

Naming Ionic & Covalent Compounds

General Information:

Common Polyatomic Ions

+1 Charge	
NH_4^+	ammonium
H_3O^+	hydronium
Hg_2^{2+}	mercury(I)

-1 Charge	
AlO_2^-	aluminate
BrO^-	hypobromite
BrO_2^-	bromite
BrO_3^-	bromate
BrO_4^-	perbromate
CH_3COO^-	acetate
HCO_3^-	hydrogen carbonate
ClO^-	hypochlorite
ClO_2^-	chlorite
ClO_3^-	chlorate
ClO_4^-	perchlorate
CN^-	cyanide
CNO^-	cyanate
CNS^-	thiocyanate
CrO_2^-	chromite
HSO_3^-	hydrogen sulfite
HSO_4^-	hydrogen sulfate
IO^-	hypoiodite
IO_2^-	iodite
IO_3^-	iodate
IO_4^-	periodate
MnO_4^-	permanganate
NO_2^-	nitrite
NO_3^-	nitrate
N_3^-	azide
OH^-	hydroxide
O_2^-	superoxide
H_2PO_3^-	dihydrogen phosphite
H_2PO_4^-	dihydrogen phosphate

-2 Charge	
HPO_3^{2-}	hydrogen phosphite
HPO_4^{2-}	hydrogen phosphate
CO_3^{2-}	carbonate
SO_3^{2-}	sulfite
SO_4^{2-}	sulfate
$\text{S}_2\text{O}_3^{2-}$	thiosulfate
SiO_3^{2-}	silicate
C_2^{2-}	carbide
$\text{C}_2\text{O}_4^{2-}$	oxalate
CrO_4^{2-}	chromate
$\text{Cr}_2\text{O}_7^{2-}$	dichromate
$\text{C}_4\text{H}_4\text{O}_6^{2-}$	tartrate
MoO_4^{2-}	molybdate
O_2^{2-}	peroxide
S_2^{2-}	disulfide

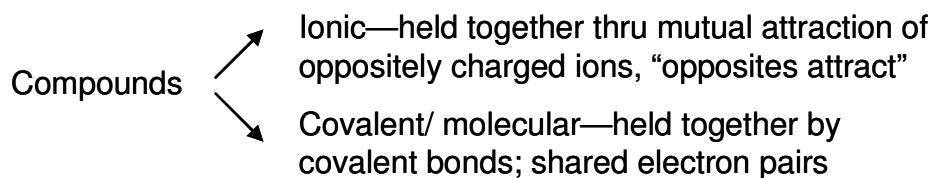
-3 Charge	
PO_3^{3-}	phosphite
PO_4^{3-}	phosphate
PO_2^{3-}	hypophosphite
AsO_3^{3-}	arsenite
AsO_4^{3-}	arsenate

-4 Charge	
$\text{P}_2\text{O}_7^{4-}$	pyrophosphate

****Most commonly encountered ions in bold.**

◆ **Polyatomic Ions** - A group of atoms held together by covalent bonds found in ionic compounds.

- ◆ Know/ memorize/ recognize names, formulas and charges!

General Information:**Recognizing Ionic vs. Covalent Compounds:****Ionic:**

- ◆ Metal plus non-metal or
- ◆ Metal plus polyatomic ion or
- ◆ Polyatomic ion plus polyatomic ion

Molecular/ Covalent:

- ◆ Contains only non-metal atoms

- ◆ **Chemical Formula** - Indicates the number and type of atoms in the base unit of a compound.

