Compound: a pure substance that contains…

2 or more elements w/ fixed ratio (exact)

Chemical formula: ratio of elements

H_2O : 2:1 ratio

Law of constant composition: ratio in a compound is consistent if the compound is pure

Formula unit: atoms represented by a chemical formula

One formula unit of $Ca_3(PO_4)_2$ contains…

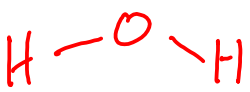
3 Ca atoms

2 P

8 O

Molecular compounds: made of molecules (groups of bonded atoms)

Contains which type of elements? nonmetals only

H_2O:  an H_2O molecule

CO_2: 

$C_{12}H_{22}O_{11}$: sucrose

H_2: H–H  H_2 molecule

H_2 is a **diatomic element** (exists as pairs of atoms)

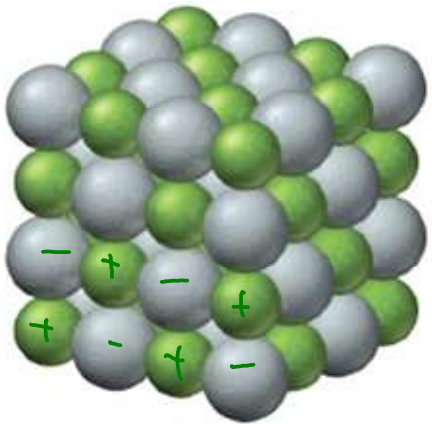
There are 7 diatomic elements:

H_2 N_2 O_2 F_2 Cl_2 Br_2 I_2

all other elements are made of single atoms

Ionic compounds: contain positive and negative ions

- Usually 1 metal and 1 or more nonmetals
- Forms a 3-dimensional lattice of opposite ions



Formation of an ionic compound from Na and Cl:

Ionic compounds must be...

neutral overall

1:1 ratio Na : Cl
Formula NaCl

What is the formula of the compound formed from calcium and chlorine? met + nonmet = ionic

Ca forms Ca^{2+} ion

Cl forms Cl^- ion

need 1:2 ratio to be neutral

1 (Ca^{2+}) = 2+
2 (Cl^-) = 2−] neutral overall

$CaCl_2$: formula

Write the name and formula of the compound formed from calcium and chlorine

Ion pair: Ca^{2+} / Cl^{-} Formula: $CaCl_2$

Name: cation (+) name then anion (-) name

element name element root + ide

Calcium chloride

Anion names:

VA	VIA	VIIA
N^{3-} nitride	O^{2-} oxide	F^{-} fluoride
P^{3-} phosphide	S^{2-} sulfide	Cl^{-} chloride
	Se^{2-} selenide	Br^{-} bromide
		I^{-} iodide

Write the name and formula of the cpd with Mg and Br:

ion pair: Mg^{2+} / Br^{-} formula: $MgBr_2$

name: magnesium bromide

Write the name and formula of the cpd with Ca and N:

ion pair: Ca^{2+} / N^{3-} formula: Ca_3N_2

name: calcium nitride

$3(Ca^{2+}) = 6+$

$2(N^{3-}) = 6-$

Write the formula for magnesium oxide

Ion pair: Mg^{2+}/O^{2-} formula: MgO

2:2 ratio → simplify to 1:1

	Ion pair	Formula
aluminum selenide	Al^{3+}/Se^{2-}	Al_2Se_3
lithium phosphide	Li^{+}/P^{3-}	Li_3P
barium sulfide	Ba^{2+}/S^{2-}	BaS
barium chloride	Ba^{2+}/Cl^{-}	$BaCl_2$

Types of binary compounds (two elements only):

	Type I	Type II	Type III (molecular)
Ions?	ionic (fixed charge)	ionic (variable charge)	molecular
Elements?	main group met + nonmetal	transition met + nonmet	
Example:	calcium chloride $CaCl_2$	iron(II) chloride $FeCl_2$	

Transition metals:

- do not form a single stable ion like nonmetals do
- can form multiple different stable ions

For instance, the iron cation can be Fe^{2+} or Fe^{3+}

iron chloride is an incomplete name

could be $FeCl_2$ or $FeCl_3$

$FeCl_3$: ion pair: Fe^{3+} / Cl^-

name: iron(III) chloride

$1(Fe^{3+}) = 3+$

$3(Cl^-) = 3-$

$FeCl_2$ ion Pair: Fe^{2+} / Cl^-

name: iron(II) chloride

Type II ionic compounds

Name	Ion pair	Ratio	Formula
titanium(IV) chloride	Ti^{4+}/Cl^-	1 : 4	$TiCl_4$
titanium(IV) oxide	Ti^{4+}/O^{2-}	1 : 2	TiO_2

Formula	Ratio	Ion pair	Name
WF_6	1 : 6	W^{6+}/F^-	tungsten (VI) fluoride
MnP_2	1 : 2	Mn^{6+}/P^{3-}	manganese(VI) phosphide
Cu_2O_3	2 : 3	Cu^{3+}/O^{2-}	copper(III) oxide

$6(F^-) = 6-$
$1(W^{6+}) = 6+$

$2(P^{3-}) = 6-$ $\quad 2(Cu^{3+})$
$1(Mn^{6+}) = 6+$ $\quad 3(O^{2-})$

Formula	Type	Ratio	Ion pair	Name
K_2O	I	2 : 1	K^+/O^{2-}	potassium oxide
CrO_2	II	1 : 2	Cr^{4+}/O^{2-}	chromium(IV) oxide
MgI_2	I	1 : 2	Mg^{2+}/I^-	magnesium iodide
Ni_2O	II	2 : 1	Ni^{+}/O^{2-}	nickel(I) oxide

Type I or Type II?

Type I: fixed charge metal

most are main-group

Type II: variable charge metal

Most are transition

A few important exceptions...