

Worksheet

③ LACTIC ACID



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

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

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

$$[\text{H}_3\text{O}^+] = 6.90 \times 10^{-4} \text{ M}$$

PROPIONIC ACID



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

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

$$[\text{H}_3\text{O}^+] = \sqrt{(1.4 \times 10^{-5})(0.056)}$$

$$[\text{H}_3\text{O}^+] = 8.85 \times 10^{-4} \text{ M}$$

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

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

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

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

Weak Bases

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

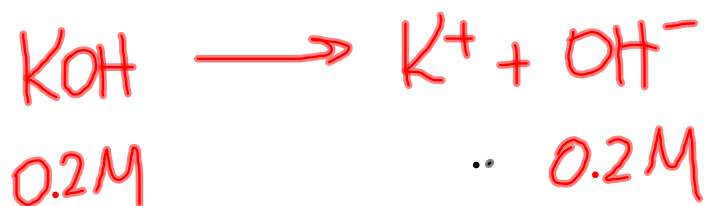
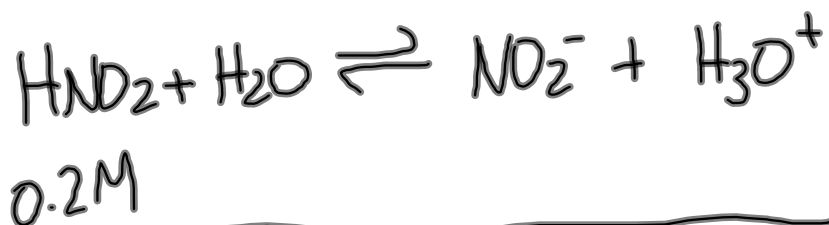
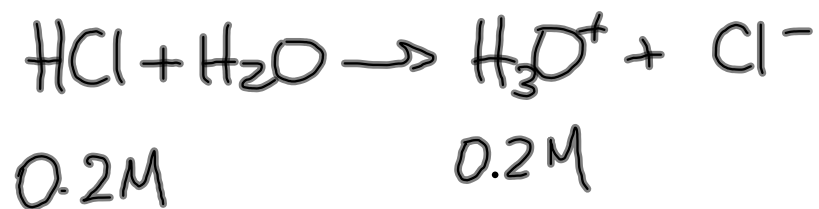


***Eqm greatly favours reverse reaction**

base dissociation constant

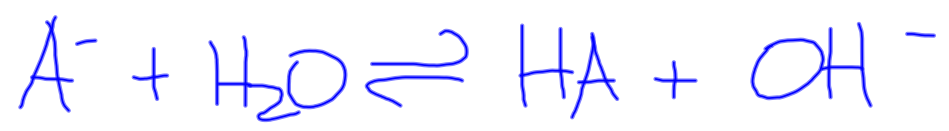
$$K_b = \frac{[\text{NH}_4^+_{(\text{aq})}][\text{OH}^-_{(\text{aq})}]}{[\text{NH}_{3(\text{aq})}]}, \quad [\text{NH}_4^+_{(\text{aq})}] = [\text{OH}^-_{(\text{aq})}]$$

$$K_b = \frac{[\text{OH}^-_{(\text{aq})}]^2}{[\text{NH}_{3(\text{aq})}]}$$

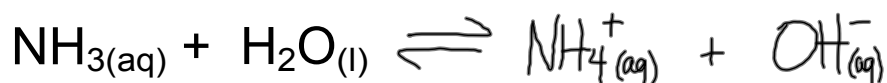


$$K_a K_b = K_w$$

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



Calculate the pH of a 0.221 mol/L solution of $\text{NH}_3(\text{aq})$ at equilibrium.



0.221 mol/L

$$K_b = \frac{[\text{NH}_4^+(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{NH}_3(\text{aq})]}, \quad [\text{NH}_4^+(\text{aq})] = [\text{OH}^-(\text{aq})]$$

$$K_b = \frac{[\text{OH}^-(\text{aq})]^2}{[\text{NH}_3(\text{aq})]}$$

$$K_a K_b = K_w$$

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

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

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

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

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

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

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

$$\text{pOH} = 2.710$$

$$\text{pH} + \text{pOH} = 14.00$$

$$\text{pH} = 14.00 - 2.710$$

$$\boxed{\text{pH} = 11.290}$$

Worksheet