I. Nomenclature

A. Binary Compounds - general formula $A_xB_y$

1. Acids - contain the cation $H^+$ and an anion from Groups IV - VIIA
   a. To name the acid when it is not dissolved in water name the hydrogen then the stem of the anion and add the ending ide. e.g. HCl, hydrogen chloride
   b. Acid in water - prefix the anion stem with hydro and add the suffix ic acid. e.g. HCl hydrochloric acid (chlor=stem)

2. Bases: Contain a cation from Groups I, II, or IIIA or a transition element at +1, +2, +3 and an anion hydroxide (OH). To name, name the cation then hydroxide. e.g. KOH potassium hydroxide

3. Salts: Contain a cation from Groups IA, IIA, IIIA or a transition element at +1, +2, +3 and an anion from IV-VIIA. Use the atomic name for the cation. Name the stem of the anion then add ide. e.g. NaCl sodium chloride

4. Binary covalent: Both the cation and anion are from groups IV-VIIB or a transition element at +4-+7. Name the cation prefix the anion and add the ending ide. e.g. CO$_2$ = carbon dioxide, P$_2$O$_5$ Phosphorus pentoxide

B. Valence Rules - all elements have a valence of 0

1. Groups IA, IIA, IIB have one valence equal to their gp. number
   e.g. Na +1, 0
   Ca +2, 0

2. Gps. (IV-VIIA) have one negative valence equal to gp. number -8 and positive valences = gp. number and decreasing by 2.
   e.g. C (gp. 4) has -4, +4, +2, 0
   P (gp. 5) has -3, +5, +3, +1, 0

3. The transition elements have no neg. valences except for this; they behave as above.

4. Exceptions O$_2$ = -2; Cu +1, +2; Fe +2, +3; Mn +7, +6, +4, +3, +2; Cr +6, +3, +2; Hg +1, +2

5. Metal valences are +1, +2 and sometimes +3

6. Nonmetal valences are +4 - +7 and sometimes +3 and negative valences

C. Ternary Compounds - General Formula $A_xB_yO_z$

1. Acids - Cation is $H^+$
   a. name the stem of the central element (a nonmetal) and add the appropriate ending and acid.
2. Salts - name the cation as in IA then the stem of the anion with the appropriate ending.

3. Prefixes and suffixes

<table>
<thead>
<tr>
<th>ACIDS</th>
<th>SALTS</th>
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</thead>
<tbody>
<tr>
<td>Central element at highest valence</td>
<td>1. highest valence ate</td>
</tr>
<tr>
<td>1. highest valence ic acid</td>
<td>2. next to highest valence ite</td>
</tr>
<tr>
<td>2. next to highest valence -ous acid</td>
<td></td>
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</tbody>
</table>

EXAMPLES

- H₂SO₄ sulfuric acid
- HNO₃ nitric acid
- HNO₂ nitrous acid
- H₂AsO₃ Arsenous acid

(These work for all except Gp. 7 elements)

4. Gp. 7 elements use rules as before except:

- highest val. +7 Prefix stem with per ---------------------- ic or ate
- next +5 (6) ic or ate
- next +3 ous or ite
- lowest +1 Prefix stem with hype ------------------------ous or ite

If the cation has two metal valences the higher is suffixed with ic, the lower with ous. Or, using modern nomenclature, use the element name and add a roman numeral.

- Fe⁺² iron (II) Cr⁺³ chromium (III)
- Fe⁺³ iron (III) Cr⁺² chromium (II)

Oxygen is always -2 in ternary compounds.

SPECIAL NAMES

- H₂O water
- NH₃ ammonia
- NH₄⁺ ammonium
- OH⁻ hydroxide
- O₃ ozone
- O₂⁻ peroxide
- CN⁻ cyanide
- Cu⁺⁺⁺ copper (I)
- Cu⁺⁺ copper (II)
- Hg⁺⁺⁺ mercury (I)
- Hg⁺⁺ mercury (II)