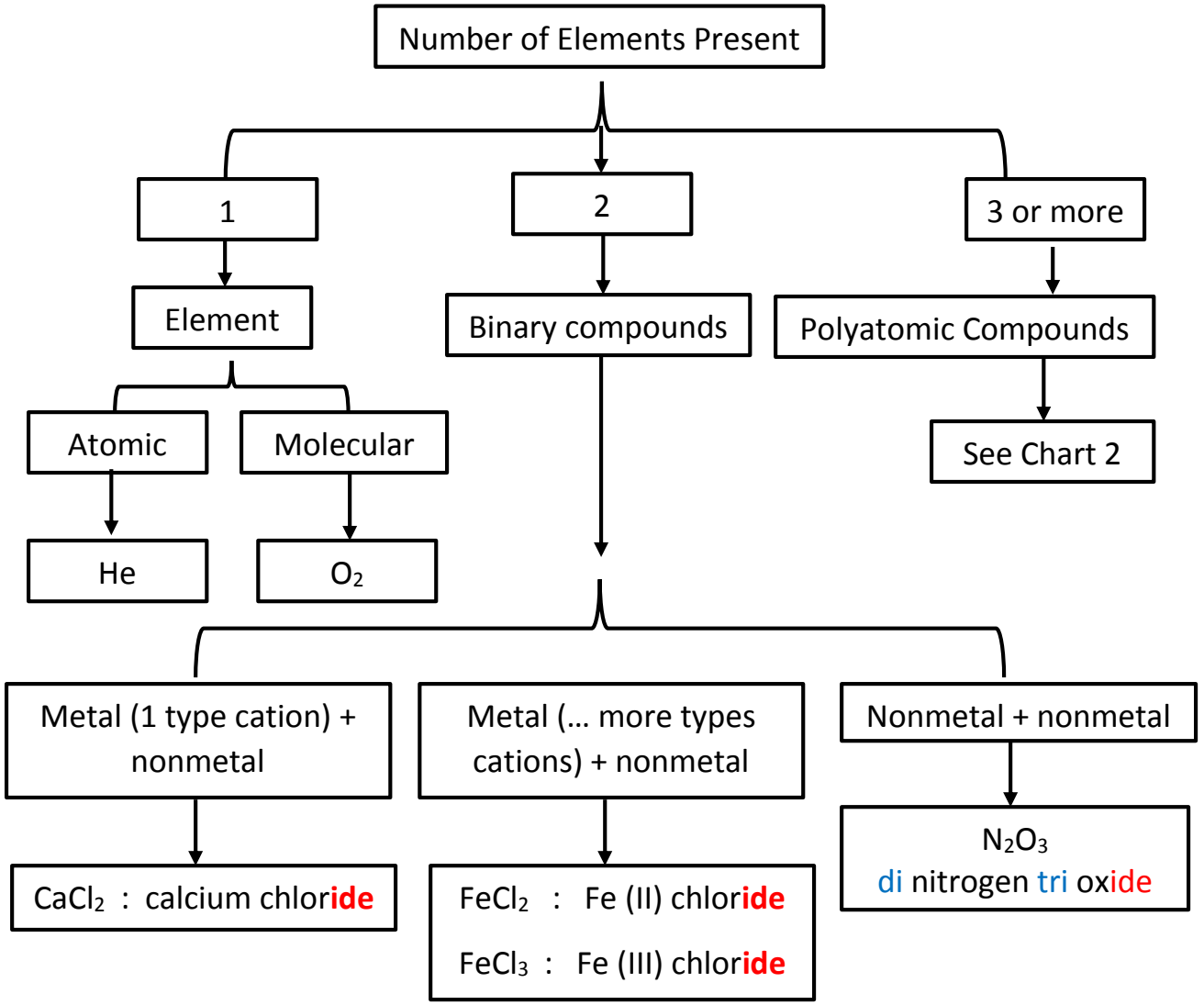
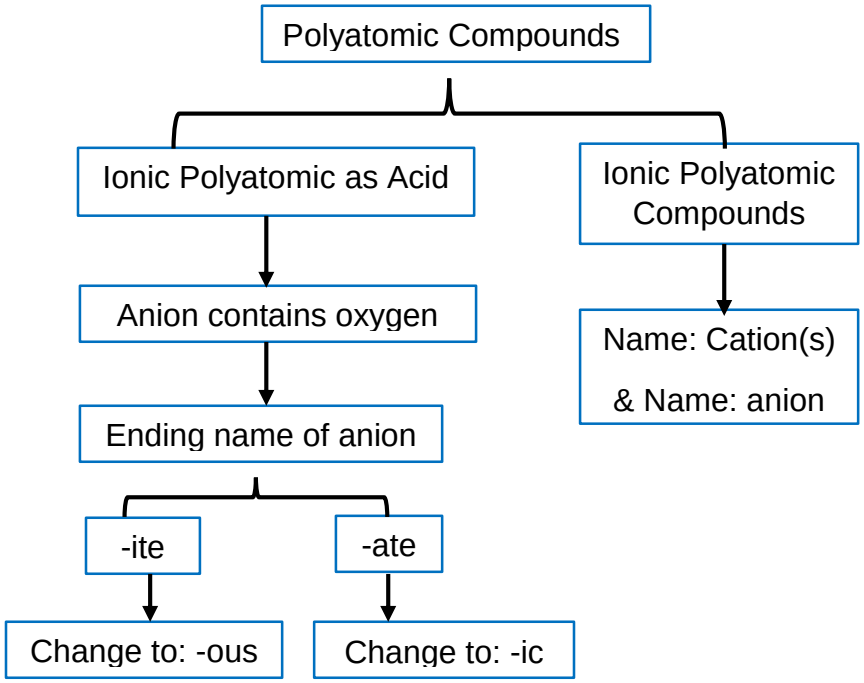
- Nomenclature is the process of naming chemical compounds.
- Organic chemistry has a **completely** different set of rules for nomenclature.
- There are two types of inorganic compounds that can be formed: **ionic compounds** and **molecular compounds.**





