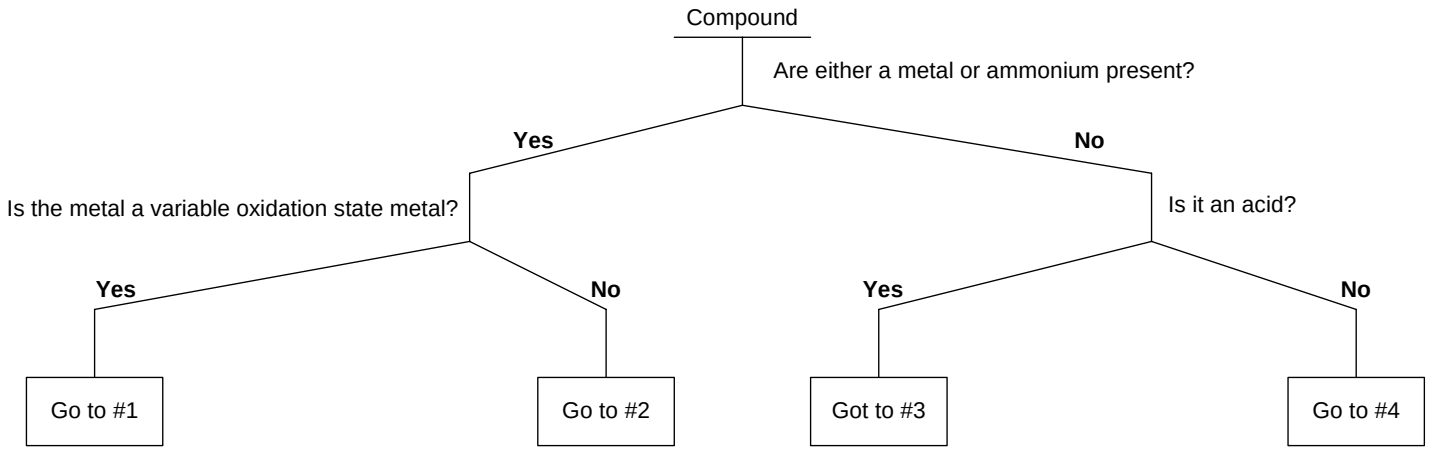

Formula to Name.

#1 – Ionic compounds WITH variable oxidation state metals

Remember: Variable oxidation state metals are those metals that can have more than one charge when it is an ion. For example, iron is a variable oxidation state metal because it can be either Fe^{+2} or Fe^{+3}. Here are ALL of the variable oxidation state metals you are responsible for: Ti, Cr, Mn, Fe, Co, Ni, Cu, As, Sn, Sb, Au, Hg, Pb, and Bi. If one of these is present, you MUST use roman numerals in the name of the compound. If one of these is not present you must NOT use roman numerals in the name.

Step 1: Find the charge on the metal.

$$(\#\text{ of cations}) \bullet (\text{charge of cation}) = (\#\text{ of anions}) \bullet (\text{charge of anion})$$

The charge of the cation will always be unknown, so will always be X

Step 2: Write the name of the metal and the roman numeral for the charge of the metal

Step 3: Add the name of the anion.

Example: $Cr_2(SO_3)_3$

Step 1: $(2) \bullet (X) = (3) \bullet (2)$

X = charge of cation = 3, so this is Cr^{+3}

Step 2: chromium (III)

Step 3: chromium (III) sulfite

Example: $Mn(CO_3)_2$

Step 1: $(1) \bullet (X) = (2) \bullet (2)$

X = charge of cation = 4, so this is Pb^{+4}

Step 2: manganese (IV)

Step 3: manganese (IV) carbonate

(NOTE: if you don't use the LCM method here, you are likely to make a mistake and get the wrong answer.)

Try these:

1) $Fe_2(CrO_4)_3$
2) $Bi_3(AsO_4)_5$
3) $CuClO$
4) $Hg_2(BrO_4)_2$
5) $AsPO_3$

#2 – Ionic compounds WITHOUT variable oxidation state metals

Step 1: Name the cation
Step 2: Add the name of the anion

Example: $Ca(OH)_2$
Step 1: calcium
Step 2: calcium hydroxide

Example: K_2O
Step 1: potassium
Step 2: potassium oxide

Try these:
1) $Sr(NO_2)_2$
2) $Al_2(Cr_2O_7)_3$
3) $Ag_2C_2O_4$
4) Li_2O_2
5) $Be(IO_2)_2$

#3 – Acids

Rule 1: Step one was to make sure it is an acid by looking for at least one leading hydrogen and a trailing $_{(aq)}$
Rule 2: if anion ends with an **–ide**, acid is named **hydro_____ic acid** where the blank is the stem of the anion.
Rule 3: if anion ends with an **–ite**, acid is named **_____ous acid** where the blank is the stem of the anion.
Rule 4: if anion ends with an **–ate**, acid is named **_____ic acid** where the blank is the stem of the anion.

