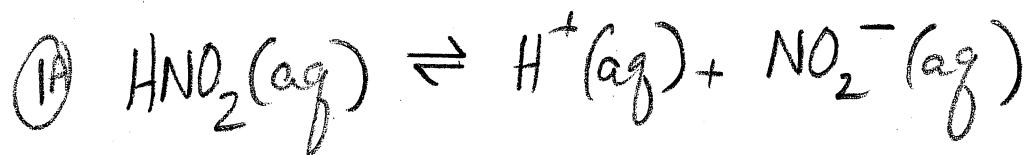
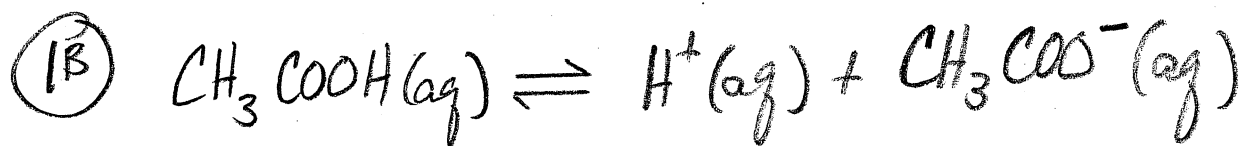


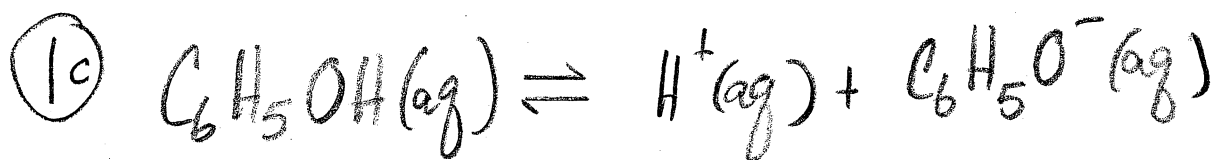
CH 16 PROBLEM SET



$$K_a = \frac{[\text{H}^+][\text{NO}_2^-]}{[\text{HNO}_2]} = 4.5 \times 10^{-4}$$



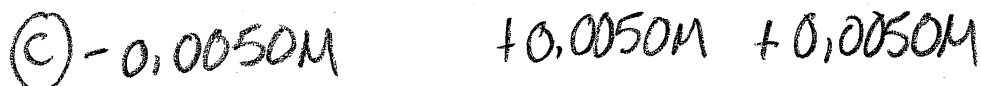
$$K_a = \frac{[\text{H}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]} = 1.8 \times 10^{-5}$$



$$K_a = \frac{[\text{H}^+][\text{C}_6\text{H}_5\text{O}^-]}{[\text{C}_6\text{H}_5\text{OH}]} = 1.3 \times 10^{-10}$$

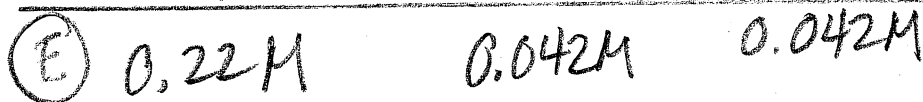
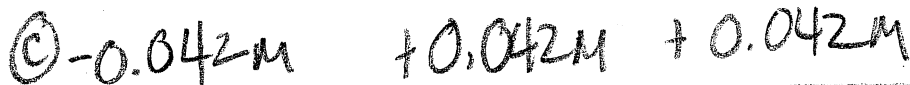
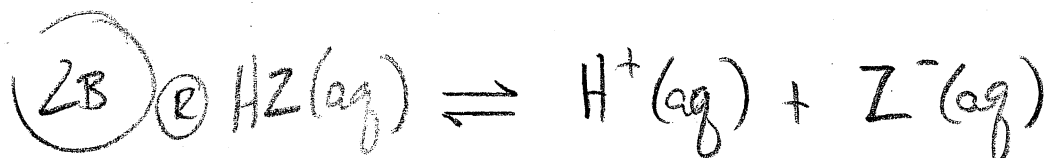


$$K_a = \frac{[\text{H}^+][\text{CN}^-]}{[\text{HCN}]} = 4.9 \times 10^{-10}$$



$$[\text{H}^+] = 0.042 * 0.12\text{M} = 5.04 \times 10^{-3}\text{M} = [\text{Z}^-]$$

