Chemistry 30 IB
Acids & Bases

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Unfinished!

Contents

1 Theories

The following two equations mean the same thing.
$H^+(aq)$ and $H_3O^+(aq)$ are interchangable.

1.1 Arrhenius

$$\mathrm{HX(aq)} \longrightarrow \mathrm{H^+(aq)} + \mathrm{X^-(aq)}$$

- doesn't specifically state water is present (aq)
- uses hydrogen ions, $H^+(aq)$
- cannot determine strong or weak

1.2 Brønsted-Lowry (aka. Modified Arrhenius)

$$\mathrm{HX(aq)} + \mathrm{H_2O(l)} \longrightarrow \mathrm{H_3O^+(aq)} + \mathrm{X^-(aq)}$$

- specifically states water is present
- uses hydronium ions, $H_3O^+(aq)$
- can determine strong or weak

2 General Equations

2.1 Ionization of Acids

Forming ions from molecular compounds.

2.1.1 Strong

$$\mathrm{HX(aq)} + \mathrm{H_2O(l)} \xrightarrow{> 99.9\%} \mathrm{H_3O^+(aq)} + \mathrm{X^-(aq)}$$

- ionize completely ($> 99.9\%$ of the reaction completes)
- irreversible ($\longrightarrow$)
- high K value ($K > 1$)

2.1.2 Weak

$$\mathrm{HX(aq)} + \mathrm{H_2O(l)} \xrightleftharpoons{< 50\%} \mathrm{H_3O^+(aq)} + \mathrm{X^-(aq)}$$

- do not ionize completely ($< 50\%$ of the reaction completes)
- reversible ($\rightleftharpoons$)

- ionize at equilibrium
- low K value ($K < 1$)

2.2 Dissociation of Bases

Separation of existing ions in solution.

2.2.1 Strong

$$\mathrm{M(OH)}_n + \mathrm{H_2O\,(l)} \xrightarrow{> 99.9\%} \mathrm{M}^{n+}\mathrm{(aq)} + \mathrm{nOH^-(aq)}$$

- M is a metal, $\mathrm{M(OH)}_n$ is highly soluble
- dissociate quantitatively

2.2.2 Weak

$$\mathrm{X\,(aq)} + \mathrm{H_2O\,(l)} \xrightleftharpoons{< 50\%} \mathrm{HX^+(aq)} + \mathrm{OH^-(aq)}$$

- dissociate at equilibrium

3 pH & pOH

3.1 K_w

The equilibrium constant of water can be used to solve for hydrogen ion concentration or hydronium ion concentration when you have the other.

$$K_w = [\mathrm{H_3O^+}][\mathrm{OH^-}]$$

$$K_w = 1.00 \times 10^{-14}\,\mathrm{mol\,L^{-1}}$$

$$1.00 \times 10^{-14}\,\mathrm{mol\,L^{-1}} = [\mathrm{H_3O^+}][\mathrm{OH^-}]$$