NAMING IONIC COMPOUNDS
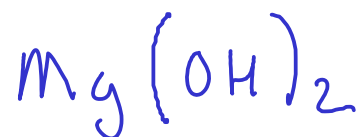
- The name of the compound is based on the name of the ions in the compound
- Cation first, anion second

Examples:
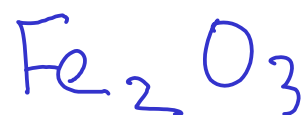
$Mg(OH)_2$

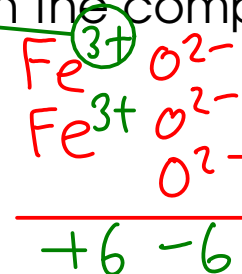magnesium hydroxide
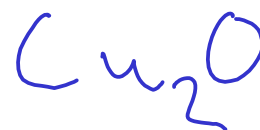
Na_2S

sodium sulfide

$BeBr_2$

beryllium bromide

Fe_2O_3

$Fe^{3+}\ O^{2-}$
$Fe^{3+}\ O^{2-}$
$\underline{\qquad\ O^{2-}}$
$+6\ -6$

iron(III) oxide

CuO

$\underline{Cu^{2+}\ O^{2-}}$
$+2\ -2$

copper(II) oxide

Cu_2O

$Cu^{+}\ O^{2-}$
$\underline{Cu^{+}\qquad}$
$+2\ -2$
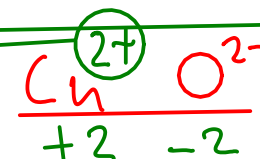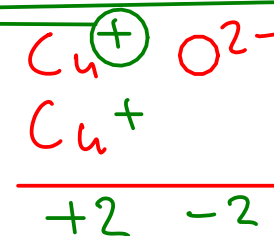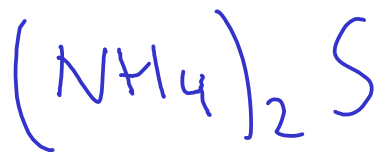
copper(I) oxide

* Remember to include the Roman numeral for CHARGE when you're writing transition metal compound names!

Page 63 (9th edition): Chart of polyatomic ions
Page 64 (10th edition)

$(NH_4)_2 S$

ammonium sulfide

$FeCO_3$

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

$$\frac{+2 \quad\quad -2}{}$$
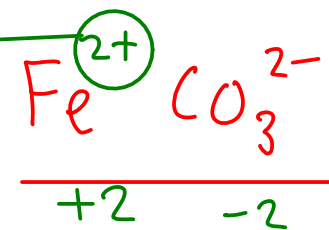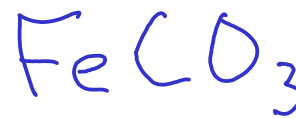
iron(II) carbonate

TiS_2

$Ti^{4+} \quad S^{2-}$

S^{2-}

$$\frac{+4 \quad -4}{}$$
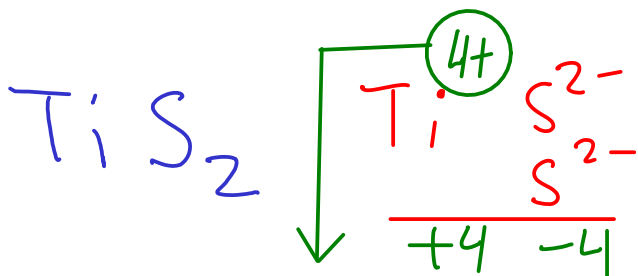
titanium(IV) sulfide

$Ba_3(PO_4)_2$

barium phosphate

Ba_3P_2

Spelling matters!

barium phosphide
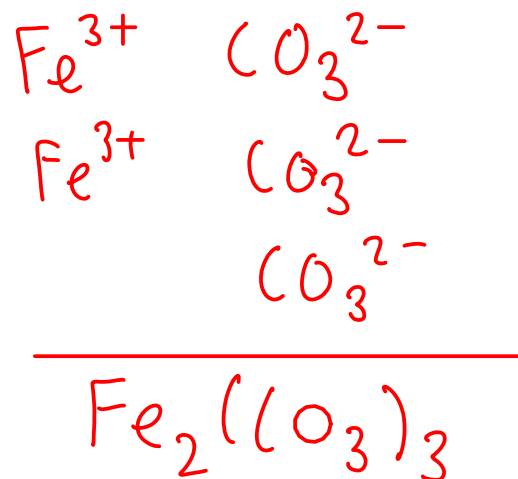
DETERMINING THE FORMULA OF AN IONIC COMPOUND FROM THE NAME

- The name of an ionic compound is made of the names of the CATION and ANION in the compound.

