

# NAMING IONIC COMPOUNDS I

Ionic compounds are named by the following simple rule:

**Name the cation;** then **name the anion.**

For example, **NaCl** is named **sodium chloride**. "NaCl" is the **formula** for the compound; "sodium chloride" is the **name** of the compound.

Notes:

1. Cations are positive ions. The **sodium** ion is **Na<sup>+</sup>**.
2. Anions are negative ions. The **chloride** ion is **Cl<sup>-</sup>**.
3. The positive ion (cation) is named before the negative ion (anion).
4. Metals form cations, e.g., **K<sup>+</sup>**, **Mg<sup>2+</sup>**, **Al<sup>3+</sup>**.
5. Nonmetals form anions, e.g., **I<sup>-</sup>**, **O<sup>2-</sup>**, **N<sup>3-</sup>**.
6. A metal ion is named simply with the name of the metal. **Ag<sup>+</sup>** is a **silver** ion.
7. A nonmetal ion ends with "ide". **Br<sup>-</sup>** is a **bromide** ion. **S<sup>2-</sup>** is a **sulfide** ion.
8. Subscripts in the formula do not appear in the name. **CaCl<sub>2</sub>** is named **calcium chloride**. **Al<sub>2</sub>O<sub>3</sub>** is named **aluminum oxide**.

You should be able to name the following:

- |                      |                                   |                                    |
|----------------------|-----------------------------------|------------------------------------|
| a. NaI               | h. Na <sub>2</sub> O              | o. BeI <sub>2</sub>                |
| b. KBr               | i. Li <sub>3</sub> N              | p. ZnTe                            |
| c. MgF <sub>2</sub>  | j. ZnS                            | q. CaF <sub>2</sub>                |
| d. CaO               | k. AlN                            | r. Ag <sub>2</sub> Se              |
| e. BaS               | l. AgCl                           | s. BaO                             |
| f. CaI <sub>2</sub>  | m. KF                             | t. Na <sub>3</sub> P               |
| g. AlCl <sub>3</sub> | n. Al <sub>2</sub> S <sub>3</sub> | u. Ba <sub>3</sub> As <sub>2</sub> |

Answers are on the other side.

# WRITING IONIC FORMULAS I

Formulas for ionic compounds are written by these rules:

**Rule 1 Write the formula (symbol) for the cation (without the charge) followed by a subscript; write the formula (symbol) for the anion (without the charge) followed by a subscript.**

**Rule 2** Subscripts are chosen so that the charges in a compound add to zero.

Notes:

1. The charges on the ions must be known before the formula can be written.

The ionic charges are as follows:

Group IA metals always form +1 ions:  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , etc.

Group IIA metals always form +2 ions:  $\text{Be}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ , etc.

Aluminum (in IIIA) always forms a +3 ion:  $\text{Al}^{3+}$ .

Zinc (in IIB) always forms a +2 ion:  $\text{Zn}^{2+}$ .

Silver (in IB) always forms a +1 ion:  $\text{Ag}^+$ .

Group VIIA always form -1 ions:  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ .

Group VIA always form -2 ions:  $\text{O}^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{Se}^{2-}$ ,  $\text{Te}^{2-}$

Group VA always form -3 ions:  $\text{N}^{3-}$ ,  $\text{P}^{3-}$ ,  $\text{As}^{3-}$

2. The subscript after the ionic formula indicates the number of those ions in the compound.

3. A subscript of one (1) is not written.

4. The cation charge times its subscript plus the anion charge times its subscript must equal zero.

5. Usually the subscripts can be determined by making the charge on an anion the subscript on the cation (leave off the minus sign) and making the charge on the cation the subscript on the anion.

6. Subscripts should be reduced to the lowest integer numbers. (e.g.,  $\text{Ba}_2\text{O}_2 \longrightarrow \text{BaO}$ )

7. Charges should not appear in the formula (of a neutral compound). (e.g.,  $\text{BaO}$  **not**  $\text{Ba}^{2+}\text{O}^{2-}$ )

To write the formula for **magnesium fluoride**,

Determine the charges: magnesium ion is  $\text{Mg}^{2+}$  and the fluoride ion is  $\text{F}^-$ .

Try subscripts 1 (the |charge| of the anion) and 2 (the charge of the cation).  $\text{Mg F} \longrightarrow \text{Mg}_1\text{F}_2$

The formula is:  **$\text{MgF}_2$**  (Notice: "1", "+", and "-" do not appear.)

The sum of the charges equals zero:  $1 \times (+2) + 2 \times (-1) = 0$



You should be able to write formulas for the following: (Answers are on the other side.)

a. sodium iodide

b. potassium bromide

c. magnesium fluoride

d. calcium oxide

e. barium sulfide

f. calcium iodide

g. aluminum chloride

h. sodium oxide

i. lithium nitride

j. zinc sulfide

k. aluminum nitride

l. silver chloride

m. potassium fluoride

n. aluminum sulfide

o. beryllium iodide

p. zinc telluride

q. calcium fluoride

r. silver selenide

s. barium oxide

t. sodium phosphide

u. barium arsenide