

Worksheet

LACTIC ACID



$$0.0034\text{M}$$

$$K_a = 1.4 \times 10^{-4}$$

$$K_a = \frac{[\text{A}^-_{(aq)}][\text{H}_3\text{O}^+_{(aq)}]}{[\text{HA}_{(aq)}]}, \quad [\text{A}^-_{(aq)}] = [\text{H}_3\text{O}^+_{(aq)}]$$

$$K_a = \frac{[\text{H}_3\text{O}^+_{(aq)}]^2}{[\text{HA}_{(aq)}]}$$

$$[\text{H}_3\text{O}^+_{(aq)}] = \underline{\underline{6.90 \times 10^{-4}\text{M}}}$$

$$[\text{H}_3\text{O}^+_{(aq)}] = \sqrt{(1.4 \times 10^{-4})(0.0034)}$$

$$K_a = 1.4 \times 10^{-5}$$

PROPIONIC ACID



$$0.056\text{M}$$

$$[\text{H}_3\text{O}^+_{(aq)}] = \underline{\underline{8.85 \times 10^{-4}\text{M}}}$$

$$\begin{aligned} [\text{H}_3\text{O}^+_{(aq)}] &= (6.90 \times 10^{-4}\text{M}) + (8.85 \times 10^{-4}\text{M}) \\ &= 1.58 \times 10^{-3}\text{M} \end{aligned}$$

$$\text{pH} = -\log [\text{H}_3\text{O}^+_{(aq)}]$$

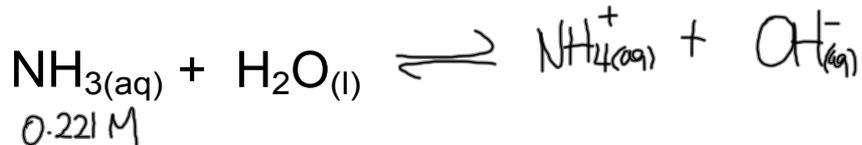
$$\text{pH} = -\log [1.58 \times 10^{-3}\text{M}]$$

$$\boxed{\text{pH} = 2.80}$$

Weak Bases

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

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



*Eqm greatly favours reverse reaction

base dissociation constant

$$K_b = \frac{[\text{NH}_4^+_{(\text{aq})}][\text{OH}^-_{(\text{aq})}]}{[\text{NH}_3_{(\text{aq})}]}, \quad [\text{NH}_4^+_{(\text{aq})}] = [\text{OH}^-_{(\text{aq})}]$$

$$K_b = \frac{[\text{OH}^-_{(\text{aq})}]^2}{[\text{NH}_3_{(\text{aq})}]}$$

$$K_a K_b = K_w$$

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

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

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

$$[\text{OH}^-_{(\text{aq})}] = 3.81 \times 10^{-6} \text{ M}$$

$$\text{pOH} = -\log[\text{OH}^-_{(\text{aq})}]$$

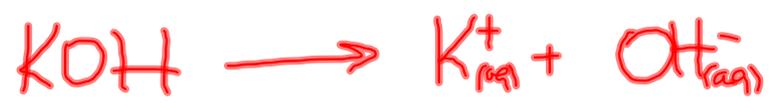
$$\text{pOH} = -\log[3.81 \times 10^{-6}]$$

$$\text{pOH} = 5.419$$

$$\text{pH} + \text{pOH} = 14.000$$

$$\text{pH} = 14.000 - 5.419$$

$$\boxed{\text{pH} = 8.581}$$



NaOH

Ba(OH)₂

$$K_a K_b = K_w$$

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

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