

Section 14.4

Hydrolysis of Salts



Michael Stogsdill

Mott Community College

Learning Objectives



- Predict whether a salt solution will be acidic, basic, or neutral
- Calculate the concentrations of the various species in a salt solution
- Describe the acid ionization of hydrated metal ions

Hydrolysis of Salts

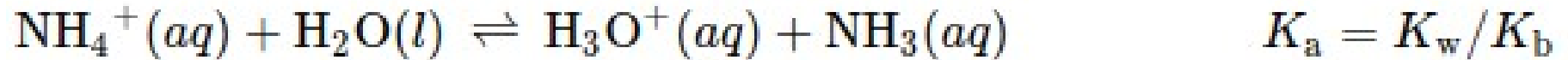


- Salts are ionic compounds composed of cations and anions
- They may be capable of undergoing an acid or base ionization reaction with water.
- Aqueous salt solutions may be acidic, basic, or neutral, depending on the relative acid-base strengths of the salt's constituent ions.

Salts with Acidic Ions



- Since ammonia is a weak base, K_b is measurable and $K_a > 0$
 - Ammonium ion is a weak acid



- HCl is a strong acid, K_a is immeasurably large and $K_b \approx 0$
 - Chloride ions don't undergo appreciable hydrolysis



Salts with Basic Ions



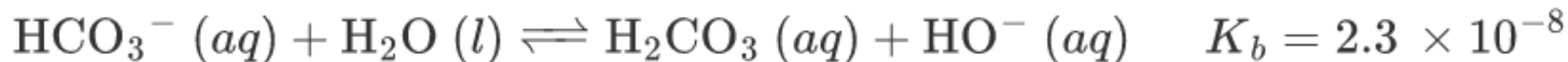
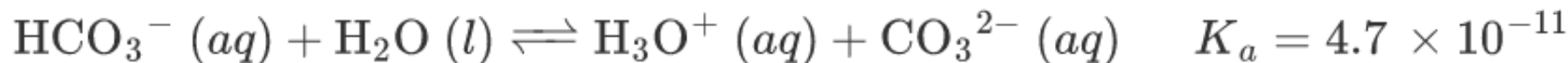
- The sodium ion does not undergo appreciable acid or base ionization and has no effect on the solution pH.
- Acetic acid is a weak acid, its K_a is measurable and $K_b > 0$
 - Acetate ion is a weak base



Salts with Acidic and Basic Ions



- Sodium does not hydrolyze to any appreciable extent.
- HCO_3^- can behave as both an acid and a base.

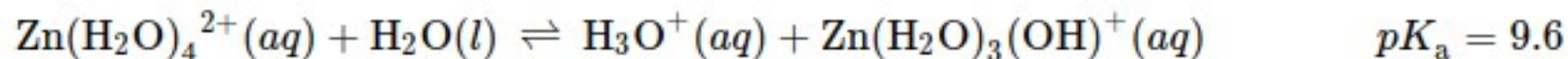
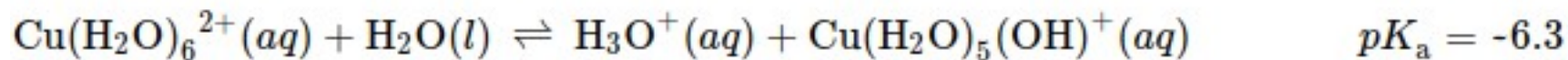
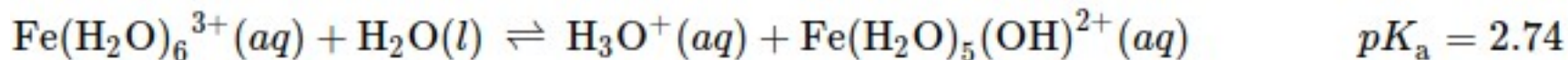


- Since $K_b \gg K_a$, the solution is basic

The Ionization of Hydrated Metal Ions



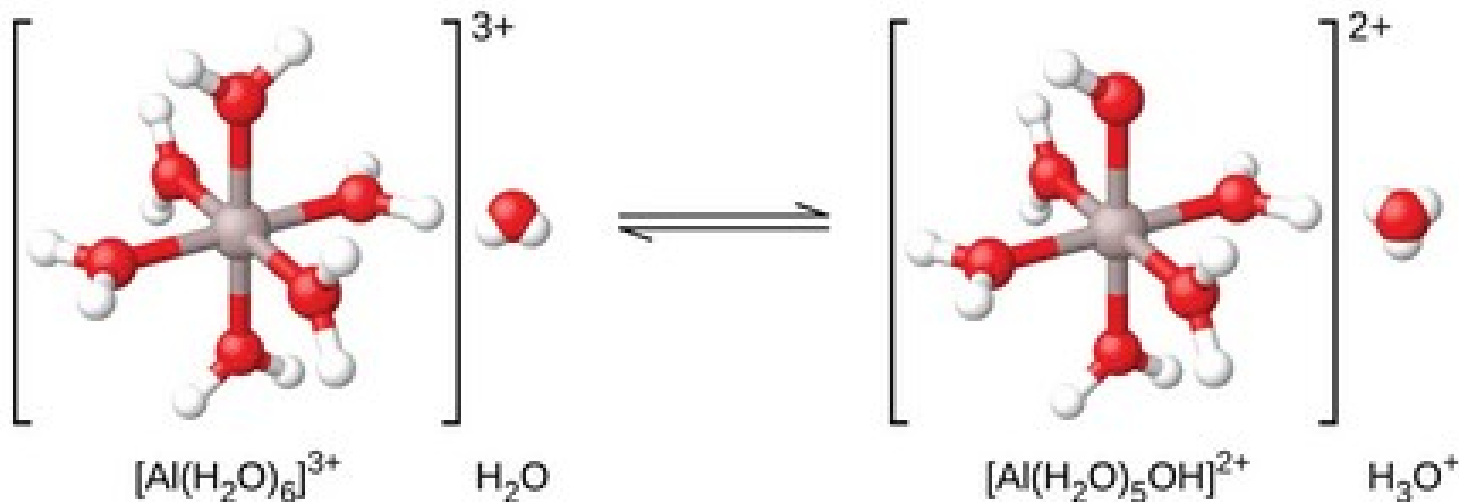
- Aside from group 1 and group 2 metals, most metal ions will undergo acid ionization to some extent when dissolved in water.
- The acid strength of these complex ions typically increases with increasing charge and decreasing size of the metal ions.



Covalently Bonded Water



- Hydrated metals covalently bonded to a fixed number of water molecules to yield a complex ion.



Step-Wise Proton Transfer



- Metal Hydrates will release protons in a step-wise fashion
 - This is an example of polyprotic acid