Note:

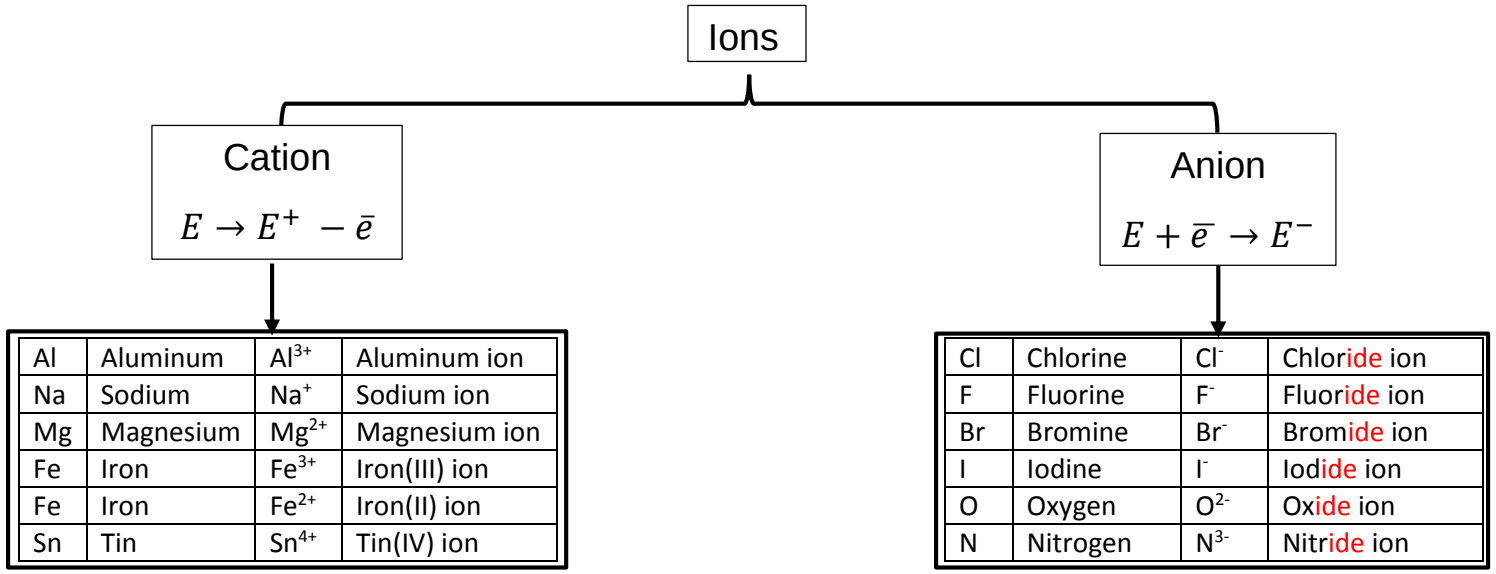
- Acid formulas often begin with H
- An acid is a substance that dissociates into hydrogen ions (H^+) and anions <u>in water</u>.
- binary acids make by two elements: HCl, H_2S
- oxy-acids: H_2SO_4, HNO_3
- Polyatomic anion acid:

-ate → -ic acid

-ite → -ous acid

Selection of Oxy acids			
Anion (ion)	Acid	Anion (ion)	Acid
SO_4^{2-} Sulfate	H_2SO_4 Sulfuric acid	PO_4^{3-} Phosphate	H_3PO_4 Phosphoric acid
SO_3^{2-} Sulfite	H_2SO_3 Sulfurous acid	PO_3^{3-} Phosphite	H_3PO_3 Phosphorous acid
NO_3^- Nitrate	HNO_3 Nitric acid	IO_3^- Iodate	HIO_3 Iodic acid
NO_2^- Nitrite	HNO_2 Nitrous acid	$C_2H_3O_2^-$ Acetate	$HC_2H_3O_2$ Acetic acid
CO_3^{2-} Carbonate	H_2CO_3 Carbonic acid	$C_2O_4^{2-}$ Oxalate	$H_2C_2O_4$ Oxalic acid
BO_3^{3-} Borate	H_3BO_3 Boric acid	BrO_3^- Bromate	$HBrO_3$ Bromic acid

The Greek numerical prefixes are used for naming									
1	2	3	4	5	6	7	8	9	10
mono	di	tri	tetra	penta	hepta	hexa	octa	nano	deca



Al	Aluminum	Al^{3+}	Aluminum ion
Na	Sodium	Na^{+}	Sodium ion
Mg	Magnesium	Mg^{2+}	Magnesium ion
Fe	Iron	Fe^{3+}	Iron(III) ion
Fe	Iron	Fe^{2+}	Iron(II) ion
Sn	Tin	Sn^{4+}	Tin(IV) ion

Cl	Chlorine	Cl^{-}	Chloride ion
F	Fluorine	F^{-}	Fluoride ion
Br	Bromine	Br^{-}	Bromide ion
I	Iodine	I^{-}	Iodide ion
O	Oxygen	O^{2-}	Oxide ion
N	Nitrogen	N^{3-}	Nitride ion

Polyatomic (3 or more elements) compounds

Formulas and Names of Some Polyatomic Ions			
Formula	Name	Formula	Name
NH^{4+}	ammonium	CO_3^{2-}	carbonate
H_3O^+	hydronium	OCN^-	cyanate
OH^-	hydroxide	SCN^-	thiocyanate
CN^-	cyanide	$S_2O_3^{2-}$	thiosulfate
O_2^{2-}	peroxide	CrO_4^{2-}	chromate
N_3^-	azide	$Cr_2O_7^{2-}$	dichromate
NO_2^-	nitrite	SO_4^{2-}	sulfate
NO_3^-	nitrate	SO_3^{2-}	sulfite
ClO^-	hypochlorite	PO_4^{3-}	phosphate
ClO_2^-	chlorite	PO_4^{3-}	monohydrogen phosphate
ClO_3^-	chlorate	PO_4^{3-}	dihydrogen phosphate
ClO_4^-	perchlorate	HCO_3^-	hydrogen carbonate (bicarbonate)
MnO_4^-	permanganate	HSO_4^-	hydrogen sulfate (bisulfate)
$C_2H_3O_2^-$	acetate (OAc-)	HSO_3^-	hydrogen sulfite (bisulfite)
$C_2O_4^{2-}$	oxalate		

Note:

- The transition metals may form more than one ion.
- This is indicated by assigning a Roman numeral after the metal. The Roman numeral denotes the charge and the oxidation state of the transition metal ion.

