

Unit 2 - Compounds

- Introduction
- Ionic Compounds
- Molecular Compounds
- Acids and Bases

**NAMES
&
FORMULAS**

Unit 2 - Compounds

COMPOUNDS are conventionally divided into three classes:

(1) **metal - nonmetal** (ionic compounds)

Ex. salt **NaCl**

(2) **nonmetal - nonmetal** (molecular compounds)

Ex. sulfur dioxide **SO₂**

(3) **metal - metal** (intermolecular compounds)

Ex. brass Cu - Zn

**we will not
be studying
metal-metal**

"tested"

Empirical Definitions

Ionic Compounds - solids at SATP

- when dissolved in water they conduct electricity
- no change in litmus paper

Molecular Compounds - solids, liquids and gases which, when dissolved in water, do not conduct electricity

- no change in litmus paper

ACIDS - when pure, resemble molecular substances

(can be solids, liquids or gases at SATP)

- in solution, their conductivity suggests a separate third class. (do conduct electricity, but strength varies)
- in solution, make blue litmus turn **red**.

BASES - compounds whose aqueous solutions make red litmus turn **blue**.

FOUR STATES OF MATTER SUBSCRIPTS

(s) - solids

(l) - liquids

(g) - gases

(aq) - aqueous (dissolved in water)

Ex. H₂O_(l)

DIAGNOSTIC TESTS : [A] Conductivity Test
 [B] Litmus Test

Periodic Table of the Elements

	I A																										0									
1	1 H 1.00794																										2 He 4.0026									
2	3 Li 6.941		4 Be 9.01219																	5 B 10.811	6 C 12.011	7 N 14.0067	8 O 16.00	9 F 18.9984	10 Ne 20.1797											
3	11 Na 22.9999		12 Mg 24.305																	13 Al 27.99	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948											
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																		
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe																		
6	55 Cs	56 Ba	57 * La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn																		
7	87 Fr	88 Ra	89 + Ac	104 Rf	105 Ha	106 106	107 107	108 108	109 109	110 110																										

• Lanthanide Series

+ Actinide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Ionic Compounds

Formula unit - of an ionic compound is the smallest amount of the compound that has the composition given by the chemical formula.

Ex. one Na^+ and one Cl^- form **NaCl**

one atom!

Monatomic ions - single atoms that have gained or lost electrons

Ex. Na^+ or F^-

Binary ionic compounds - are composed of monatomic ions.

Ex. $\text{Na}^+ + \text{Cl}^- \rightarrow \text{NaCl}$

many atoms!

Polyatomic ion - a cation or anion that is composed of a group of atoms with a net positive or negative charge.

Ex. NO_3^-

(back of periodic table)

Multivalent ion - some atoms (transition elements) can form more than one ion, each with its own particular charge.

Ex. Fe^{2+} and Fe^{3+}

Hydrate - compounds that decompose at relatively low temperatures to yield water and another associated compound (usually ionic)

- the water is loosely held to the ionic compound.

Ex. $\text{Cu}^{2+}\text{SO}_4^{2-} \cdot 5\text{H}_2\text{O}$

$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Anhydrous - the form of a hydrate with the water removed.

Ex. $\text{CuSO}_{4(s)}$

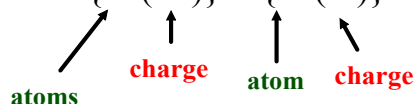
Ionic Formulas

" The net electrical charge in a theoretical chemical formula is zero (see Table 3.3)

Therefore the sum of the charges on the positive ions (cations) must equal the sum of the electrical charges on the negative ions (anions)

Ex. Na_2O

$$\{2 \cdot (+1)\} + \{1 \cdot (-2)\} = 0$$



CHEMICAL NAMES AND FORMULA'S

Type I Binary Ionic Compounds

Binary Compounds - are compounds containing only two elements. In naming binary compounds, place the name of the cation (metal) followed by the name of the anion (nonmetal) with the suffix -ide added.

Ex. AlCl_3



Writing the chemical symbol from the name

RULE:

[a] write the chemical symbol, with its charge, for each of the two ions in the name.

[b] predict the simplest whole number ratio of ions to obtain a net charge of zero.

Ex. lithium sulfide



Write the chemical formula /name for the following ionic compounds:

a) magnesium oxide

b) lithium bromide

c) KI

d) SrCl₂