Worksheet

④ KOH

m = ?

V = 500. mL

pH = 11.5

$KOH_{(aq)} \longrightarrow K^+_{(aq)} + OH^-_{(aq)}$

3.16×10^{-3} M 3.16×10^{-3} M 3.16×10^{-3} M

pH + pOH = 14.0

pOH = 14.0 − 11.5

pOH = 2.5

$[OH^-_{(aq)}] = 10^{-pOH}$

$[OH^-_{(aq)}] = 10^{-2.5}$

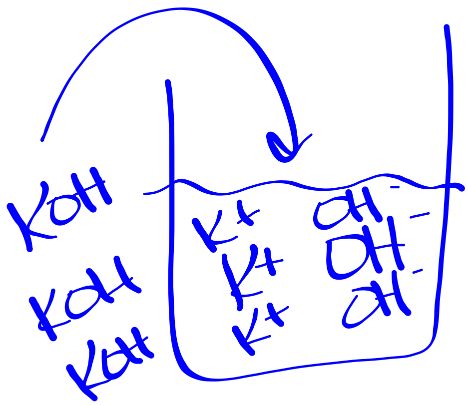
$[OH^-_{(aq)}] = 3.16\times10^{-3}$ M

$C = \frac{n}{V}$

$n = (3.16\times10^{-3}\ mol/L)(0.500\ L)$

$n = 1.58\times10^{-3}$ mol

$1.58\times10^{-3}\ mol \times \frac{56.11\ g\ KOH}{1\ mol\ KOH}$ = **0.09 g KOH**


KOH
KOH
KOH
K+ OH-
K+ OH-
K+ OH-

Ionization Constants for Acids

Strong acids - ionizes quantitatively in water to form hydronium ions

H^+

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

Weak acids - ionizes partially in water to form hydronium ions

H^+

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

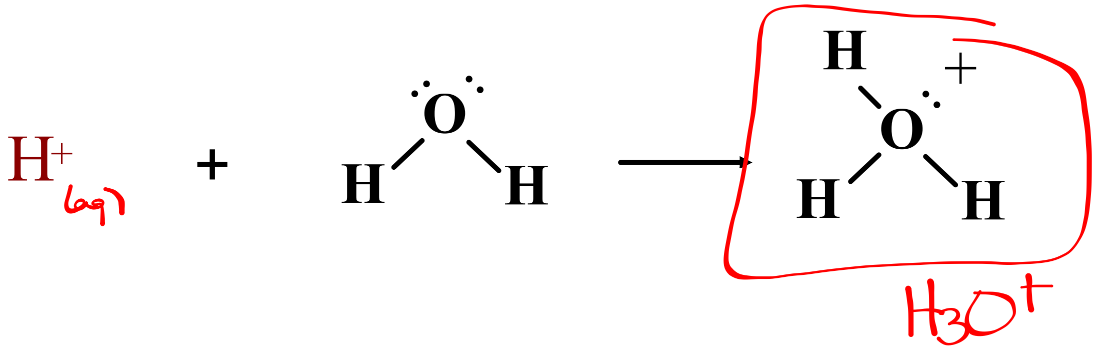
To describe the equilibrium of acids in water, the equilibrium law is used to calculate the acid ionization constant, K_a.

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

0.10M

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

$$HCl_{(aq)} \rightarrow H^+ + Cl^-$$



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

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

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

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

$$HNO_{2(aq)} + H_2O_{(l)} \rightleftharpoons NO_{2(aq)}^- + H_3O^+_{(aq)}$$

1.0 mol/L

$$K_a = \frac{[NO^-_{2(aq)}][H_3O^+_{(aq)}]}{[HNO_{2(aq)}]}, \quad [NO^-_{2(aq)}] = [H_3O^+_{(aq)}]$$

$$K_a = \frac{[H_3O^+_{(aq)}]^2}{[HNO_{2(aq)}]}$$

$$[H_3O^+_{(aq)}] = \sqrt{K_a[HNO_{2(aq)}]}$$

$$[H_3O^+_{(aq)}] = \sqrt{(7.2\times10^{-4})[1.0]}$$

$$[H_3O^+_{(aq)}] = 0.027M$$

$$pH = -\log[H_3O^+_{(aq)}]$$

$$pH = -\log[0.027]$$

$$pH = 1.57$$

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

HNO_2

HNO_2

HNO_2

HNO_2 H^+ NO_2^-

HNO_2

HNO_2