INTRODUCTION TO NOMENCLATURE

1**. Binary ionic compounds -** one metal element & one non-metal. i.e. NaCl & TiH_2 Separate the compound into ions before naming it. i.e

Na^+ Cl^- Ti^{2+} H^- H^-

The sum of the positive and negative charges must = 0. Some elements like Ti may have different positive charges which may be calculated from the negative charges which are fixed. (Refer to table, next page). The cation is named first, then the anion, i.e. sodium chloride and titanium (II) hydride. The Roman numeral on the name of the cation is necessary to specify the charge if the element is one that can have different charges. Na can only have a +1 charge so it needs no Roman numerals. Ti can have charges of 2+ or 3+ or 4+ so Roman numerals are needed.

2. **Binary molecular compounds** are composed of two non-metals and no ions are present. i.e. CO CO_2 N_2O_4 PCl_3 CF_4 IF_7

Use Greek numerical prefixes to designate the number of atoms in the molecule: i.e carbon monoxide, carbon dioxide, dinitrogen tetroxide, etc.

Note – if the first atom written is singular then the mono prefix is not used – but if the second atom is singular – then the mono prefix **MUST** be used in the name. The second atom written has the - ide suffix, even though it is not a "true" anion.

1-mono, 2-di, 3-tri , 4-tetra, 5-penta, 6-hexa , 7-hepta , 8-octa , 9-nona, 10-deca

3. Compounds with **oxyanions** are named, with the cation first, then the anion. The suffix: *ate* means the compound contains oxygen. The suffix *ite* means it contains one less oxygen.

ClO_3^{1-} chlorate ClO_2^{1-} is chlorite prefixes like *hypo* and *per* are used when even less or more oxygen is present

ClO^{1-} hypochlorite ClO_4^{1-} perchlorate Br and I behave as Cl

Oxyanions of different elements may have different number of oxygens and charges. Even though many compounds have similar names, like NO_3^- is nitrate, ClO_3^- is chlorate, PO_4^{3-} is phosphate, and SO_4^{2-} sulfate, their charges may differ.

Brackets are needed to enclose molecules if more than one is present in a formula

$(NH_4)_2SO_4$ $Ca(CN)_2$ $Al_2(SO_3)_3$

4**. Acids** have hydrogen (though, not all compounds with hydrogen are acids)

a) Binary acids – can be named like binary molecular compounds, but when in aqueous solution, they have the distinctive *hydro* prefix and *ic* suffix.

HCl (g) hydrogen chloride HCl (aq) hydrochloric acid

b) Oxyacids are derived from oxyanions and are only named as acids, since they tend to be unstable on their own without water.

HNO_3 from NO_3^{1-} : nitrate HNO_2 from NO_2^{1-} nitrite

Thus HNO_3 : nitric acid. So HNO_2 : nitrous acid

Prefixes are retained thus HClO : hypochlorous acid

H_3O^+	hydronium ion

B. Cation - Variable Charge

Symbol	Systematic Name	Common Name	Symbol	Systematic Name	Common Name
Cu^+	copper(I) ion	cuprous ion	Hg_2^{2+}	mercury(I) ion	mercurous ion
Cu^{2+}	copper(II) ion	cupric ion	Hg^{2+}	mercury(II) ion	mercuric ion
Fe^{2+}	iron(II) ion	ferrous ion	Pb^{2+}	lead(II) ion	plumbous ion
Fe^{3+}	iron(III) ion	ferric ion	Pb^{4+}	lead(IV) ion	plumbic ion
Sn^{2+}	tin(II) ion	stannous ion	Co^{2+}	cobalt(II) ion	cobaltous ion
Sn^{4+}	tin(IV) ion	stannic ion	Co^{3+}	cobalt(III) ion	cobaltic ion
Cr^{2+}	chromium(II) ion	chromous ion	Ni^{2+}	nickel(II) ion	nickelous ion
Cr^{3+}	chromium(III) ion	chromic ion	Ni^{4+}	nickel(IV) ion	nickelic ion
Mn^{2+}	manganese(II) ion	manganous ion	Ti^{2+}	titanium(II) ion	titanous ion
Mn^{3+}	manganese(III) ion	manganic ion	Ti^{4+}	titanium(IV) ion	titanic ion

C. Monatomic Anions

Symbol	Name	Symbol	Name
H^-	hydride ion	O^{2-}	oxide ion
F^-	fluoride ion	S^{2-}	sulfide ion
Cl^-	chloride ion	N^{3-}	nitride ion
Br^-	bromide ion	P^{3-}	phosphide ion
I^-	iodide ion	C^{4-}	carbide ion

D. Polyatomic Anions

Formula	Name
$C_2H_3O_2^-$	acetate ion*
OH^-	hydroxide ion
MnO_4^-	permanganate ion
CN^-	cyanide ion
HS^-	hydrogen sulfide ion (bisulfide ion)
HCO_3^-	hydrogen carbonate ion (bicarbonate ion)
HSO_4^-	hydrogen sulfate ion (bisulfate ion)
HSO_3^-	hydrogen sulfite ion (bisulfite ion)
HPO_4^{2-}	hydrogen phosphate ion
$H_2PO_4^-$	dihydrogen phosphate ion
NO_3^-	nitrate ion
NO_2^-	nitrite ion
ClO_4^-	perchlorate ion
ClO_3^-	chlorate ion
ClO_2^-	chlorite ion
ClO^-	hypochlorite ion

Formula	Name
BrO_4^-	perbromate ion
BrO_3^-	bromate ion
BrO_2^-	bromite ion
BrO^-	hypobromite ion
IO_4^-	periodate ion
IO_3^-	iodate ion
IO_2^-	iodite ion
IO^-	hypoiodite ion
CrO_4^{2-}	chromate ion
$Cr_2O_7^{2-}$	dichromate ion
CO_3^{2-}	carbonate ion
SO_4^{2-}	sulfate ion
SO_3^{2-}	sulfite ion
$C_2O_4^{2-}$	oxalate ion
SiO_3^{2-}	silicate ion
O_2^{2-}	peroxide ion

Formula	Name
PO_4^{3-}	phosphate ion
PO_3^{3-}	phosphite ion
AsO_4^{3-}	arsenate ion
BO_3^{3-}	borate ion