CHEMISTRY: IONIC COMPOUNDS

Charges across the Periodic Table:

	IA	IIA	IIA	IVA	VA	VIA	VIIA	VIIIA
Element	Na	Mg	Al	Si	P	S	Cl	Ar
Charges	+1	+2	+3	+4	-3	-2	-1	0

I. Making IONIC COMPOUNDS:

In creating an ionic compound, the positive charges from the metal ion must balance the negative charges from the non-metal ion, when the charges are added together.

Eg) Na^+ Cl^- +1 -1 = 0 NaCl

Mg^{2+} Cl^- +2 -1 = **+1** (not balanced – need 2 Cl^-)
Mg^{2+} $2Cl^-$ +2 2x(-1) = 0 $MgCl_2$

Na^+ O^{2-} +1 -2 = **-1** (not balanced – need 2 Na^+)
$2Na^+$ O^{2-} 2x(+1) -2 = 0 Na_2O

Practice: Write the compounds formed between ions of the following elements

a) Ca and O

b) Rb and O

c) Al and O

d) Mg and N

e) K and I

f) Fe^{3+} and Cl

g) Fe^{2+} and Cl

h) H and O

2. Naming BINARY Ionic Compounds (involving 2 elements only)

RULES:

1. Metal ion is named first
2. Non-metal ion is named second – ending in "ide"
3. If metal ion is a transition element, use roman numerals in the name to indicate charge on the metal ion.

Eg) NaCl Sodium chloride
AlF_3 Aluminum fluoride
Ca_3N_2 Calcium nitride
MgH_2 Magnesium hydride
K_3P Potassium phosphide

Practice: Name the following compounds:

a) Na_2S _____

b) SrH_2 _____

c) Al_2S_3 _____

d) $BeCl_2$ _____

e) RbI _____

f) Ba_3N_2 _____

g) Cs_2O _____

g) Mg_3P_2 _____

Practice:
Write formulas for the following compounds:

a) sodium nitride

b) calcium fluoride

c) aluminum selenide

d) hydrogen sulfide

II. Transition Metal Ions

Transition metals may lose different numbers of electrons. For example, copper atoms may lose one electron to form a Cu^{+} ion, OR two electrons to form a Cu^{2+} ion.

This mans that there must be a way to name the transition metal ion to indicate the charge on the ion.

RULES: We use roman numerals to name compounds containing transition metal ions.
EXCEPT: Silver always Ag^{+} Zinc always Zn^{2+} Aluminum Al^{3+}

Eg) Cu^{+} is copper (I) ion Cu^{2+} is copper (II) ion

Eg) Fe^{2+} is iron (II) ion so FeO indicates that Fe^{2+} and O^{2-} are present, so this is named: iron(II) oxide

Sn^{4+} is tin(IV) ion so SnO_2 indicates that Sn^{4+} and 2 ions of O^{2-} are present, so this is named tin (IV) oxide

Practice: Name the following

a) $FeCl_2$_____
b) Cu_2S_____
c) PbI_4_____
d) SnF_2_____
e) $ZnBr_2$_____
f) SnO_____
g) Cr_2O_3_____
h) CoP_____
i) Ag_2O_____

Practice: Give formulas for the following:

a) cobalt (II) phosphide _____
b) copper (II) iodide _____
c) tin (IV) fluoride _____
d) chromium (II) nitride _____
e) gold (III) oxide _____
f) tin (II) sulfide _____
g) lead (IV) nitride _____
h) zinc chloride _____
i) silver sulfide _____

III. Compounds containing POLYATOMIC IONS

Polyatomic ions are ions that are made up of more than one atom.

RULES:

1. When you see more than 2 elements in a compound, **look for the polyatomic ion.**
2. They are used in compounds the same way that any ion would be – **treated as a unit**, where the whole unit is given a specific charge.
3. If more than one polyatomic ion is needed in a compound, **brackets** are used with the subscript after the bracket to indicate the number of polyatomic ions in the compound.
4. The **name** of the compound includes the name of the polyatomic ion

Eg) NO_3^- nitrate ion

Sodium nitrate:	Na^+ NO_3^-	+1 -1 = 0		**$NaNO_3$**
Magnesium nitrate:	Mg^{2+} NO_3^-	+2	-1 = **-1**	(not balanced ; we need 2 nitrate ions)
	Mg^{2+} $(NO_3^-)_2$	+2	2x(-1) = 0	**$Mg(NO_3)_2$**
Iron (III) nitrate	Fe^{3+} NO_3^-	+3	-1 = **-2**	(not balanced; we need 3 nitrate ions)
	Fe^{3+} $(NO_3^-)_3$	+3	3x(-1) = 0	**$Fe(NO_3)_3$**

Write formulas for the following compounds:

a) sodium sulfate

b) calcium sulfate

c) aluminum phosphate

d) magnesium carbonate

e) sodium carbonate

f) iron (II) carbonate

g) iron (III) carbonate

h) aluminum hydroxide

i) sodium nitrite

j) strontium chromate

k) chromium (III) acetate

l) copper (II) sulfate

Write names for the following compounds:

a) $Al_2(SO_4)_3$

b) $Zn(OH)_2$

c) $Ag_2Cr_2O_7$

d) $CaCO_3$

e) Na_2SO_3

f) $Sn(CO_3)_2$

g) Ni(ClO3)2

h) $Ni(ClO_3)_2$