$$K_a = \frac{[\text{H}^+][\text{Z}^-]}{[\text{HZ}]} = \frac{[0.0050]^2}{[0.115]} = \boxed{2.2 \times 10^{-4}}$$



$$[\text{HZ}]_1 * 0.84 = [\text{HZ}]_2 \quad [\text{HZ}]_1 = \frac{0.22\text{M}}{0.84} = 0.262\text{M}$$

$$K_a = \frac{[\text{H}^+][\text{Z}^-]}{[\text{HZ}]} = \frac{[0.0050]^2}{[0.22]} = \boxed{0.0080}$$

$$3A \quad [H^+] = \sqrt{K_a * [HNO_2]} = \sqrt{4.5 \times 10^{-4} * 0.32} = 0.012 M$$

$$pH = -\log [0.012] = 1.92$$

$$3B \quad [H^+] = \sqrt{K_a * [CH_3COOH]} = \sqrt{1.8 \times 10^{-5} * 0.44} = 2.81 \times 10^{-3} M$$

$$pH = -\log [2.81 \times 10^{-3}] = 2.55$$

$$2A \quad [H^+] = \sqrt{K_a * [C_6H_5OH]} = \sqrt{1.3 \times 10^{-10} * 0.76} = 9.94 \times 10^{-6} M$$

$$pH = -\log [9.94 \times 10^{-6}] = 5.00$$

$$3D \quad [H^+] = \sqrt{K_a * [HCN]} = \sqrt{4.9 \times 10^{-10} * 0.11} = 7.34 \times 10^{-6} M$$

$$pH = -\log [7.34 \times 10^{-6}] = 5.13$$

$$\textcircled{4A} \quad [H^+] = \sqrt{K_a * [HF]} = \sqrt{6.8 \times 10^{-4} * 0.040} = 0.00522 M$$

$$pH = -\log [0.00522] = 2.28$$

$$\textcircled{4B} \quad [H^+] = \sqrt{K_a * [HIO]} = \sqrt{2.3 \times 10^{-11} * 0.19} = 2.09 \times 10^{-6} M$$

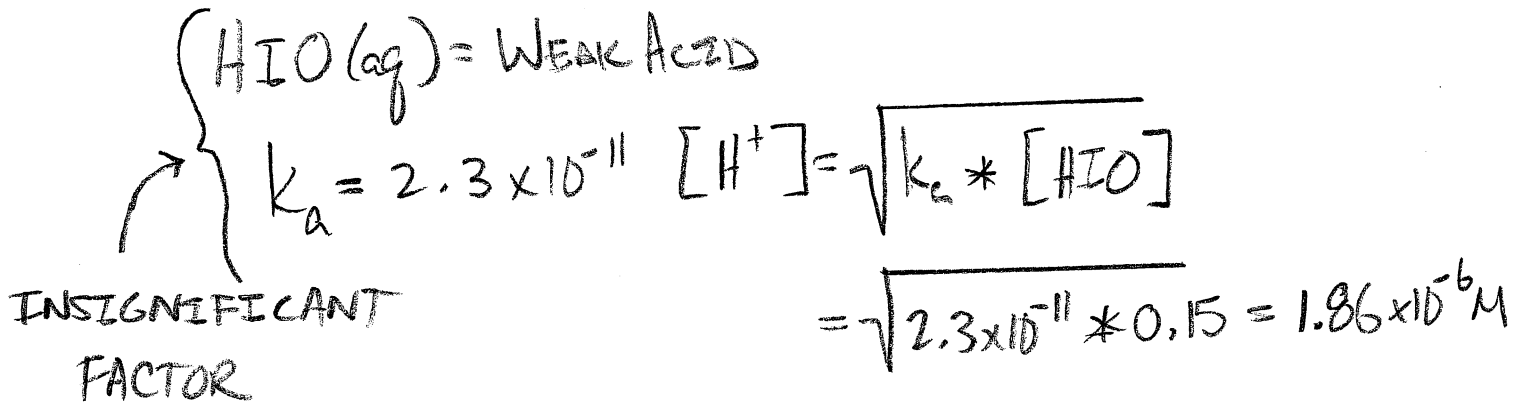
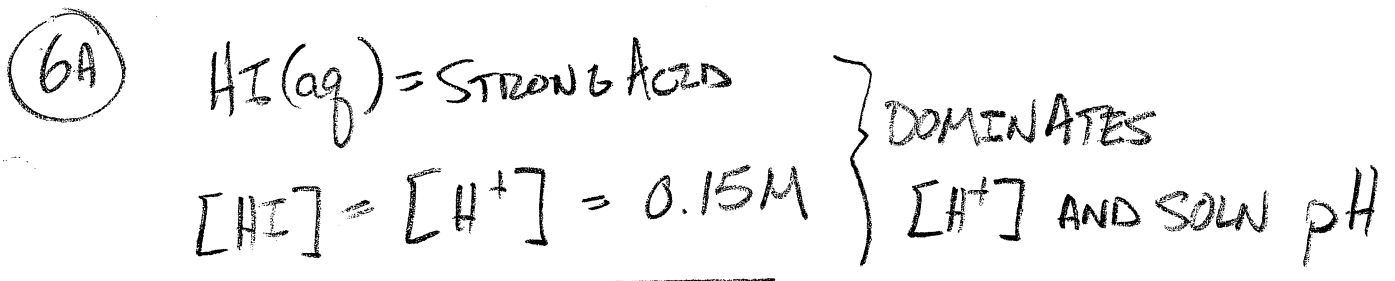
$$pH = -\log [2.09 \times 10^{-6}] = 5.68$$

