Strong Acids

$$H_2SO_{4(aq)} \longrightarrow 2H^+_{(aq)} + SO_{4(aq)}^{2-}$$

0.25M 0.50M

$pH = -\log[H^+_{(aq)}]$

pOH

$[OH^-_{(aq)}]$

Strong Bases

$NaOH_{(aq)} \longrightarrow Na^+_{(aq)} + OH^-_{(aq)}$

0.10M 0.10M 0.10M

pOH
pH
$[H^+]$

Worksheet #3,4

Ionization Constants for Acids

Strong acids - ionizes quantitatively in water to form hydronium ions

$$HCl_{(aq)} + H_2O_{(l)} \longrightarrow H_3O^+_{(aq)} + Cl^-_{(aq)}$$

Weak acids - ionizes partially in water to form hydronium ions

$$CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + CH_3COO^-_{(aq)}$$

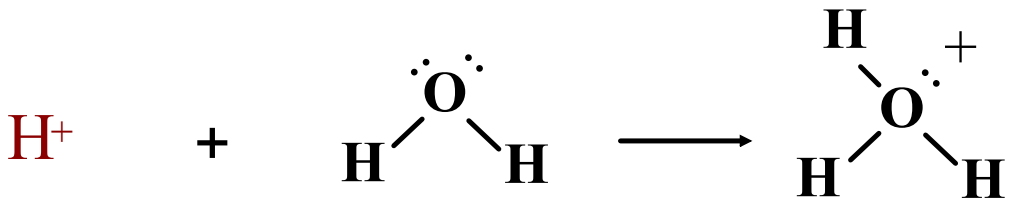
To describe the equilibrium of acids in water, the equilibrium law is used to calculate the acid ionization constant, K_a

$$CH_3COOH_{(aq)} + H_2O_{(l)} \longrightarrow H_3O^+_{(aq)} + CH_3COO^-_{(aq)}$$

$$K = \frac{[H_3O^+_{(aq)}][CH_3COO^-_{(aq)}]}{[CH_3COOH_{(aq)}][H_2O_{(l)}]}$$

$$K_a = \frac{[H_3O^+_{(aq)}][CH_3COO^-_{(aq)}]}{[CH_3COOH_{(aq)}]}$$

1.8×10^{-5}



$$pH = -\log [H_3O^+]$$

$$[H_3O^+] = 10^{-pH}$$

$$[H_3O^+][OH^-] = 1.0 \times 10^{-14}$$

Ex. Predict the hydronium ion concentration, and pH of a 1.0 mol/L nitrous acid solution at equilibrium.

WEAK

$HNO_{2(aq)} + H_2O_{(l)} \rightleftharpoons NO_{2(aq)}^- + H_3O_{(aq)}^+$

1.0 mol/L

$K_a = \frac{[NO_{2(aq)}^-][H_3O_{(aq)}^+]}{[HNO_{2(aq)}]}$, $[NO_{2(aq)}^-] = [H_3O_{(aq)}^+]$

$K_a = \frac{[H_3O_{(aq)}^+]^2}{[HNO_{2(aq)}]}$

$7.2 \times 10^{-4} = \frac{[H_3O_{(aq)}^+]^2}{[1.0]}$

$[H_3O_{(aq)}^+] = \sqrt{(7.2 \times 10^{-4})(1.0)}$

$[H_3O_{(aq)}^+] = 0.027\ M$

$pH = -\log[H_3O_{(aq)}^+]$

$pH = -\log[0.027]$

$pH = 1.57$

$$HA_{(aq)} + H_2O_{(l)} \rightleftharpoons A^-_{(aq)} + H_3O^+_{(aq)}$$