

Chemical Compounds

Chapter 3

Molecular Compounds *Molecular Formulas*

exact number of atoms of each type in compound

- inorganic compounds
- organic compounds

Molecular Compounds *Molecular Formulas*

methods for writing formulas

- molecular formula
- structural formula
- condensed formula

Naming Binary Inorganic Compounds

molecules containing atoms of only two elements

- element farthest left first
- if same group - lowest first
- second element ends in *-ide*
- Greek prefixes for numbers

Naming Binary Inorganic Compounds

TABLE 3.2 Prefixes Used in Naming Chemical Compounds

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

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Naming Binary Inorganic Compounds

compounds with common, nonsystematic names:

- H_2O water
- NH_3 ammonia
- N_2H_4 hydrazine (text p. 82)
- NO nitric oxide
- N_2O nitrous oxide
- PH_3 phosphine

Hydrocarbons

- contain only C and H
- simplest type is alkanes

Hydrocarbons

TABLE 3.4 The First Ten Alkane Hydrocarbons, C_nH_{2n+2}

Molecular Formula	Name	Boiling Point (°C)	Physical State at Room Temperature
CH_4	Methane	-161.6	Gas
C_2H_6	Ethane	-88.6	Gas
C_3H_8	Propane	-42.1	Gas
C_4H_{10}	Butane	-0.5	Gas
C_5H_{12}	Pentane	36.1	Liquid
C_6H_{14}	Hexane	68.7	Liquid
C_7H_{16}	Heptane	98.4	Liquid
C_8H_{18}	Octane	125.7	Liquid
C_9H_{20}	Nonane	150.8	Liquid
$C_{10}H_{22}$	Decane	174.0	Liquid

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Ions and Ionic Compounds

ionic compound - composed of positive and negative ions

- typically metal with non-metal

Hydrogen appears twice because it can gain or lose an electron.

Main group metals

Transition metals

Metalloids

Nonmetals, noble gases

Transition metals can have varying numbers of electrons, forming cations with different charges.

- overall charge on formula is neutral

-
-
-
-
-

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Naming Ionic Compounds *Anions*

- Monatomic
- Polyatomic
 - oxoanions

Naming Ionic Compounds *Anions (cont'd)*

- Polyatomic (*cont'd*)
 - oxoanions - if more than two possible

Naming Ionic Compounds *Anions (cont'd)*

- Polyatomic (*cont'd*)
 - oxoanions with hydrogen

Naming Ionic Compounds *Anions (cont'd)*

■ Polyatomic anions with nonstandard names

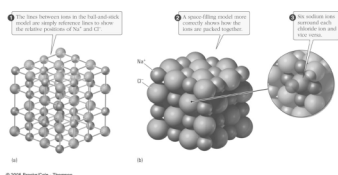
CH_3COO^-	acetate ion
CN^-	cyanide ion
$\text{C}_2\text{O}_4^{2-}$	oxalate ion
OH^-	hydroxide ion
O_2^{2-}	peroxide ion
O_2^-	superoxide ion
MnO_4^-	permanganate ion
CrO_4^{2-}	chromate ion
$\text{Cr}_2\text{O}_7^{2-}$	dichromate ion

Naming Ionic Compounds

■ Cation then anion

Properties of Ionic Compounds

- metal + nonmetal
- crystalline
- hard, brittle
- high melting points
- high boiling points
- electrolytes



Percent Composition

- composition of any compound expressed by
 - # atoms of each type per molecule or formula unit
 - mass of each element in a mole of compound

Empirical Formulas

ratio of mol of each element gives subscripts

Molecular Formula

need:

- empirical formula
- molar mass of molecular formula
