

Ionic Compounds

An ionic compound, for the purposes of naming, consists of a metal combined with a non-metal or a polyatomic ion, e.g., sodium and chlorine (NaCl) or barium and nitrate ($\text{Ba}(\text{NO}_3)_2$).

Metal (single valence) + Non-metal or ion

Metal + Non-metal (e.g., Na + Cl)

- Rule: **Name of metal + name of non-metal + "-ide" suffix**

e.g., NaCl → Sodium chloride

Metal + polyatomic ion (e.g., Na + CO₃)

- Rule: **Name of metal + name of ion**

e.g., Na₂CO₃ → Sodium carbonate

Metal (multiple valences) + Non-metal or ion

Some metals (mostly transition metals) have multiple valence values, so you need to specify which value the metal has in the compound you are naming. You do this by placing the metal's valence value as a roman numeral in parentheses immediately after the metal's name.

Metal + Non-metal (e.g., Fe + O)

Metal + polyatomic ion (e.g., Fe + SO₄)

- Rule: **Metal name (valence/charge) non-metal/ion name**

e.g., FePO₄ → Iron (III) phosphate

Fe₃(PO₄)₂ → Iron (II) phosphate

Multi-valence Exceptions

These transition metals have only one valence and don't require parentheses:

Ag(1+) Zn(2+) Cd(2+)

These non-transition metals have multiple valences:

Sn Pb

Covalent Compounds (Non-metal + Non-metal)

- Rule: **Prefix + 1st element + prefix + 2nd element + "ide"**

e.g., P₂O₃ → diphosphorous trioxide

CF₄ → carbon tetrafluoride
(note no "mono" for first element)

Non-metal Prefixes

1	Mono	6	Hexa
2	Di	7	Hepta
3	Tri	8	Octa
4	Tetra	9	Nona
5	Penta	10	Deca

Naming Oxy-Anions

Number of Oxygens:

Start with the *-ate* ion; the others are based on the number of oxygens compared to that.

▶ Start with the <i>-ate</i> ion		Na_2BrO_3	Sodium bromate
▶ -1 Oxygen	Suffix <i>-ite</i>	Na_2BrO_2	Sodium Bromite
▶ -2 Oxygen	Prefix <i>Hypo-</i> , suffix <i>-ite</i>	Na_2BrO	Sodium hypobromite
▶ +1 Oxygen	Prefix <i>Per-</i> , suffix <i>-ate</i>	Na_2BrO_4	Sodium perbromate
▶ Add H^+	Prefix <i>Hydrogen</i>	Na_2HBrO_3	Sodium hydrogenbromate
		Na_2HBrO_2	Sodium hydrogenbromite

Naming Acids

Binary Acids

Hydrogen + one non-metal element

- Rule: "Hydro" + name of non-metal + "-ic" suffix + "acid"

The suffix replaces the "-ine" that ends the original element name.

e.g., HCl → Hydrochloric acid

Oxyacids

Hydrogen + polyatomic ion

The name of one of these acids is derived from the name, and in particular the suffix, of the polyatomic ion. Note that it's not possible to derive these names without knowing the name of the ion.

Ion name ends in "-ate"

- Rule: Name of ion with "-ate" replaced by "-ic" + "acid"

e.g., H_2CO_3 (Carbonate ion) → Carbonic acid

The ion name is sometimes massaged to make pronunciation smoother.

H_2SO_4 (Sulfate ion) → Sulfuric acid (not "Sulfic acid")

Ion name ends in "-ite"

- Rule: Name of ion with "-ite" replaced by "-ous" + "acid"

e.g., HNO_2 (Nitrite ion) → Nitrous acid

The ion name is sometimes massaged to make pronunciation smoother.

H_2SO_3 (Sulfite ion) → Sulfurous acid (not "Sulfous acid")