$$\textcircled{5} \quad \frac{0.0624 g \text{ CH}_3\text{COOH}}{1} * \frac{1 \text{ mole}}{60.0 g \text{ CH}_3\text{COOH}} = 1.04 \times 10^{-3} \text{ mol CH}_3\text{COOH}$$

$$[\text{CH}_3\text{COOH}]_1 = \frac{1.04 \times 10^{-3} \text{ mol}}{0.080 L} = 0.0129 M$$

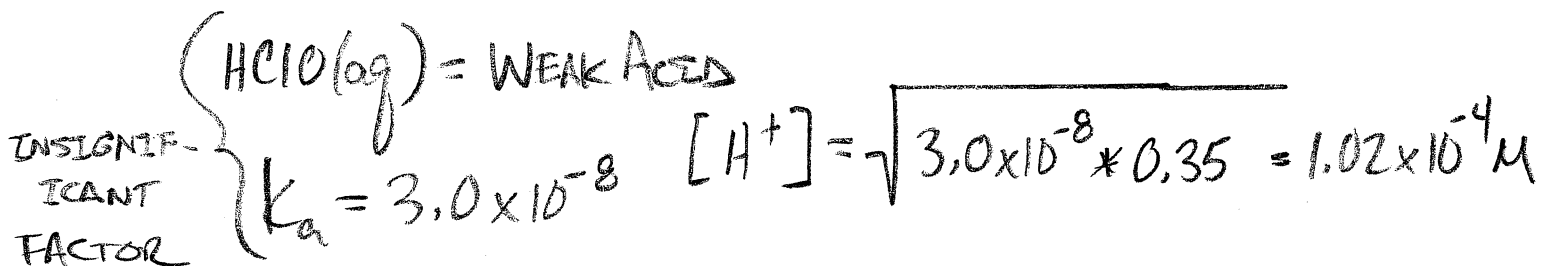
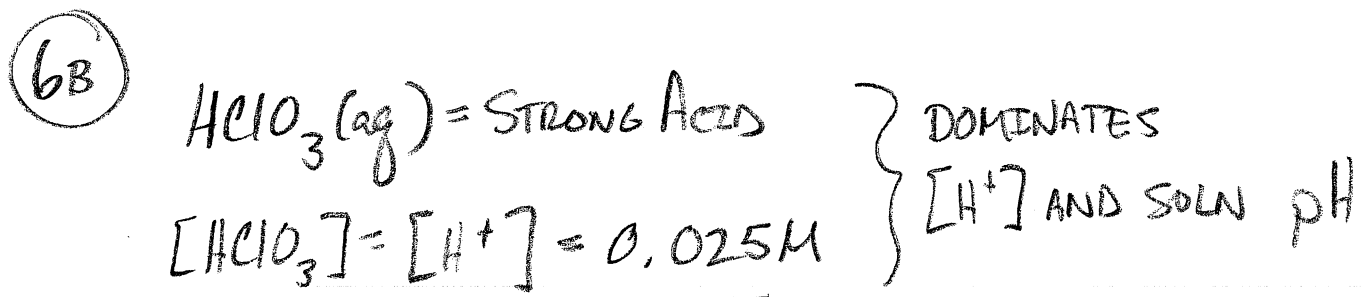
$$[H^+] = [\text{CH}_3\text{COO}^-] = \sqrt{K_a * 0.0129} = \sqrt{1.8 \times 10^{-5} * 0.0129} = \boxed{4.83 \times 10^{-4} M}$$

