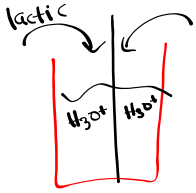
Worksheet



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

LACTIC

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

0.0034M

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

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

$[H_3O^+_{(aq)}] = \sqrt{(1.4\times10^{-4})[0.0034]}$

$[H_3O^+_{(aq)}] = 6.90\times10^{-4}M$

PROPIONIC ACID

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

0.056M

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

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

$[H_3O^+_{(aq)}] = \sqrt{(1.4\times10^{-5})[0.056]}$

$[H_3O^+_{(aq)}] = 8.85\times10^{-4}M$

$[H_3O^+_{(aq)}] = (8.85\times10^{-4}M) + (6.90\times10^{-4}M)$

$= 1.58\times10^{-3}M$

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

$pH = -\log[1.58\times10^{-3}]$

$pH = 2.80$

Weak Bases

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

Weak base

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

0.221 mol/L

base dissociation constant

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

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

$K_a K_b = K_w$

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

$K_b = 1.72 \times 10^{-5}$

$[OH_{(aq)}^-] = \sqrt{(1.72 \times 10^{-5})[0.221]}$

$[OH_{(aq)}^-] = 1.95 \times 10^{-3}\ M$

$K_w = [H_3O^+][OH^-]$

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

$pOH = -\log[1.95 \times 10^{-3}]$

$pOH = 2.710$

$pH + pOH = 14.00$

$pH = 14.000 - 2.710$

$pH = 11.290$

$$K_a K_b = K_w$$

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

Calculate the pH of a 0.221 mol/L solution of $NH_{3(aq)}$ at equilibrium.

$$NH_{3(aq)} + H_2O_{(l)}$$

Weak Bases Worksheet