

Chemical Nomenclature: Writing Names and Formulas

Bonding is the way atoms are attracted to each other to form compounds. During bonding atoms gain, lose, or share electrons to reach stable configurations.

The three types of compounds which you should be able to recognize are:

- Ionic Compounds
- Covalent (Molecular) Compounds
- Acids

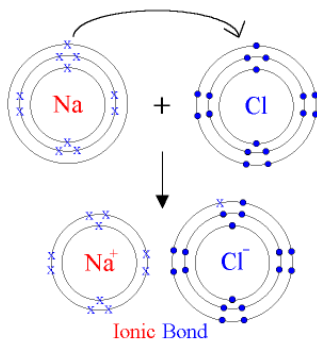
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Figure 5.4 The periodic table.

Ionic Compound: Metal + Nonmetal

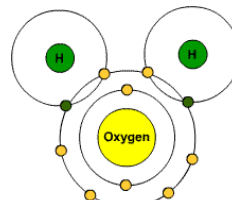
Metal atoms will give up electrons to form positive ions (cations) and non-metal atoms will receive or take additional electrons to become negative ions (anions). The bond forms when there is this transfer of electrons from metal to nonmetal. The molecule is held together by opposite charges attracting (electrostatic attraction)

Sodium Chloride is an Ionic Compound



Covalent (Molecular) Compound: Nonmetal + Nonmetal

- Nonmetals hold onto their valence electrons.
- They can't give away electrons to bond, so instead they share electrons.
- Water is a molecular compound:



Acids: Hydrogen + Nonmetal or Hydrogen + Polyatomic Ion

- An acid is a compound consisting of hydrogen combined with a non-metallic element or with a polyatomic ion
- Ex. HCl or H₂CO₃
- In the formula for an acid, **hydrogen is always listed as the first element.**
 - (The only exception to this is water, H₂O)

Note: If you continue with your study of chemistry you will learn that there are other ways to define acids. For our purposes, it will be convenient to identify an acid as something which can release H⁺ in water.

Names and Formulas for Ionic Compounds

Common Ion Charges

Varies... will either be given to you or you can work backwards from the formula to determine the charge.
Memorize:
Zn²⁺, Ag⁺, and Cd²⁺

1+																	0						
H	2+																		He				
Li	Be																	B	C	N	O	F	Ne
Na	Mg																	Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr						
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe						
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn						
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Uun														

Simple Ionic Compounds

The overall charge of ionic compounds must equal zero.

When you write formulas use the swap and drop method to balance charges. (You should simplify subscripts if possible.)

Ionic Compounds Containing Polyatomic Ions

A polyatomic ion is a group of atoms that has a charge. It is treated like a single ion in formulas, but must have parentheses when more than one is used.

Naming Ionic Compounds

Write the names of both ions, cation first.

Change ending of anion to **-ide**.

Polyatomic ions have special endings.

Stock System- Use Roman numerals to show the cation's charge if more than one is possible. (There is also an older naming system using Latin roots and an -ous or -ic ending)

What is the name of the compound formed when zinc combines with fluorine?

1. zinc difluoride
2. zinc fluorate
3. zinc fluoride
4. zinc (II) fluorite

The correct formula for aluminum oxide is

1. Al_3O_2
2. Al_2O_2
3. Al_2O_3
4. Al_4O_3

Name the compound $\text{Ni}(\text{ClO}_3)_2$

1. nickel chlorate
2. nickel chloride
3. nickel chlorite
4. nickel (II) chlorate

What is the formula for tin (IV) chromate?

1. $\text{Sn}(\text{CrO}_4)_4$
2. $\text{Sn}_2(\text{CrO}_4)_2$
3. $\text{Sn}_2(\text{CrO}_4)_4$
4. $\text{Sn}(\text{CrO}_4)_2$

Names and Formulas for Covalent (Molecular) Compounds

To Name A Binary Non-Metal Compound

- Name each element in the order they appear in the formula
- Use the appropriate prefix to indicate the number of atoms of the element in the compound.
- The second element uses an -ide ending.
- The prefix *mono-* is generally omitted on the first element.

Prefixes

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

To Write Formulas for a Binary Non-Metal Compound

- Put the elements in the same order that they appear in the name
- Use the prefixes to determine the number of each element in the formula.
- DO NOT simplify subscripts.
- DO NOT swap and drop.

Names and Formulas for Acids

Binary or Non-Oxygen Acids

- Binary acids consist of hydrogen combined with a non-metal element.
- **Binary acids are named by using the prefix hydro- followed by the stem name of the non-metal element** (the second element in the formula) **with an -ic ending.**
 - The name is followed by the word **ACID**.

Examples

- HCl – is named **hydrochloric acid**
- HBr – is named **hydrobromic acid**
- HI – is named **hydroiodic acid**
- H₂S – is named **hydrosulfuric acid**

(Notice that charges must still balance so you must still do swap and drop when writing formulas)

Acids Containing Polyatomic Ions

- These acids contain three elements – hydrogen, a non-metal, and oxygen. (ie hydrogen and a polyatomic ion)
- Look at the polyatomic ion you are using to choose the ending for the name:
- **Polyatomic ion ending in -ite= -ous ending**
- **Polyatomic ion ending in -ate= -ic ending**
- DO NOT use the prefix Hydro-

Examples

- H_2SO_3 – is named sulfurous acid
- H_2SO_4 – is named sulfuric acid

(Notice that charges must still balance so you must still do swap and drop when writing formulas)