

# Chapter 4 Nomenclature

## 4.1 Naming Binary Compounds

### Key Terms

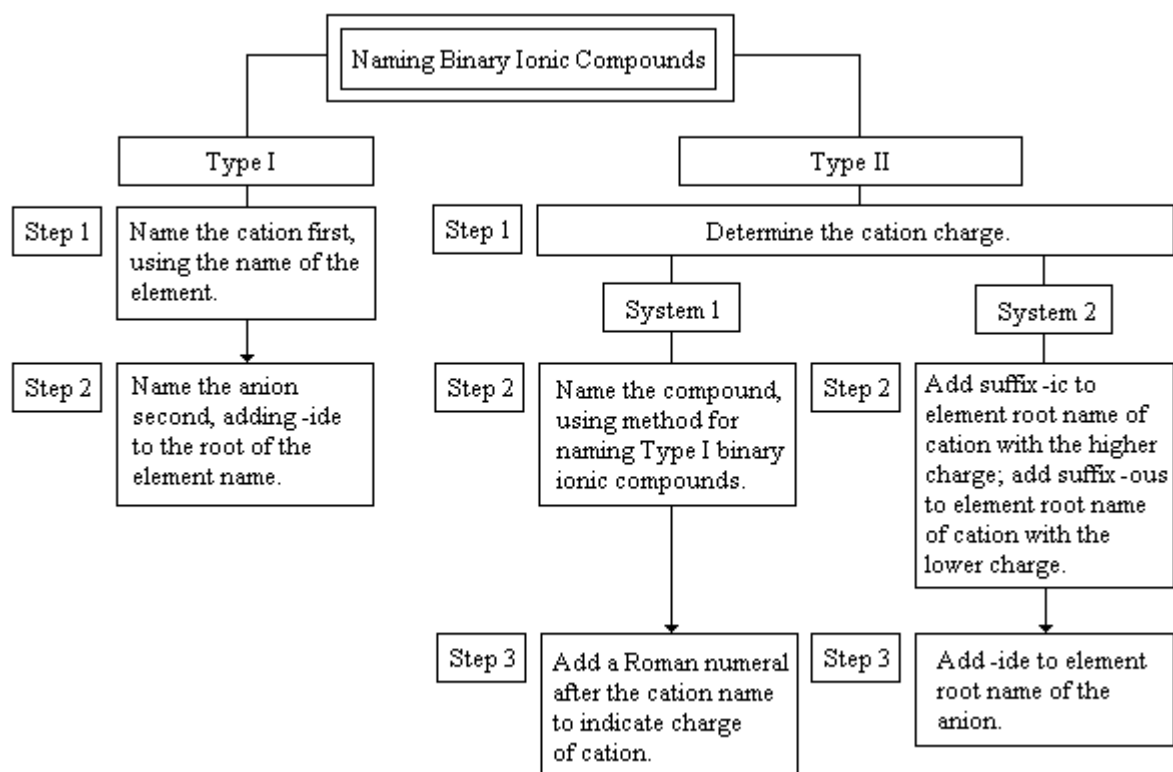
binary compound

binary ionic compound

### Summary

A compound that is made up of two elements is called a *binary compound*. When a metal combines with a nonmetal, the compound that is formed is called a *binary ionic compound*. A binary ionic compound contains ions. The metal loses one or more electrons to become a cation, and the nonmetal gains one or more electrons to become an anion. The positive ion is always written first in the formula, and the negative ion is written second.

It is convenient to group binary ionic compounds into two types: Type I binary ionic compounds and Type II binary ionic compounds. Type I binary ionic compounds contain metal atoms that can form only one type of cation. Type II binary ionic compounds are formed from metal atoms that can form two or more types of cations with different charges.



Type III binary compounds contain only nonmetals. In naming these compounds, the first element in the formula is named first, and the full element name is used. The second element is

named as though it were an anion according to the rules summarized above. Prefixes (word beginnings) are used to tell how many atoms are present.

Each of the three types of binary compounds has a specific strategy for naming it. *Type I binary ionic compounds* are formed from metals that always form a cation with the same charge. *Type II binary ionic compounds* are formed from metals that form cations with various charges. *Type III binary compounds* contain only nonmetals. When determining which type of compound you are naming, use the periodic table to help you identify metals and nonmetals and to find out which elements form only one type of cation and which form more than one.

## 4.2 Naming and Writing Formulas for More Complex Compounds

### Key Terms

polyatomic ions

oxyanions

acids

### Summary

*Polyatomic ions* consist of several atoms bound together and carry an overall positive or negative charge. The names and charges of polyatomic ions must be memorized in order to name the compounds that contain them. Table 4.4 lists the most common polyatomic ions. One type of polyatomic anion contains an element plus different numbers of oxygen atoms. These anions are called *oxyanions*. The rules for naming ionic compounds that contain polyatomic ions are similar to those for naming binary ionic compounds. These rules are summarized in section 4.1 above.

*Acids* are substances that produce  $H^+$  ions when dissolved in water. An acid is a molecule with one or more  $H^+$  ions attached to an anion. The rules for naming acids depend on whether the anion contains oxygen. If the anion does not contain oxygen, the acid is named with the prefix *hydro-* and the suffix *-ic* attached to the root of the element name. When the anion contains oxygen, the acid name is formed from the root of the central element name of the anion or the anion name, with the suffix *-ic* or *-ous*. When the anion name ends in *-ate*, the suffix *-ic* is used. When the anion's suffix is *-ite*, the suffix *-ous* is used in the acid name.

It is necessary to learn the name, composition, and charge of each of the common polyatomic anions and the  $NH_4^+$  cation by formula and by name in order to be able to write the compound's name given its formula or the compound's formula given its name.

### Additional Active Reading Questions

1. What types of elements make up a binary ionic compound?
2. What kind of metal atoms form Type I binary ionic compounds?
3. What are two names for  $FeCl_2$ ?
4. Which type of binary compound uses prefixes to indicate how many atoms of the elements are present?

5. For each item below, use Table 4.4 to find the chemical formula that matches the name or the name that matches the chemical formula.

a. sulfate  
c. carbonate

b.  $\text{C}_2\text{H}_3\text{O}_2^-$   
d. ammonium

6. Describe an acid molecule.

7. What acid is formed from the sulfate ( $\text{SO}_4^{2-}$ ) anion? the sulfite ( $\text{SO}_3^{2-}$ ) anion?