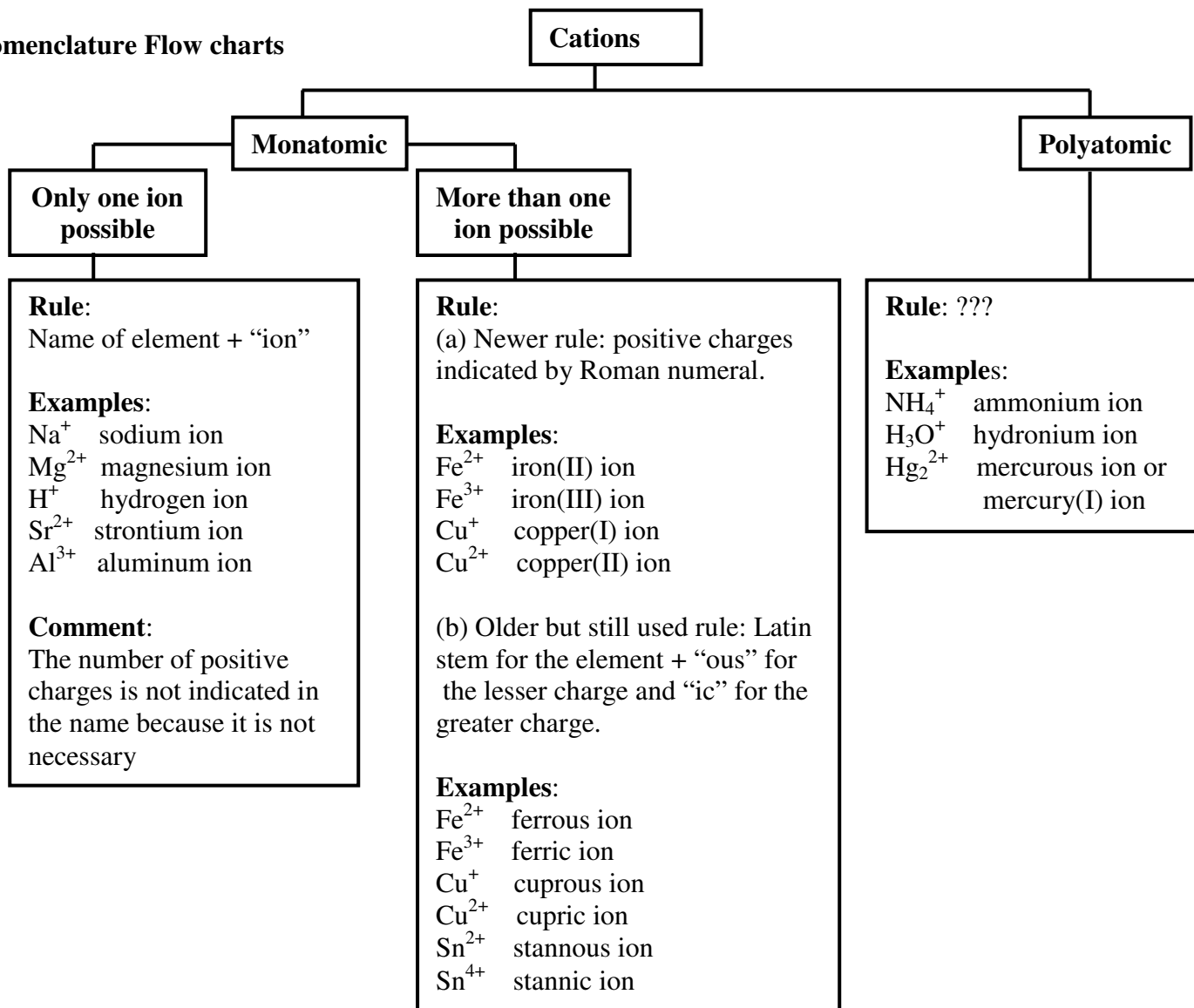
Type of compound	Base unit
Ionic	Formula unit (f.u.)
Molecular	Molecule

