

## 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 **SO<sub>2</sub>**

(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. H<sub>2</sub>O<sub>(l)</sub>

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

## Periodic Table of the Elements

1	H 1.00794											He 4.0026						
2	Li 6.941	Be 9.01218											Ne 20.1797					
3	Na 22.98977	Mg 24.305	III B	IV B	V B	VI B	VII B	VIII	IX	X	IB	II B	B 10.811	C 12.011	N 14.0067	O 16.00	F 18.9984	Ar 39.948
4	K 39.0983	Ca 40.078	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga 69.723	Ge 72.64	As 74.9216	Se 78.96	Br 79.904	Kr 83.80
5	Rb 85.4678	Sr 87.62	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In 114.818	Sn 118.710	Sb 121.757	Te 127.60	I 126.905	Xe 131.29
6	Cs 132.905	Ba 137.327	* La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg 200.59	Tl 204.383	Pb 207.2	Bi 208.980	Po	At	Rn 222
7	Fr 223	Ra 226	+ Ac	Rf	Ha	106	107	108	109	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  $\text{Na}^+$  and one  $\text{Cl}^-$  form **NaCl**

**one atom!**

Monatomic ions - single atoms that have gained or lost electrons

Ex.  $\text{Na}^+$  or  $\text{F}^-$

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.  $\text{NO}_3^-$

(back of periodic table)

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

Ex.  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$

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

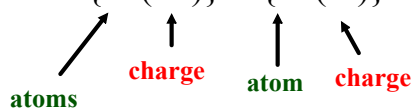
## Ionic Formulas

" 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.  $\text{Na}_2\text{O}$

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



## CHEMICAL NAMES AND FORMULA'S

### Type I Binary Ionic Compounds

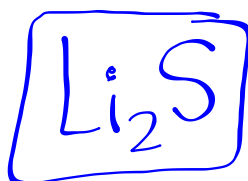
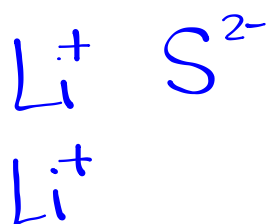
Binary Compounds - are compounds containing only two elements. In naming binary compounds, place the name of the cation (metal) followed by the name of the anion (nonmetal) with the suffix -ide added.

Ex.  $\text{AlCl}_3$



*Writing the chemical symbol from the name*

Ex. lithium sulfide



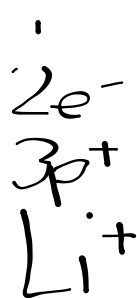
2e<sup>-</sup>  
3pt  
Lit

8e<sup>-</sup>  
2e<sup>-</sup>  
11pt  
Na<sup>+</sup>

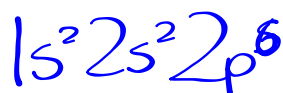
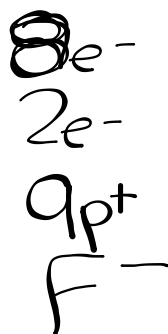
8e<sup>-</sup>  
8e<sup>-</sup>  
2e<sup>-</sup>  
9pt  
K<sup>+</sup>



metals - lose



+

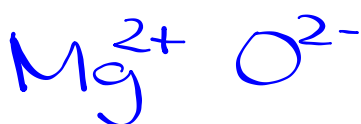


nonmetals - gain  
=

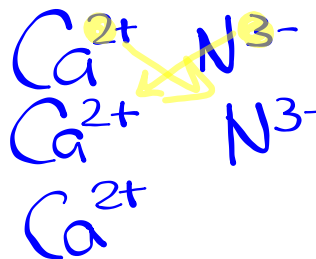


Write the chemical formula or name for the following ionic compounds:

a) magnesium oxide



b) calcium nitride

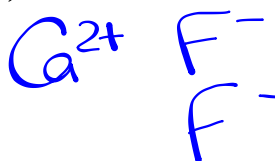


c)  $\text{Na}_2\text{S}$



Sodium sulfide

d)  $\text{CaF}_2$



Calcium fluoride



# Homework

Chapter 9 p. 252 - 285

p. 256 #1, 2

p. 258 #4, 5, 7-9