Worksheet

③ LACTIC

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

$K_a = \frac{[A^-_{(aq)}][H_3O^+_{(aq)}]}{[HA_{(aq)}]}$, $[A^-] = [H_3O^+]$

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

$[H_3O^+_{(aq)}] = \sqrt{(1.4 \times 10^{-4})[0.0034]}$

$[H_3O^+] = 6.90 \times 10^{-4} M$

PROPIONIC

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

$K_a = \frac{[A^-_{(aq)}][H_3O^+_{(aq)}]}{[HA_{(aq)}]}$, $[A^-] = [H_3O^+]$

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

$[H_3O^+_{(aq)}] = \sqrt{(1.4 \times 10^{-5})[0.056]}$

$[H_3O^+] = 8.85 \times 10^{-4} M$

$[H_3O^+] = 1.6 \times 10^{-3} M$

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

$pH = -\log[1.6 \times 10^{-3}]$

$pH = 2.80$

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

0.20M 0.20M

↓

pH

Weak Bases

Weak bases react with water to form the hydroxide ion and conjugate acid of the base.

Ex. Calculate the pH of a 0.176M solution of ammonia

weak base

$NH_{3(aq)} + H_2O_{(l)} \rightleftharpoons NH_{4(aq)}^+ + OH_{(aq)}^-$

H^+

base dissociation constant

$K_b = \frac{[NH_{4(aq)}^+][OH_{(aq)}^-]}{[NH_{3(aq)}]}$, $[NH_{4(aq)}^+] = [OH_{(aq)}^-]$

$K_b = \frac{[OH_{(aq)}^-]^2}{[NH_{3(aq)}]}$

$[OH^-] = \sqrt{(1.72\times10^{-5})[0.176]}$

$[OH_{(aq)}^-] = 1.7\times10^{-3}M$

$K_aK_b = K_w$

$K_b = \frac{K_w}{K_a} = \frac{1.0\times10^{-14}}{5.8\times10^{-10}}$

$K_b = 1.72\times10^{-5}$

$pOH = -\log[1.7\times10^{-3}]$

$pOH = 2.77$

$pH + pOH = 14.00$

$pH = 14.00 - 2.77$

$pH = 11.23$

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

0.10 M 0.10 M

↓

pH

1.0×10^{-14}

$$K_a K_b = K_w$$

$$K_b = \frac{K_w}{K_a}$$

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