$$[\text{CH}_3\text{COOH}]_2 = \underset{M}{0.0129} - \underset{M}{4.83 \times 10^{-4}} = \boxed{0.0125 M}$$



$$[\text{H}^+]_{\text{TOTAL}} = 0.15\text{M} + 1.86 \times 10^{-6}\text{M} = 0.15\text{M}$$

$$\text{pH} = -\log [0.15] = 0.82$$



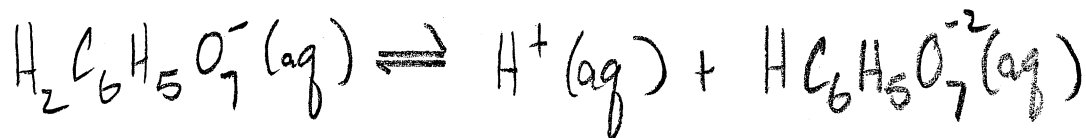
$$[\text{H}^+]_{\text{TOTAL}} = 0.025\text{M} + 1.02 \times 10^{-4}\text{M} = 0.025\text{M}$$

$$\text{pH} = -\log [0.025] = 1.60$$

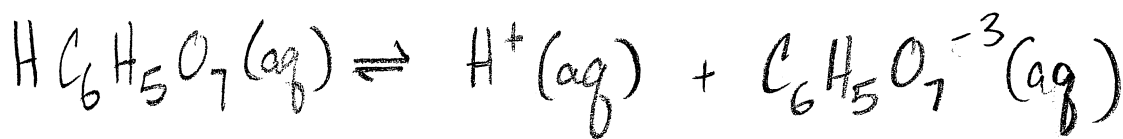
8B



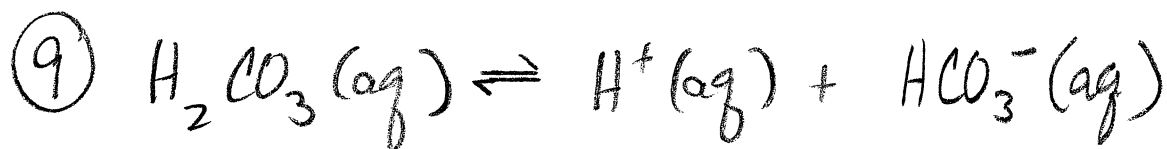
$$K_{a_1} = \frac{[\text{H}^+][\text{H}_2\text{C}_6\text{H}_5\text{O}_7^-]}{[\text{H}_3\text{C}_6\text{H}_5\text{O}_7]} = 7.4 \times 10^{-4}$$



$$K_{a_2} = \frac{[\text{H}^+][\text{HC}_6\text{H}_5\text{O}_7^{2-}]}{[\text{H}_2\text{C}_6\text{H}_5\text{O}_7^-]} = 1.7 \times 10^{-5}$$



$$K_{a_3} = \frac{[\text{H}^+][\text{C}_6\text{H}_5\text{O}_7^{3-}]}{[\text{HC}_6\text{H}_5\text{O}_7^{2-}]} = 4.0 \times 10^{-7}$$



$$[\text{H}^+] = \sqrt{K_a * [\text{H}_2\text{CO}_3]} = \sqrt{4.3 \times 10^{-7} * 0.25} = 3.28 \times 10^{-4}$$

$$\text{pH} = -\log [3.28 \times 10^{-4}] = \boxed{3.48}$$