- To get the FORMULA, you must figure out the SMALLEST RATIO of cation to anion that makes the charges balance out
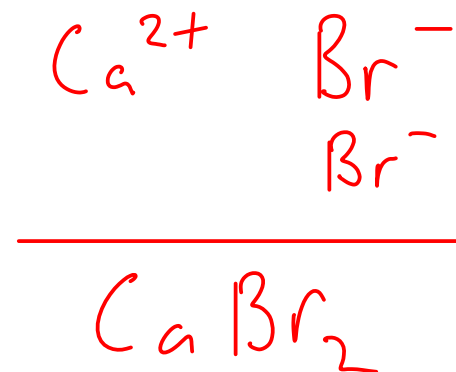

Examples:

iron(III) carbonate

Fe^{3+} CO_3^{2-}

Fe^{3+} CO_3^{2-}

CO_3^{2-}

$Fe_2(CO_3)_3$

potassium sulfide

K^+ S^{2-}

K^+

K_2S

calcium bromide

Ca^{2+} Br^-

Br^-

$CaBr_2$
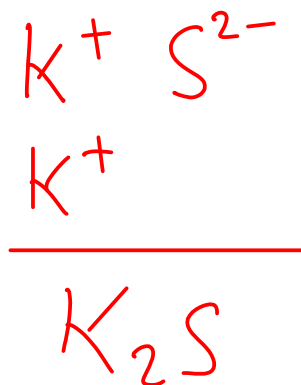
DETERMINING IONIC FORMULAS

sodium sulfate

$$Na^+ \quad SO_4^{2-}$$
$$\frac{Na^+}{Na_2SO_4}$$

strontium oxide

$$Sr^{2+} \quad O^{2-}$$
$$\frac{}{SrO}$$

tin(II) phosphate

$$Sn^{2+} \quad PO_4^{3-}$$
$$Sn^{2+} \quad PO_4^{3-}$$
$$\frac{Sn^{2+}}{Sn_3(PO_4)_2}$$

chromium(III) nitrate

$$Cr^{3+} \quad NO_3^-$$
$$NO_3^-$$
$$NO_3^-$$
$$\frac{}{Cr(NO_3)_3}$$

barium hydroxide

$$Ba^{2+} \quad OH^-$$
$$\frac{OH^-}{Ba(OH)_2}$$

~~BaOH₂~~
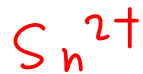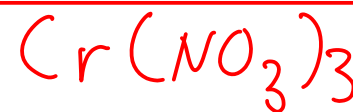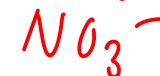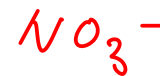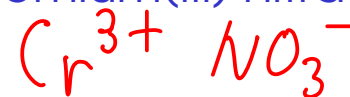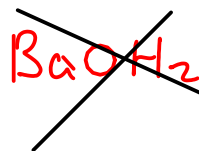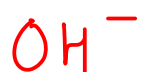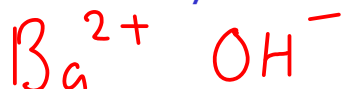
titanium(IV) chloride

$$Ti^{4+} \quad Cl^-$$
$$Cl^-$$
$$Cl^-$$
$$\frac{Cl^-}{TiCl_4}$$

Note: Be careful with HYDROXIDES, CYANIDES, and HYPOCHLORITES. These polyatomic ions do not end in their own subscripts, but you still need to use parenthesis if you want to add one!

HYDRATES

- many ionic compounds are formed by crystallizing the compound from water. Sometimes, this causes water molecules to become part of the crystal structure.

- This water is present in a definite ratio to the ions in the compound. Can be removed by heating, but will NOT evaporate if the compound is left standing.