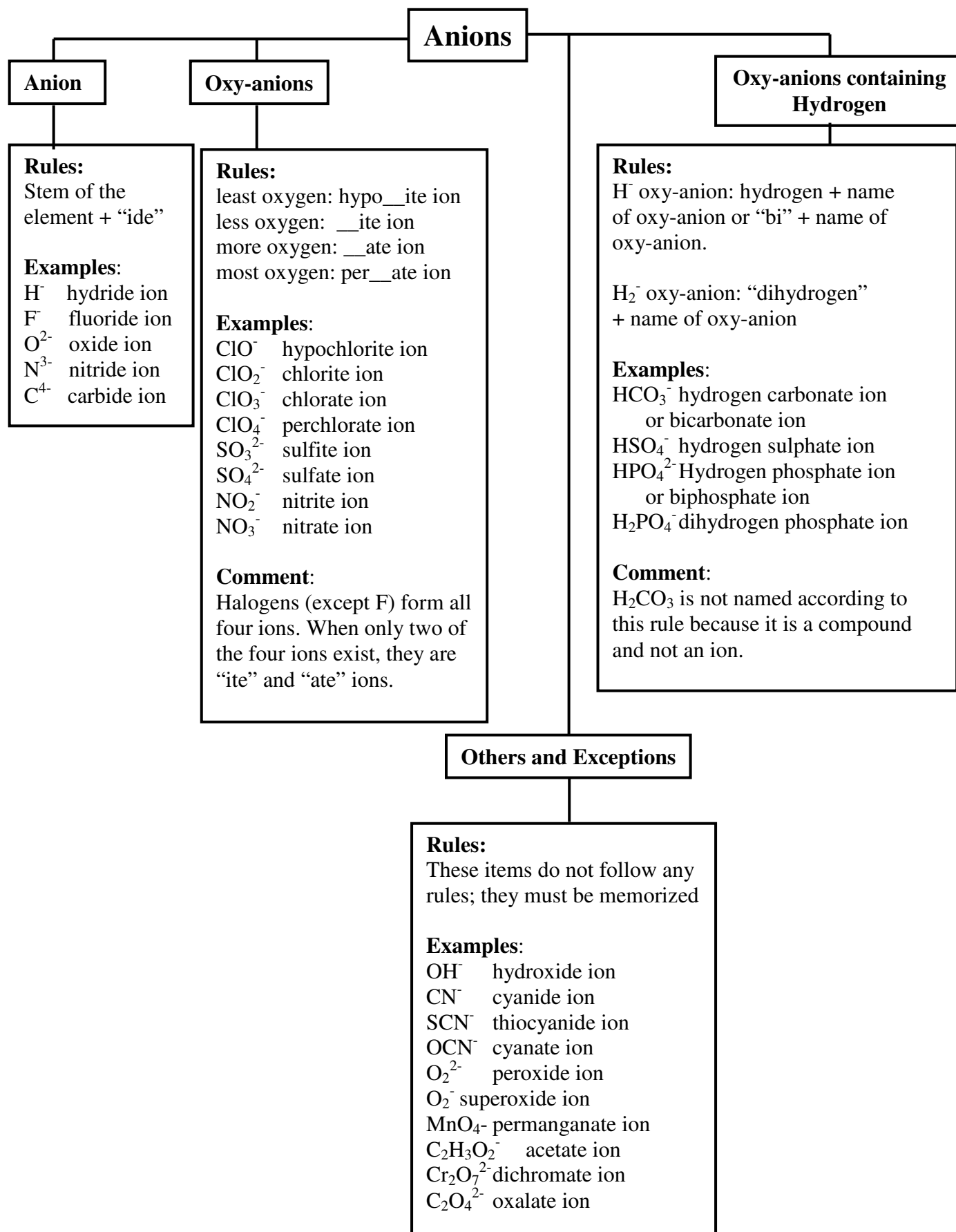
- ◆ **Valence Electrons** - Electrons in the outermost shell of an atom
 - ◆ The only e^- s involved in bonding and chemical reactions.
 - ◆ For the S- & P-blocks: $\# \text{ Valence } e^- = \text{Group number}$
- ◆ **Ionic Compounds:** An electrostatic attraction between a positive ion and a negative ion, where one or more electrons have been transferred from the valence shell of one atom to the valence shell of the other atom.
- ◆ **Molecular Compounds:** Sharing valence electrons between atoms of different elements form COVALENT bonds
 - ◆ **Octet Rule** - An atoms tends to gain, lose or share such that it achieves eight valence electrons. There are some exceptions to the “Octet” Rule!