Example: $HClO_{4(aq)}$
There is a leading hydrogen and a trailing $_{(aq)}$ so this is an acid
The anion is ClO_4^- which is the perchlor**ate** anion, so Rule 4 applies
Ending is changed to –**ic,** so this is **perchloric acid**

Example: $H_2SO_{3(aq)}$
There is a leading hydrogen and a trailing $_{(aq)}$ so this is an acid
The anion is SO_3^{-2} which is the sulf**ite** anion, so Rule 3 applies
Ending is changed to –**ous**, so this is **sulfurous acid**

Example: $HCN_{(aq)}$
There is a leading hydrogen and a trailing $_{(aq)}$ so this is an acid
The anion is CN^- which is the cyan**ide** anion, so Rule 2 applies
hydro is put out front and the ending is changed to **–ic**, so this is **hydrocyanic acid**

Try these:
1) $H_2C_2O_{4(aq)}$
2) $HIO_{2(aq)}$
3) $HBr_{(aq)}$
4) $HMnO_{4(aq)}$
5) $HNO_{3(aq)}$

#4 – Covalent compounds

Step 1: Write the prefix for the first subscript
Step 2: Write the name of the elements with no changes
Step 3: Write the prefix for the second subscript
Step 4: Write the name of the second element with the ending changed to –ide

Example: O_2F
Step 1: di
Step 2: dioxygen
Step 3: dioxygen mono
Step 4: dioxygen monofluoride

Example: P_3S_7

Step 1: tri
Step 2: triphosphorous
Step 3: triphosphorous hepta
Step 4: triphosphorous heptasulfide

You try:

1) Br_6Cl_9
2) I_4Cl_5
3) CO
4) S_8O_6
5) HCl

Name to Formula.

#1 and #2 – all ionic compounds

Step 1: Write the symbol for the cation, including the charge and the symbol for the anion, including charge.

Step 2: Find the LCM of the two charges and use it to determine how many cations and how many anions you need in the formula.

$\frac{\text{LCM}}{\text{charge of cation}}$ = # of cations $\qquad$ $\frac{\text{LCM}}{\text{charge of anion}}$ = # of anions

Step 3: Write the formula for the compound: $\{\text{symbol of cation}\}_{\{\#\text{ of cations}\}}\{\text{symbol of anion}\}_{\{\#\text{ of anions}\}}$ no charges in the formula

Remember, if, and only if, there are more than one of a polyatomic ion present, you MUST surround it with parentheses. Parentheses are NOT used for monatomic ions or for single polyatomic ion.

Example: ammonium carbonate

Step 1: ammonium = NH_4^+ carbonate = CO_3^{2-}

Step 2: LCM of 1 and 2 is 2. $\frac{2}{1}$ = 2 cations $\qquad$ $\frac{2}{2}$ = 1 anion

Step 3: $(NH_4)_2CO_3$

Note: There are two ammonium ions needed, so the NH_4 MUST be in parentheses with the number of cations on the outside of the parentheses. There is only a single carbonate needed, so there must NOT be parentheses.

Example: calcium phosphide

Step 1: calcium = Ca^{+2} phosphide = P^{3-}

Step 2: LCM of 2 and 3 is 6. $\frac{6}{2}$ = 3 cations $\qquad$ $\frac{6}{3}$ = 2 anions

Step 3: Ca_3P_2

Note: There are no polyatomic ions here, so there will not be any parentheses in the formula. There will NEVER be parentheses unless there is a poly atomic ion present.

Example: arsenic (V) arsenate

Step 1: arsenic (V) = As^{5+} arsenate = AsO_4^{3-}

Step 2: LCM of 5 and 3 is 15. $\frac{15}{5}$ = 3 cations $\qquad$ $\frac{15}{3}$ = 5 anions

Step 3: $As_3(AsO_4)_5$

You try:

1) manganese (IV) selenide
2) copper (II) biphosphate
3) rubidium peroxide
4) calcium perbromate
5) nickel (III) sulfide

#3 – Acids

Step 1: Identify the anion of the acid

Rule 1: If the acid name starts with **hydro-**, then the anion ends in an –**ide**.

Rule 2: If the acid name ends with an –**ous acid**, then the anion ends in an –**ite**.

Rule 3: If the acid name ends with an –**ic acid** (without a hydro in the front), then the anion ends in –**ate**.

Step 2: Add the number of hydrogens needed to make the acid neutral and add an $_{(aq)}$ to the end.

Example: hydrofluoric acid

Step 1: The acid name starts with a hydro, so the anion ends with an –ide. That means that it is F^-

Step 2: The acid is $HF_{(aq)}$

Example: carbonic acid

Step 1: The acid name end with –**ic** acid (without a hydro), so the anion ends with an –**ate**. That means that it is CO_3^{-2}

Step 2: The acid is $H_2CO_{3(aq)}$

You try:

1) perchloric acid
2) hydrosulfuric acid
3) hypoiodous acid
4) sulfuric acid
5) chlorous acid

#4 – Covalent compounds

Step 1: Write the symbol of the first element
Step 2: Write the subscript for the first prefix
Step 3: Write the symbol of the second element
Step 4: Write the subscript for the second prefix

Example: tetranitrogen nonachloride

Step 1: N
Step 2: N_3
Step 3: N_3Cl
Step 4: N_3Cl_9

Example: hexaarsenic octaphosphide

Step 1: As
Step 2: As_6
Step 3: As_6P
Step 4: As_6P_8

You try:

1) chlorine pentoxide
2) pentasulfur tetrabromide
3) diphosphorous hexaiodide
4) carbon dioxide
5) dixenon decafluoride