DETERMINING IONIC FORMULAS

sodium sulfate

Na^+ SO_4^{2-}

Na^+

Na_2SO_4

strontium oxide

Sr^{2+} O^{2-}

SrO

chromium(III) nitrate

Cr^{3+} NO_3^-

NO_3^-

NO_3^-

$Cr(NO_3)_3$

chromium(III) nitride

Cr^{3+} N^{3-}

CrN

tin(II) phosphate

Sn^{2+} PO_4^{3-}

Sn^{2+} PO_4^{3-}

Sn^{2+}

$Sn_3(PO_4)_2$

titanium(IV) chloride

Ti^{4+} Cl^-

Cl^-

Cl^-

Cl^-

$TiCl_4$

titanium(IV) oxide

Ti^{4+} O^{2-}

O^{2-}

TiO_2

barium hydroxide

Ba^{2+} OH^-

OH^-

$Ba(OH)_2$

~~$BaOH_2$~~

Be careful when you have a polyatomic that does not end in a subscript. You still need parenthesis to indicate more than one hydroxide (or cyanide)!

MOLECULAR COMPOUNDS

- There are several kinds of molecular compound. We will learn to name two simple but important classes

1 BINARY MOLECULAR COMPOUNDS

- molecular compounds containing only two elements

2 ACIDS

- molecular compounds that dissolve in water to release H^+ ions
- corrosive to metals (react with many to produce hydrogen gas)
- contact hazard: can cause chemical burns to eyes and skin
- sour taste
- turn litmus indicator RED
- two kinds of acids:

1 BINARY ACIDS

usually Group VIIA

- contain hydrogen and one other element

2 OXYACIDS

- contain hydrogen, OXYGEN, and another element

BINARY MOLECULAR COMPOUNDS

- Named based on the elements they contain, plus prefixes to indicate the number of atoms of each element in each molecule

(1) FIRST ELEMENT

- Add a GREEK PREFIX to the name of the element.
- Omit the "MONO-" (1) prefix if there is only one atom of the first element

(2) SECOND ELEMENT

- Add a GREEK PREFIX to the STEM NAME of the element
- Add the suffix "-ide" (as if you were naming an anion)
- DO NOT omit the "mono-" prefix if there is only one atom of the second element

MEMORIZE THE GREEK PREFIXES. SEE COURSE WEB SITE FOR A LIST!

BINARY MOLECULAR COMPOUNDS

Examples:

BF_3

boron trifluoride

Cl_2O_7

dichlorine heptaoxide
OR dichlorine heptoxide

CO

carbon monoxide

CO_2

carbon dioxide

H_2O

dihydrogen monoxide (but we call it water...)

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carbon tetrachloride

CCl_4

iodine trichloride

ICl_3

dinitrogen tetrafluoride

N_2F_4

$MgCl_2$: magnesium CHLORIDE, NOT magnesium DICHLORIDE. We use the ionic naming ssystem here, since magnesium chloride is an ionic compound.

How do we tell? Look at the first element. Compounds with metals as the first element are almost always ionic.

ACIDS

1 BINARY ACIDS

- named after the element (other than hydrogen) they contain
- common binary acids include a Group VIIA element
- named: "Hydro-" + STEM NAME OF ELEMENT+ "-ic acid"

Four common binary acids

- HF : hydrofluoric acid * dissolves glass!
- HCl : hydrochloric acid *most common binary acid!
- HBr : hydrobromic acid
- HI : hydroiodic acid

ACIDS

(2) OXYACIDS

- Easy to think about as HYDROGEN IONS combined with POLYATOMIC IONS

- These acids are not true ionic compounds, but they interact with water to PRODUCE ions!

- named based on the polyatomic ion they contain, with an ending change:

(1) - ions ending in -ATE form acids ending in -IC

(2) - ions ending in -ITE form acids ending in -OUS

sulfate

H_2SO_4

sulfuric acid

phosphate

H_3PO_4

phosphoric acid

sulfite

H_2SO_3

sulfurous acid

nitrate

HNO_3

nitric acid

OXYACID EXAMPLES

acetic acid

Based on ACETATE

$H^+ \quad C_2H_3O_2^-$

$HC_2H_3O_2$

nitrous acid

Based on NITRITE

$H^+ \quad NO_2^-$

HNO_2

carbonic acid

Based on CARBONATE

$H^+ \quad CO_3^{2-}$

H^+

H_2CO_3

* The number of hydrogen ions to add to the polyatomic to make the acid equals the charge of the polyatomic.