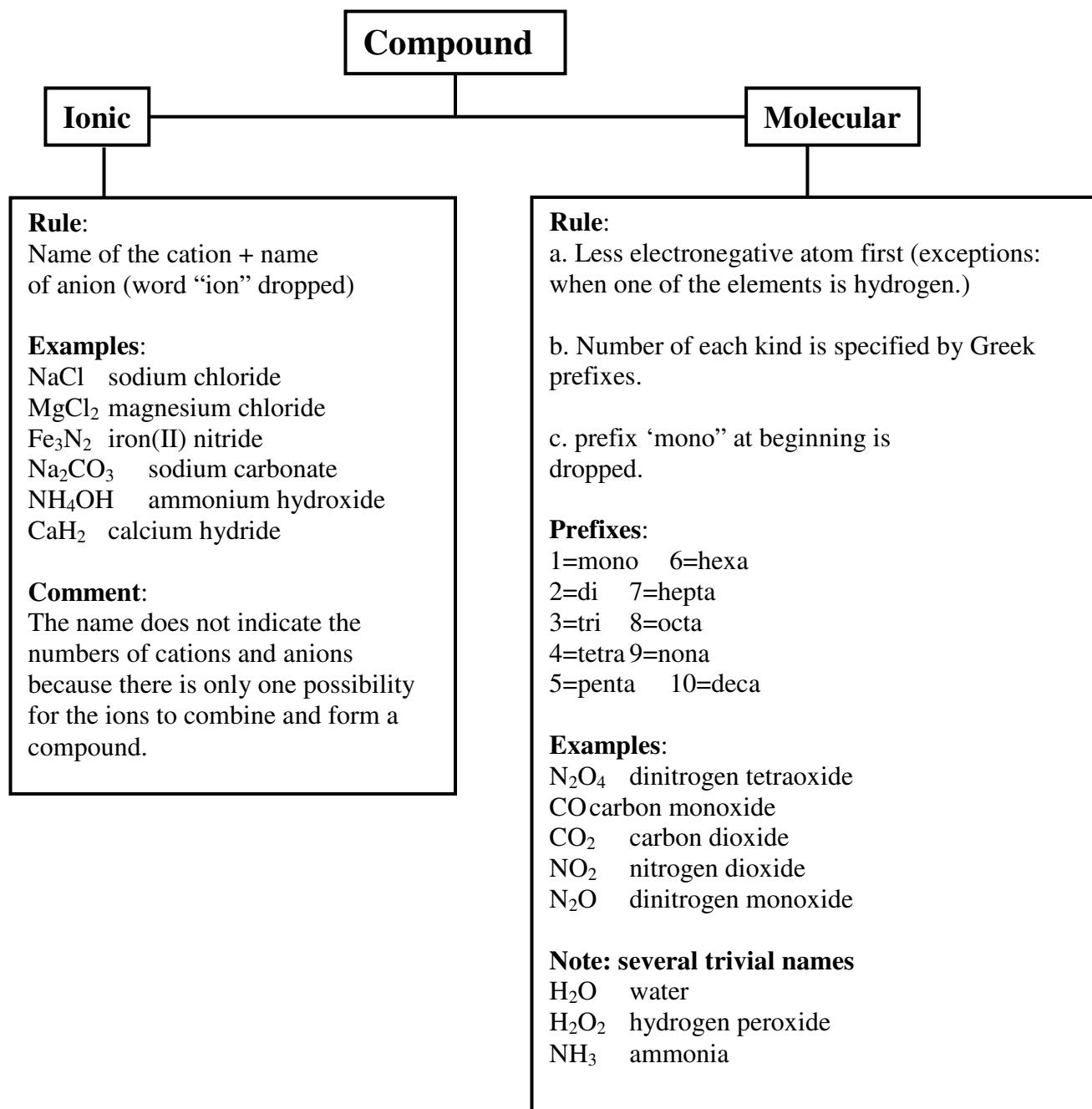
Formation of Ionic Compounds:

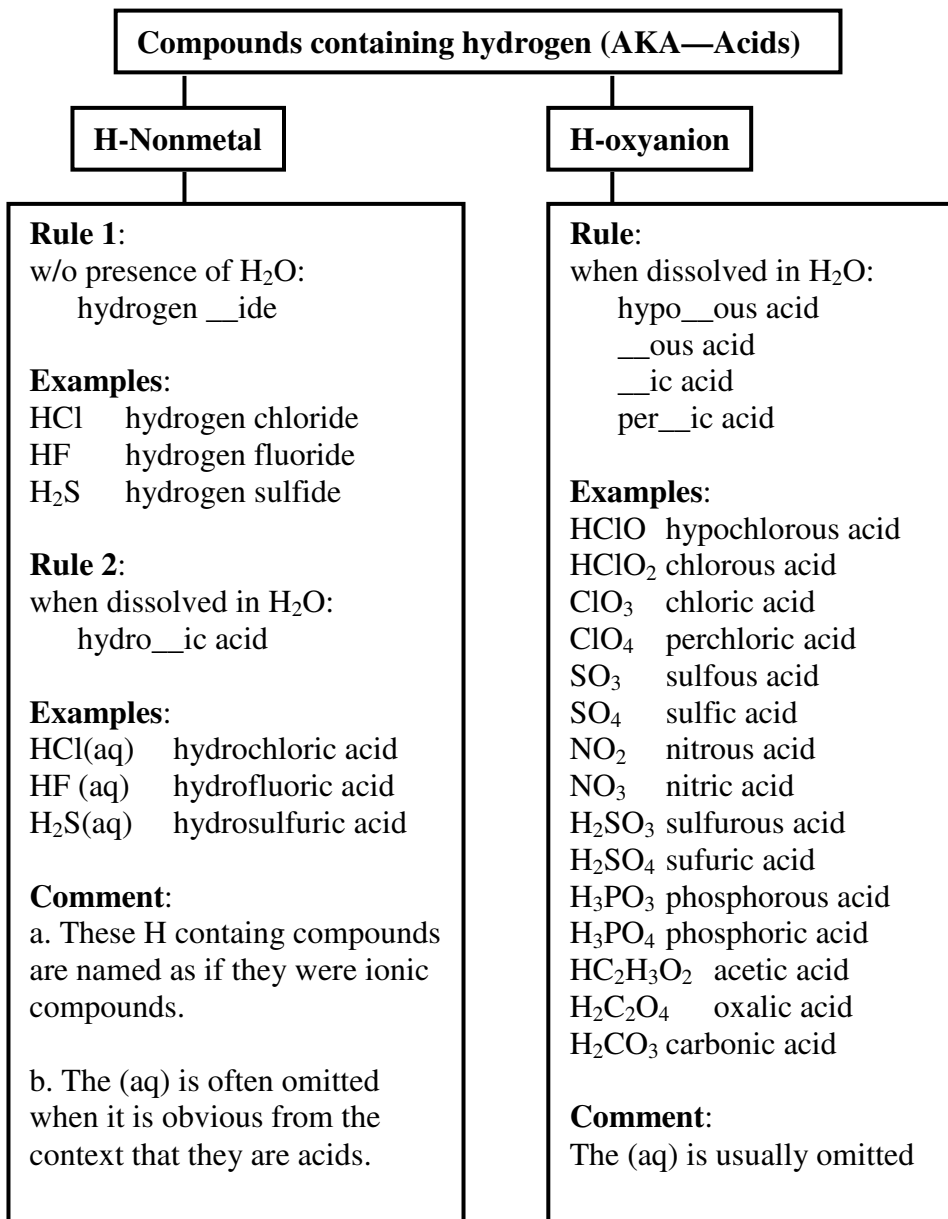
- ◆ All compounds are electrically neutral \Rightarrow possess no net charge.
- ◆ Number of positives = number of negatives