water molecules per formula unit of compound

ex: $CuSO_4 \cdot 5H_2O$

dot indicates that the water is weakly bound to the ionic compound

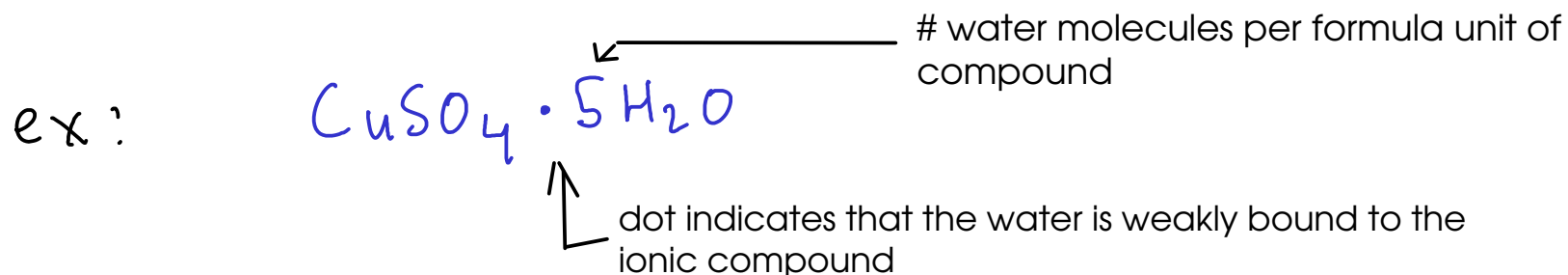- many DESSICANTS are hydrates that have had their water molecules driven off. They will slowly reabsorb water from the air (and keep the environment in a dessicator at a low humidity)

- Hydrates are named using the name of the ionic compound, and a Greek prefix in front of the word "hydrate" to indicate how many water molecules are associated

$Cu^{2+} \; SO_4^{2-}$

copper (II) sulfate pentahydrate

Why "copper(II)"?
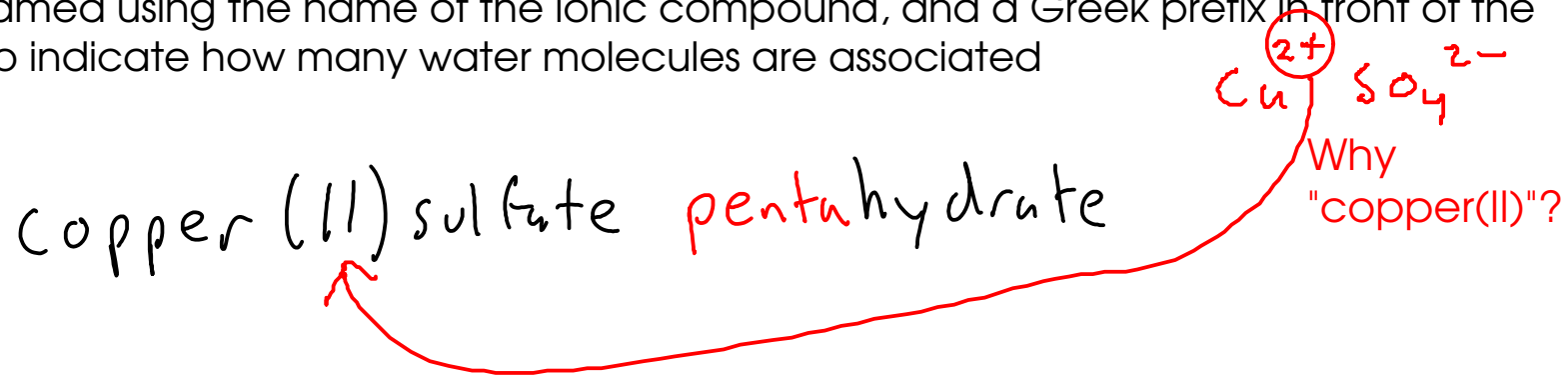
MOLECULAR COMPOUNDS

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

(1) <u>BINARY MOLECULAR COMPOUNDS</u>

      - molecular compounds containing only two elements

(2) <u>ACIDS</u>

      - 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) <u>BINARY ACIDS</u>

Usually from Group VIIA

               - contain hydrogen and one other element

           (2) <u>OXYACIDS</u>

               - 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
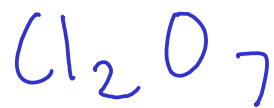
> SEE COURSE WEB SITE FOR A LIST OF GREEK PREFIXES!
> THESE ARE THE SAME PREFIXES USED FOR THE HYDRATES!

BINARY MOLECULAR COMPOUNDS

Examples:

BF_3

boron trifluoride

Cl_2O_7

dichlorine hept(a)oxide

CO

carbon monoxide

CO_2

carbon dioxide

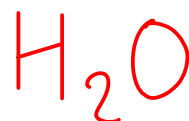*Note: metalloids like boron behave chemically like nonmetals do.

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carbon tetrachloride

CCl_4

dihydrogen monoxide

H_2O

dinitrogen tetrafluoride

N_2F_4