Ionic Compounds: Formulas and Names

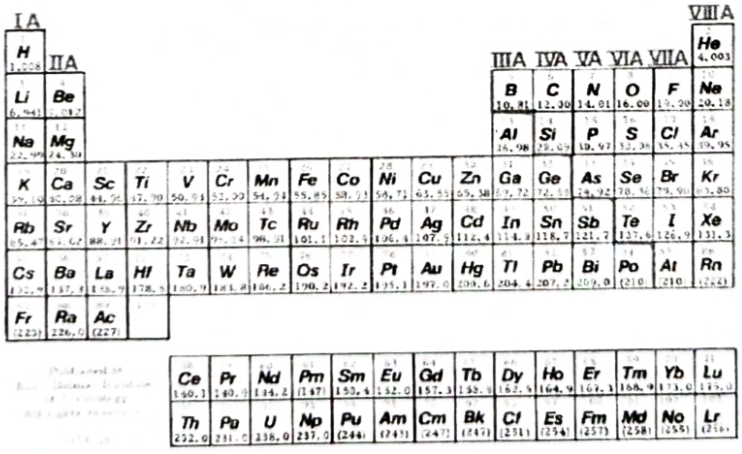
Compounds are neutral (0 charge)

Achieve the smallest whole number ratio of cations to anions

Binary compounds containing a metal that forms only one type of cation:

Name of cation + name of anion + ide
metal nonmetal

Periodic Table



Metals lose electrons to form positively charged ions (cations)
Nonmetals gain electrons to form negatively charged ions (anions)

Metal	Nonmetal
Na	Cl
Ca	O
K	S
Sr	F

Formula	Name
NaCl	Sodium chloride
CaO	Calcium oxide
K_2S	Potassium sulfide
SrF_2	Strontium fluoride

Metals that form more than one type of cation

Metal	Ion	Name
Chromium	Cr^{2+} Cr^{3+}	Chromium(II) Chromium(III)
Iron	Fe^{2+} Fe^{3+}	Iron(II) Iron(III)
Cobalt	Co^{2+} Co^{3+}	Cobalt(II) Cobalt(III)
Copper	Cu^{+} Cu^{2+}	Copper(I) Copper(II)
Tin	Sn^{2+} Sn^{4+}	Tin(II) Tin(IV)
Mercury	Hg_2^{2+} Hg^{2+}	Mercury(I) Mercury(II)
Lead	Pb^{2+} Pb^{4+}	Lead(II) Lead(IV)

Binary compounds containing a metal that forms more than one type of cation:

Name of cation (charge) +
Name of anion + ide

Metal	Nonmetal
Fe	O
Cu	I

Formula	Name
FeO	Iron (II) oxide
Fe_2O_3	Iron (III) oxide
CuI	Copper (I) iodide
CuI_2	Copper (II) iodide

Polyatomic Ions oxyanions

TABLE 3.4 ■ Some Common Polyatomic Ions

Name	Formula	Name	Formula
Acetate	$C_2H_3O_2^-$	Hypochlorite	ClO^-
Carbonate	CO_3^{2-}	Chlorite	ClO_2^-
Hydrogen carbonate (or bicarbonate)	HCO_3^-	Chlorate	ClO_3^-
Hydroxide	OH^-	Perchlorate	ClO_4^-
Nitrite	NO_2^-	Permanganate	MnO_4^-
Nitrate	NO_3^-	Sulfite	SO_3^{2-}
Chromate	CrO_4^{2-}	Hydrogen sulfite (or bisulfite)	HSO_3
Dichromate	$Cr_2O_7^{2-}$	Sulfate	SO_4^{2-}
Phosphate	PO_4^{3-}	Hydrogen sulfate (or bisulfate)	HSO_4
Hydrogen phosphate	HPO_4^{2-}	Cyanide	CN^-
Dihydrogen phosphate	H_2PO_4	Peroxide	O_2^{2-}
Ammonium	NH_4^+		

Naming Polyatomic Ions

4A	5A	6A	7A
C CO_3^{2-} Carbonate $C_2O_4^{2-}$ Oxalate	N NO_2^- Nitrite NO_3^- Nitrate	O	ClO^- Hypochlorite
HCO_3^- Bicarbonate	P PO_4^{3-} Phosphate	S SO_3^{2-} Sulfite SO_4^{2-} Sulfate $S_2O_3^{2-}$ Thiosulfate	Cl ClO_2^- Chlorite ClO_3^- Chlorate ClO_4^- Perchlorate

*When there are two oxyanions for an element, the one with the smaller number of oxygens ends in *–ite*, and the one with the largest number of oxygens ends in *–ate*.

**When there are more than two oxyanions for an element the one with the smallest number of oxygens begins with *hypo-*, and the one with the largest number of oxygen atoms begins with *per-*.

Naming ionic compounds containing polyatomic ions

Name of cation + name of anion

Na_2SO_4 Sodium sulfate

$Ca_3(PO_4)_2$ Calcium phosphate