Nomenclature Flow charts









Identify the cation and anion for the following ionic compounds. Be sure to include the correct charge!								
	Cation	Anion		Cation	Anion		Cation	Anion
CaS			MgF ₂			Cs ₂ O		
Fe ₂ O ₃			Al ₂ S ₃			NaBr		
FeSO ₃			Mg ₃ (PO ₄) ₂			KNO ₃		
Na ₂ SO ₄			Ba(NO ₃) ₂			Fe ₂ (SO ₃) ₃		
MgCl ₂			NaCl			Ba ₃ (PO ₄) ₂		
KI			Sr(MnO ₄) ₂			Fe ₃ As ₂		
Mn ₂ (SO ₃) ₇			NaF			PbSO ₄		
SnBr ₄			Cr(PO ₄) ₂			Pb(OH) ₄		
Mg ₃ P ₂			Al ₂ Se ₃			Cu(C ₂ H ₃ O ₂) ₂		

Provide the correct name the following compounds.			
NaBr		B ₂ H ₄	
CaSO ₄		CO	
P ₂ O ₅		IO ₂	
Zn(NO ₂) ₂		BBr ₃	
K ₃ N		VO ₂	
V ₂ S ₃		PbS	
Ca(C ₂ H ₃ O ₂) ₂		Cr(CO ₃) ₃	
SO ₂		N ₂ O ₃	
Ag ₃ P		CH ₄	
FePO ₄		FeSO ₄	
CuOH		NH ₃	
Ti(SO ₄) ₂		P ₂ O ₅	
C ₂ Br ₆		SiO ₂	
GaCl ₃		Na ₂ CO ₃	
CoBr ₂		H ₂ O	

Write the correct chemical formula for the following chemical compounds.			
tin (IV) selenide		dinitrogen trioxide	
nickel (III) sulfide		lithium acetate	
silver acetate		phosphorus trifluoride	
silicon dioxide		vanadium (V) oxide	
manganese (II) phosphate		aluminum hydroxide	
ammonium oxide		zinc sulfide	
diboron tetrabromide		silicon tetrafluoride	
magnesium sulfate heptahydrate		silver phosphate	
potassium carbonate		iron (II) phosphide	
carbon tetrachloride		potassium acetate	
tetrasulfur dinitride		disilicon hexabromide	
diselenium diiodide		titanium (IV) nitrate	
copper (I) phosphate		tetraphosphorus triselenide	
gallium oxide		Dihydrogen monoxide	

Provide the correct name for the following acids or bases.			
NaOH		NH ₃	
H ₂ SO ₃		HCN	
H ₂ S		Ca(OH) ₂	
H ₃ PO ₄		Fe(OH) ₃	

Write the correct chemical formula for the following acids or bases.			
hydrofluoric acid		cobalt (II) hydroxide	
hydroselenic acid		sulfuric acid	
chlorous acid		beryllium hydroxide	
lithium hydroxide		hydrobromic acid	
nitrous acid		perchloric acid	
sulfurous acid		potassium hydroxide	
hypochlorous acid		chloric acid	
carbonic acid		phosphoric acid	