Selected Transition Metal and Metal Cations:

+1 Charge	**+2 Charge**	**+3 Charge**	**+4 Charge**
Copper(I): Cu^{+}	Copper(II): Cu^{2+}	Aluminum: Al^{3+}	Lead(IV): Pb^{4+}
Silver: Ag^{+}	Iron(II): Fe^{2+}	Iron(III): Fe^{3+}	Tin(IV): Sn^{4+}
	Cobalt(II): Co^{2+}	Cobalt(III): Co^{3+}	
	Tin(II): Sn^{2+}		
	Lead(II): Pb^{2+}		
	Nickel: Ni^{2+}		
	Zinc: Zn^{2+}		

Transition Metal Ion with Roman Numeral	Latin name
Copper (I): Cu^{+}	Cuprous
Copper (II): Cu^{2+}	Cupric
Iron (II): Fe^{2+}	Ferrous
Iron (III): Fe^{3+}	Ferric
Lead (II): Pb^{2+}	Plumbous
Lead (IV): Pb^{4+}	Plumbic
Mercury (I): Hg_2^{2+}	Mercurous
Mercury (II): Hg^{2+}	Mercuric
Tin (II): Sn^{2+}	Stannous
Tin (IV): Sn^{4+}	Stannic

Note:

- We do not use Roman numerals after names of: Aluminum, Zinc, and Silver, because these metals only exist in one ion.

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Compounds between Nonmetals and Nonmetals (Molecular Compounds):

Compounds that consist of a nonmetal bonded to a nonmetal are commonly known as **Molecular Compounds**, where the element with the positive oxidation state is written first. In many cases, nonmetals form more than one binary compound, so **prefixes** are used to distinguish them.

Number of atoms & Prefixes									
1	2	3	4	5	6	7	8	9	10
mono	di	tri	tetra	penta	hexa	Hepta	octa	nano	deca

Example:

CO = carbon ***mon***oxide BCl_3 = boron***tri***chloride

CO_2 = carbon ***di***oxide N_2O_5 =***di***nitrogen ***pent***oxide

Note:

- The prefix *mono-* is not used for the first element.
- An acid is a substance that dissociates into hydrogen ions (H^+) and anions <u>in water</u>.

Selected common binary acids			
Gas State		**Aqueous State**	
Formula	**Name**	**Formula**	**Name**
$HF_{(g)}$	Hydrogen fluoride	$HF_{(aq)}$	Hydrofluoric acid
$HBr_{(g)}$	Hydrogen bromide	$HBr_{(aq)}$	Hydrobromic acid
$HCl_{(g)}$	Hydrogen chloride	$HCl_{(aq)}$	Hydrochloric acid
$H_2S_{(g)}$	Hydrogen sulfide	$H_2S_{(aq)}$	Hydrosulfuric acid

Polyatomic Ions

- Polyatomic (meaning two or more atoms) are joined together by **covalent bonds**.

Increasing number of oxygen atoms $\longrightarrow$			
hypo — ite	— ite	— ate	per — ate
Example:			
ClO^-	ClO_2^-	ClO_3^-	ClO_4^-
hypochlorite	chlorite	chlorate	perchlorate

Common Polyatomic ions

Name: Cation Anion	Formula
Ammonium ion	NH_4^+
Hydronium ion	H_3O^+
Acetate ion	$C_2H_3O_2^-$
Arsenate ion	AsO_4^{3-}
Carbonate ion	CO_3^{2-}
Hypochlorite ion	ClO^-
Chlorite ion	ClO_2^-
Chlorate ion	ClO_3^-
Perchlorate ion	ClO_4^-
Chromate ion	CrO_4^{2-}
Dichromate ion	$Cr_2O_7^{2-}$
Cyanide ion	CN^-
Hydroxide ion	OH^-
Nitrite ion	NO_2^-
Nitrate ion	NO_3^-
Oxalate ion	$C_2O_4^{2-}$
Permanganate ion	MnO_4^-
Phosphate ion	PO_4^{3-}
Sulfite ion	SO_3^{2-}
Sulfate ion	SO_4^{2-}
Thiocyanate ion	SCN^-
Thiosulfate ion	$S_2O_3^{2-}$