Worksheet

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

③ LACTIC ACID

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

0.034M

$K_a = \frac{[A^-][H_3O^+]}{[HA]}$, $[A^-] = [H_3O^+]$

$K_a = \frac{[H_3O^+]^2}{[HA]}$

$1.4 \times 10^{-4} = \frac{[H_3O^+]^2}{[0.0034]}$

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

$[H_3O^+] = 6.9 \times 10^{-4} M$

PROPIONIC ACID

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

$K_a = \frac{[A^-][H_3O^+]}{[HA]}$, $[A^-] = [H_3O^+]$

$K_a = \frac{[H_3O^+]^2}{[HA]}$

$1.4 \times 10^{-5} = \frac{[H_3O^+]^2}{[0.056]}$

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

$[H_3O^+] = 8.9 \times 10^{-4} M$

$+$

$1.6 \times 10^{-3} M$

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

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

$pH = 2.80$

Weak Bases

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

Find the pH of a 0.319 mol/L solution of ammonia

WEAK BASE H^+

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

0.319 M

base dissociation constant

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

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

$$1.72\times10^{-5} = \frac{[OH_{(aq)}^-]^2}{[0.319]}$$

$$[OH_{(aq)}^-] = \sqrt{(1.72\times10^{-5})[0.319]}$$

$$[OH_{(aq)}^-] = 2.34\times10^{-3}\ M$$

$K_aK_b = K_w$

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

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

$$pOH = -\log[OH_{(aq)}^-]$$

$$pOH = -\log[2.34\times10^{-3}]$$

$$pOH = 2.631$$

$$pH + pOH = 14.000$$

$$pH = 14.000 - 2.631$$

$$\boxed{pH = 11.369}$$

$NaOH \rightarrow Na^+ + OH^-$

x x

$$K_a\ K_b = K_w$$

Worksheet