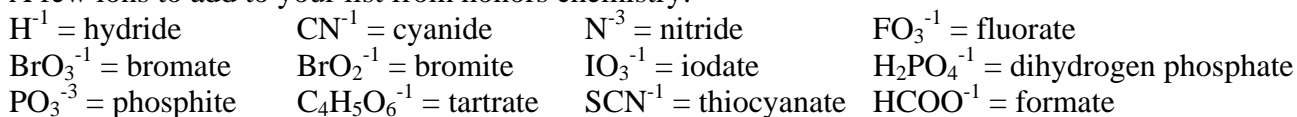


## Descriptive Chemistry (Equations) for AP Chemistry Test Takers

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### Memorize those ions!

A few ions to add to your list from honors chemistry:

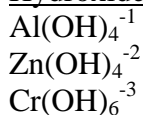


### Complexes

Ammonia (NH<sub>3</sub>) Complexes: Note: the # of ammonias is double the charge of the metal ion (except with Nickel) and the overall charge of the complex is the same as the metal ion.

$\text{Ag}(\text{NH}_3)_2^{+1}$	All
$\text{Cd}(\text{NH}_3)_4^{+2}$	Colored
$\text{Zn}(\text{NH}_3)_4^{+2}$	Zebras
$\text{Cu}(\text{NH}_3)_4^{+2}$	Could
$\text{Ni}(\text{NH}_3)_6^{+2}$	Never
$\text{Cr}(\text{NH}_3)_6^{+3}$	Cry

Hydroxide (OH) Complexes “AZC 123”:



### Equations

Assume all reactions happen. Write them in net ionic form (go back and remember those rules!)

#### Water as a reactant

- Oxides and hydrides never split.
- Metal (or metal hydride) + water → base (hydroxide) + hydrogen  
 $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$
- Metal oxide + water → base (hydroxide)  
 $\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2$
- Nonmetal oxide + water → acid  
 $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$

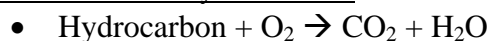
#### Acid-Base:

Note: Water will only be a product if base has hydroxide

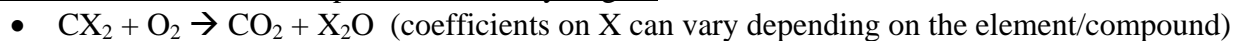
- Strong Acid + Strong Base → Neutral Salt + Water
- Weak Acid + Strong Base → Basic Salt + Water
- Strong Acid + Weak Base → Acidic Salt + Water
- Ammonia + acid →  $\text{NH}_4^+$  + possible other ions
- Acid + basic salt → acid (proton from acid added to basic salt to form new acid)
- Ammonium ion + hydroxide ion → Ammonia (NH<sub>3</sub>) + water
- Acid anhydride + base → write as two steps to see what acid will form from the anhydride

Single Displacement and Double Displacement: Know your solubility rules!!!!

Combustion of a hydrocarbon:



Combustion of a carbon compound without hydrogen:



Formation of complexes with ammonia, hydroxide, cyanide, and thiocyanate: (see above for hints with ammonia and thiocyanate)

Number of ligands (ammonia, cyanide, etc) will be twice the charge of the metal ion. Don't stress over the number though – the important thing is to get the charge of the complex correct.

Metal + Strong Oxoacid (acid with oxygen): Think of it as breaking apart the acid into an oxide gas, water, and then the metal switches to ionic form

- $\text{Metal} + \text{HXO} \rightarrow \text{Metal ion} + \text{oxide gas} + \text{water}$ 
  - Example: A piece of zinc is immersed in nitric acid
    - $\text{Zn} + \text{H}^+ + \text{NO}_3^- \rightarrow \text{Zn}^{+2} + \text{NO} + \text{H}_2\text{O}$  (the “NO” is the oxide gas)