

5.10: Nomenclature Summary

To summarize, many compounds may be classified into five different categories, each of which uses a slightly different, but related, set of rules. These five common classes of compounds are

1. Binary ionic compounds
2. Ionic compounds containing polyatomic ions
3. Binary molecular compounds
4. Binary acids
5. Oxyacids

Binary Ionic Compounds

A binary ionic compound is one that contains two elements, one of which is a metal and the other of which is a nonmetal. The metal is always written first in the name and formula followed by the nonmetal. The convention for naming binary ionic compounds is

- Metals retain their name.
- Nonmetals retain their root name followed by a suffix of *-ide*.

Most main-group elements (groups labeled with Roman numerals followed by the letter *A*) have **fixed charges**, while most transition metals (groups labeled with Roman numerals followed by the letter *B*) have **charges that are variable**.

Examples:

- SrF_2
- copper(II) nitride

Ionic Compounds Containing Polyatomic Ions

An ionic compound with polyatomic ions is one that contains more than two elements. These compounds always involve metals combined with nonmetals, unless it contains the ammonium ion, NH_4^+ . Polyatomic ions encountered in this text may be found in [Table 5.7.1](#), [Table 5.7.2](#), and [Table 5.7.3](#). It is generally a good practice to memorize the polyatomic ions found in [Table 5.7.1](#).

In an ionic compound containing polyatomic ions:

- The cation name comes first.
- The anion name comes second.

The same holds true for their position in the chemical formula.

Examples:

- $\text{Cr}(\text{NO}_3)_3$
- sodium carbonate

Binary Molecular Compounds

A binary molecular compound is one that contains two elements, both of which are nonmetals and/or metalloids. Naming binary molecular compounds is similar to naming binary ionic compounds. The convention for naming binary molecular compounds is

- The first element in the formula retains its name.
- The second element retains its root name followed by a suffix of *-ide*.
- Greek prefixes (see [Table 5.8.1](#)) are added to each name* to indicate the number of atoms of each element present in the formula. *The prefix *mono-* is not used for the first element's name.

When writing formulas, prefixes tell exactly how many atoms of each element are present in one molecule.

Examples:

- dinitrogen tetrachloride
- IBr_5

Binary Acids

A **binary acid** is an acid that consists of hydrogen combined with one other element. The most common binary acids contain a halogen. The convention for naming binary acids is

hydro- + *root name of the other element* + *-ic acid*

Binary acids only carry their acid name when they are dissolved in water, indicated by a phase label of (*aq*). When writing a formula for a binary acid, H is always written at the front of the formula. If an acid name has a *hydro-* prefix, it will always be a binary acid.

Examples:

- hydrochloric acid
- HBr (*aq*)

Oxyacids

An **oxyacid** is an acid that also contains the element oxygen, along with a third element (or more). The third element is almost always a nonmetal. Oxyacids may also be thought of as a compound where H^+ has combined with an **oxyanion**. The convention for naming oxyacids:

- Identify and name the oxyanion present in the acid.
- If the oxyanion name ends with *-ate*, drop the *-ate* suffix from the anion name and replace with an *-ic acid* suffix.
- If the oxyanion name ends with *-ite*, drop the *-ite* suffix from the anion name and replace with an *-ous acid* suffix.

Oxyacids carry their acid name whether they are dissolved in water or not. If there is **not** a *hydro-* prefix in the acid name, it will always be an oxyacid.

Examples:

- H_2CO_3
- sulfurous acid

Exercise 5.10.1

If the chemical formula is provided, write the name. If the name is provided, write the formula.

- A. LiNO_3
- B. P_2S_5
- C. Au_2O
- D. $\text{Mg}_3(\text{PO}_4)_2$
- E. H_2CO_3
- F. hydrochloric acid
- G. potassium sulfate
- H. silver bromide
- I. boron trifluoride
- J. chromium(III) acetate

Answer A

lithium nitrate

Answer B

diphosphorus pentasulfide

Answer C

gold(I) oxide

Answer D

magnesium phosphate

Answer E

carbonic acid

Answer F

HCl (*aq*) or simply HCl

Answer G

K₂SO₄

Answer H

AgBr

Answer I

BF₃

Answer J

Cr(C₂H₃O₂)₃

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