

Writing Binary Ionic Compound Formulas

THIS PRESENTATION WILL EXPLAIN HOW TO WRITE THE FORMULAS FOR BINARY IONIC COMPOUNDS.



A binary ionic compound contains an ion that is a metal (**cation**) and an ion that is a nonmetal (**anion**).

IONIC COMPOUND = METALLIC ION + NONMETALLIC ION

Determining Charge on Cations

- ▶ (1) Metallic ions will have a positive charge. Ions of metals in the first column of the periodic table (IA) will have a 1+ charge.
 - ▶ Example: Lithium ion is written as Li^{1+} ; the potassium ion is written as K^{1+} .
- ▶ (2) Metals in the second column (2A) will have a 2+ charge.
 - Example: Magnesium ion is written Mg^{2+} ; the calcium ion is written Ca^{2+} .
- ▶ (3) Aluminum ion has a 3+ charge (Al^{3+}).
- ▶ (4) Transition metals have some elements with only one charge (silver ion is always Ag^{1+}) and some elements with more than one possible charge (iron ion can be either Fe^{2+} or Fe^{3+}).

Determining Charge on Anions

- ▶ (1) A nonmetallic element's placement on the periodic table will give you an indication as to the charge on the ion.
 - ▶ Ions of the halogen elements (Group 7A) are always 1-. For example, the fluoride ion is written F^{1-} .
 - ▶ Ions formed from the first three elements in group 6A always form 2- ions. For example, the oxide ion is O^{2-} and the sulfide ion is always S^{2-} .
 - ▶ Ions formed from the first two elements in group 5A always form 3- ions. Those ions would be the nitride ion (N^{3-}) and the phosphide ion (P^{3-}).
- ▶ (2) Note that all of the anions end in the suffix *-ide*.

Determining Binary Ionic Compound Formulas

- ▶ The guiding principle when writing binary ionic compound formulas is that the positive charges on the cation must balance the negative charges on the anion.
- ▶ Examples: For Na^{1+} and Cl^{1-} , the resulting formula would be NaCl (1 positive charge balanced with one negative charge); for Ca^{2+} and I^{1-} , the resulting formula would be CaI_2 because you will need 2 negative charges from iodide ions to balance the positive 2 charge on the calcium ion.
- ▶ One easy way to determine the formula if the charges do not cancel out is to use the “criss-cross” method.
 - ▶ (1) Write the cation first with its charge
 - ▶ (2) Write the anion second with its charge.
 - ▶ (3) Drop the “+” and “-” signs and bring the number of the charge down as a subscript for the other element. The result should be the correct formula for that compound.

Examples of Binary Ionic Compound Formulas

