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Sections 3.5 and 3.6

Notes from Chapter # 3 Part 2

Naming of ionic and molecular compounds

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1. Naming of Ionic Compounds

- Write systematic name by simply naming the ions

We have three cases:

1. If the cation is metal with invariant charge

Groups 1A, 2A, Al^{+3}, zn^{2+}, Ag^{+}, Sc^{3+} (Table 3.1, page 62)

TABLE 3.2 Metals Whose Charge Is Invariant from One Compound to Another

Metal	Ion	Name	Group Number
Li	Li^+	Lithium	1A
Na	Na^+	Sodium	1A
K	K^+	Potassium	1A
Rb	Rb^+	Rubidium	1A
Cs	Cs^+	Cesium	1A
Be	Be^{2+}	Beryllium	2A
Mg	Mg^{2+}	Magnesium	2A
Ca	Ca^{2+}	Calcium	2A
Sr	Sr^{2+}	Strontium	2A
Ba	Ba^{2+}	Barium	2A
Al	Al^{3+}	Aluminum	3A
Zn	Zn^{2+}	Zinc	*
Sc	Sc^{3+}	Scandium	*
Ag**	Ag^+	Silver	*

*The charge of these metals cannot be inferred from their group number.
**Silver sometimes forms compounds with other charges, but these are rare.

- Contain metal cation + nonmetal anion

1. name metal cation first, name nonmetal anion second
2. cation name is the metal name
3. nonmetal anion named by changing the ending on the nonmetal name to ***-ide***

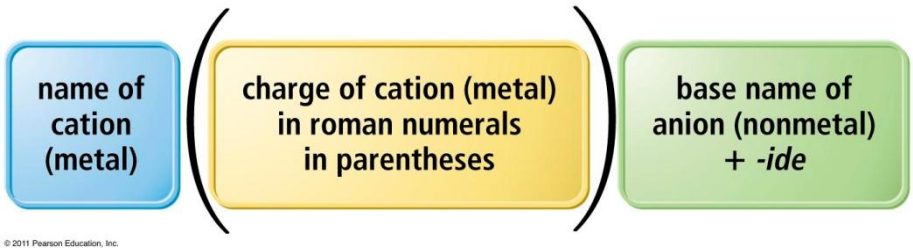
Examples:

- CsF ➔ cesium fluoride
- KCl ➔ potassium chloride
- $MgCl_2$ ➔ magnesium bromide
- Al_3O_2 ➔ aluminum sulfide

2. Metals with Variable Charges

- Contain metal cation + nonmetal anion
-

1. name metal cation first, name nonmetal anion second
2. metal cation name is the metal name followed by a Roman numeral (I, II, III, IV, V) in parentheses (بين اقواس) to indicate its charge (Table 3.3, page 64)
3. nonmetal anion named by changing the ending on the nonmetal name to ***-ide***



Examples:

- CuF_2 ➔ copper(II) fluoride
- $TiCl_4$ ➔ titanium(IV) chloride
- $PbBr_2$ ➔ lead(II) bromide
- Fe_2S_3 ➔ iron(III) sulfide

3. polyatomic ion = name of polyatomic ion

Polyatomic ions are single ions that contain more than one atom (i.e OH^-, SO_4^{2-}, PO_4^{3-}, CO_3^{2-}, HCO_3^-, NO_3^-)

- Often identified by parentheses around ion in formula
- Name and charge of polyatomic ion do not change
- Name any ionic compound by naming cation first and then anion

Example:

$NaC_2H_3O_2$ ➔ Sodium acetate

$Ca(OH)_2$ ➔ Calcium hydroxide

$K_2Cr_2O_7$ ➔ Potassium dichromate

NH_4NO_3 ➔ Ammonium nitrate

$FeSO_4$ ➔ Iron (II) sulphate (Fe has more than one oxidation state)

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2. Naming of Molecular compounds

Prefix Name of first element Prefix Base name of 2nd element

Prefix = Mono, di, tri, tetra, penta, hexa, hepta, octa, nona, deca

Example:

NO_2 ➔ Nitrogen dioxide (we don't add Mono at the first of the name)

N_2O ➔ Dinitrogen monoxide

CO_2 ➔ Carbon dioxide

PF_5 ➔ Phosphorus pentaflouride

P_4S_{10} ➔ Phosphorus decasulfide

Acids

- Contain H^{+1} cation and anion
  - ✓ in aqueous solution
- Binary acids have H^{+1} cation and nonmetal anion
- Oxyacids have H^{+} cation and polyatomic anion

Naming binary acids ➔ HCl(*aq*)

1. Identify the anion

Cl = Cl^-, chloride because Group 7A

2. Name the anion with an ***–ic*** suffix

Cl^- ➔ chloric

3. Add a ***hydro-*** prefix to the anion name

hydrochloric

4. Add the word ***acid*** to the end

hydrochloric acid

Example:

HBr ➔ Hydrobromic acid

HI ➔ Hydroiodic acid

HF ➔ Hydrofluoric acid