Inorganic Nomenclature Guidelines

First determine whether you compound is an ionic compound, an acid, or binary molecular.

Ionic Compound – starts with a metal or ammonium (NH_4^+). Go to procedure 1.
Acid – Starts with H (except H_2O and H_2O_2). Go to procedure 2.
Binary Molecular – Two <u>non-metal</u> elements. Go to procedure 3.

1. **Ionic Compound**: Name is "cation anion". Determine the names each of the cation and anion. Divide the formula into the cation and anion. Use the formulas to determine the names of each.
    a. Name cation. Simple metal, variable valence or NH_4^+?
        i. Simple metal: Cation is the name of the element.
        ii. Variable valence: Determine the charge of the metal by looking at the charge of the anion and the formula subscripts. Roman numeral name of cation will be element (charge) where charge is a roman numeral (without plus sign!). Classical name ends in "–ous" if lower charged metal and "–ic" if higher charged.
        iii. NH_4^+ cation name is ammonium.
    b. Name anion. Is the anion a Non-metal or polyatomic anion?
        i. Non-metal anion: Anion name is name of the element with "–ide" ending.
        ii. Polyatomic ion: Oxyanion or other?
            1. Oxyanion: Name derived from the name of the non-metal that oxygen is paired with. Larger subscript of oxygen in a series name ends in "–ate." Smaller subscript of oxygen in a series name ends in "–ite." See Oxyanion tips.
            2. Other: Some other polyatomic anions include CN^- cyanide, OH^- hydroxide, peroxide O_2^{2-}
2. **Acid**: Last word of acid name is always "acid." Determine whether the acid has oxygen or not:
    a. Oxyacid: Name derived from non-metal that accompanies the oxyanion
        i. "–ate" oxyanion becomes "-ic acid" (higher number of oxygens)
        ii. "–ite" oxyanion becomes "-ous acid" (lower number of oxygens)
    b. Non-Oxyacid: Name starts with "hydro-" and the rest of the name is derived from anion: "-ide" becomes "hydro[anion]-ic acid"
3. **Binary Molecular**: Two non-metals. Name is composed of two words:
    a. First word is the first element in the formula. Second word is the second element with the usual modified "-ide" ending.
    b. Prefixes are added to each word based on the subscript of each element. Refer to Greek prefix table (e.g. tri = 3 atoms)
    c. Prefix exception: Mono is never used on the first word regardless if there is one atom of that element. (e.g. carbon monoxide not monocarbon monoxide)
    d. Prefix vowel omitted if similar vowel sounds run together by addition of the prefix. (e.g. carbon monoxide NOT carbon monooxide)

Notes:

Be aware of the following compounds, which use a common name. Common names do not follow systematic (IUPAC) procedure:

H_2O water
H_2O_2 hydrogen peroxide
NH_3 ammonia
CH_4 methane

Oxyanion Tips:

- Oxyanion names will always end in –ate or –ite. Since oxyanions are anions (negatively charged ions), they will always be found paired with a cation and form the latter **part** of a name and formula.
- Do not confuse the naming of oxyanions (end in –ate or –ite) with the naming of binary molecular compounds because they have similar formulas. Binary molecular compounds are named using the greek prefixes.
- Do not allow other instances of Greek or similar prefixes to confuse use in naming some of the oxyanions. For example, $Cr_2O_7^{2-}$ is named dichromate. This has nothing to do with the naming of binary molecular compounds.
- There are a few instances of oxyanions series for a non-metal with two possible anions (e.g. NO_3^-, NO_2^-). Remember the higher number of oxygens name ends in –ate.
- Most oxyanions with just one type in their series (e.g. only one type with Carbon and Oxygen: CO_3^{2-}) will end in "-ate."
- Cl, Br, and I each all form four oxyanions with the pattern (XO_4^-, XO_3^-, XO_2^-, XO^-) where X=halogen and names respectively (per____ate, ____ate, ____ite, and hypo____ite). Fill the halogen name (or shortened name in each blank.
- Recall oxyanions that are charged –2 and –3 form hydrogen-containing polyatomic ions as well (e.g. HPO_4^{2-} hydrogen phosphate).
- Remember all common acids dissolve in water. The prefix "hydro" <u>does not necessarily indicate</u> that it is an acid. Hydro means that the acid <u>does not</u> contain the element oxygen. Oxoacids <u>do not</u> begin with the prefix "hydro."