such as in managed-care companies, pharmaceutical companies, and governmental agencies. In these settings, pharmacists establish drug guidelines, conduct drug reviews, and assist in the research and development of new drugs.

Binary Ionic Compounds

Compounds composed of two elements are known as **binary compounds.** In a binary ionic compound, the total numbers of positive charges and negative charges must be equal. Therefore, the formula for such a compound can be written given the identities of the compound's ions. For example, magnesium and bromine combine to form the ionic compound magnesium bromide. Magnesium, a Group 2 metal, forms the Mg^{2+} cation. Note that the $^{2+}$ in Mg^{2+} is written as a superscript. Bromine, a halogen, forms the Br^- anion when combined with a metal. In each formula unit of magnesium bromide, two Br^- anions are required to balance the 2+ charge of the Mg^{2+} cation. The compound's formula must therefore indicate one Mg^{2+} cation and two Br^- anions. The symbol for the cation is written first.

Ions combined: Mg^{2+}, Br^-, Br^- *Chemical formula:* $MgBr_2$

Note that the $_2$ in Br_2 is written as a subscript. The charges of the ions are not included in the formula. This is usually the case when writing formulas for binary ionic compounds.

As an aid to determining subscripts in formulas for ionic compounds, the positive and negative charges can be "crossed over." Crossing over is a method of balancing the charges between ions in an ionic compound. For example, the formula for the compound formed by the aluminum ion, Al^{3+}, and the oxide ion, O^{2-}, is determined as follows.

1. *Write the symbols for the ions side by side. Write the cation first.*

$$Al^{3+}\ O^{2-}$$

2. *Cross over the charges by using the absolute value of each ion's charge as the subscript for the other ion.*

$$Al_2^{3+}\ O_3^{2-}$$

3. *Check the subscripts and divide them by their largest common factor to give the smallest possible whole-number ratio of ions. Then write the formula.*

Multiplying the charge by the subscript shows that the charge on two Al^{3+} cations ($2 \times 3+ = 6+$) equals the charge on three O^{2-} anions ($3 \times 2- = 6-$). The largest common factor of the subscripts is 1. The correct formula is therefore written as follows.

$$Al_2O_3$$

Naming Binary Ionic Compounds

The **nomenclature,** *or naming system,* of binary ionic compounds involves combining the names of the compound's positive and negative ions. The name of the cation is given first, followed by the name of