

WORKSHEET: ACIDS AND BASES



$$K_a = \frac{[\text{C}_6\text{H}_5\text{COO}^-_{(aq)}][\text{H}_3\text{O}^+_{(aq)}]}{[\text{C}_6\text{H}_5\text{COOH}_{(aq)}]}$$



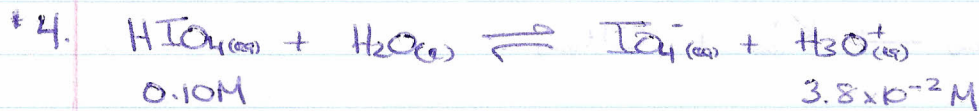
$$K_b = \frac{[\text{HCN}_{(aq)}][\text{OH}^-_{(aq)}]}{[\text{CN}^-_{(aq)}]}$$



$$K_b = \frac{[\text{C}_2\text{H}_4\text{O}_2_{(aq)}][\text{OH}^-_{(aq)}]}{[\text{C}_2\text{H}_3\text{O}_2^-_{(aq)}]}$$



$$K_b = \frac{[\text{C}_6\text{H}_5\text{NH}_3^+_{(aq)}][\text{OH}^-_{(aq)}]}{[\text{C}_6\text{H}_5\text{NH}_2_{(aq)}]}$$



$$K_a = \frac{[\text{IO}_4^-][\text{H}_3\text{O}^+]}{[\text{HIO}_4]}, \quad [\text{IO}_4^-] = [\text{H}_3\text{O}^+]$$

$$K_a = \frac{[\text{H}_3\text{O}^+]^2}{[\text{HIO}_4]}$$

$$K_a = \frac{[3.8 \times 10^{-2}]^2}{[0.10]}$$

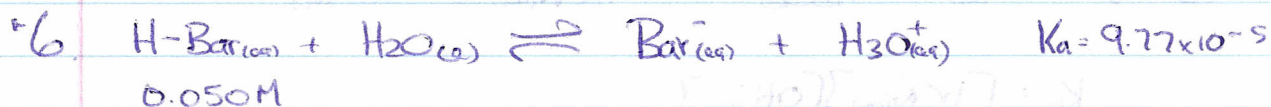
$$\boxed{K_a = 0.014}$$



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

$$\text{pH} = -\log [0.600]$$

$$\boxed{\text{pH} = 0.222}$$



$$K_a = \frac{[\text{Bar}^-][\text{H}_3\text{O}^+]}{[\text{H-Bar}]}, \quad [\text{Bar}^-] = [\text{H}_3\text{O}^+]$$

$$K_a = \frac{[\text{H}_3\text{O}^+]^2}{[\text{H-Bar}]}$$

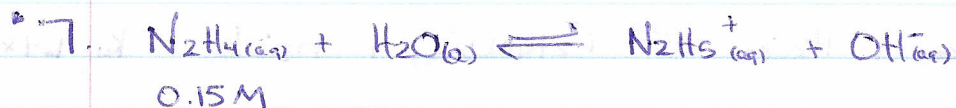
$$[\text{H}_3\text{O}^+] = \sqrt{(9.77 \times 10^{-5})(0.050)}$$

$$\boxed{[\text{H}_3\text{O}^+] = 2.2 \times 10^{-3}\text{M}}$$

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

$$\text{pH} = -\log [2.2 \times 10^{-3}]$$

$$\boxed{\text{pH} = 2.66}$$



$$[\text{H}_3\text{O}^+(\text{aq})] = 10^{-\text{pH}}$$

$$[\text{H}_3\text{O}^+(\text{aq})] = 10^{-10.70}$$

$$[\text{H}_3\text{O}^+(\text{aq})] = 2.00 \times 10^{-11} \text{ M}$$

$$K_w = [\text{OH}^-(\text{aq})][\text{H}_3\text{O}^+(\text{aq})]$$

$$[\text{OH}^-(\text{aq})] = \frac{K_w}{[\text{H}_3\text{O}^+(\text{aq})]}$$

$$[\text{OH}^-(\text{aq})] = \frac{1.0 \times 10^{-14}}{2.00 \times 10^{-11}}$$

$$[\text{OH}^-(\text{aq})] = 5.0 \times 10^{-4} \text{ M}$$

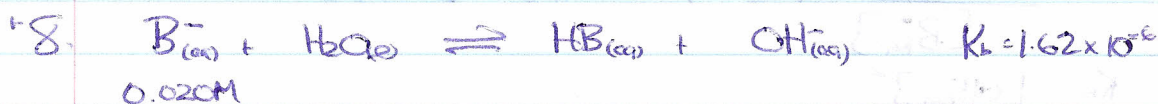
$$[\text{OH}^-(\text{aq})] = 5.0 \times 10^{-4} \text{ M}$$

$$K_b = \frac{[\text{N}_2\text{H}_5^+(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{N}_2\text{H}_4(\text{aq})]}, \quad [\text{N}_2\text{H}_5^+(\text{aq})] = [\text{OH}^-(\text{aq})]$$

$$K_b = \frac{[\text{OH}^-(\text{aq})]^2}{[\text{N}_2\text{H}_4(\text{aq})]}$$

$$K_b = \frac{[5.0 \times 10^{-4}]^2}{[0.15]}$$

$$K_b = 1.7 \times 10^{-6}$$



$$K_b = \frac{[\text{HB}(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{B}^-(\text{aq})]}, \quad [\text{HB}(\text{aq})] = [\text{OH}^-(\text{aq})]$$

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

$$[\text{OH}^-(\text{aq})] = \sqrt{(1.62 \times 10^{-6})(0.020)}$$

$$[\text{OH}^-(\text{aq})] = 1.8 \times 10^{-4} \text{ M}$$

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

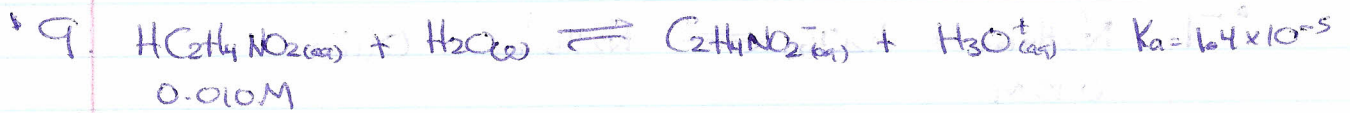
$$\text{pOH} = -\log[1.8 \times 10^{-4}]$$

$$\text{pOH} = 3.74$$

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

$$\text{pH} = 14.00 - 3.74$$

$$\text{pH} = 10.26$$



$$K_a = \frac{[\text{C}_2\text{H}_3\text{NO}_2^-(\text{aq})][\text{H}_3\text{O}^+(\text{aq})]}{[\text{HC}_2\text{H}_3\text{NO}_2(\text{aq})]}, \quad [\text{C}_2\text{H}_3\text{NO}_2^-(\text{aq})] = [\text{H}_3\text{O}^+(\text{aq})]$$

$$K_a = \frac{[\text{H}_3\text{O}^+(\text{aq})]^2}{[\text{HC}_2\text{H}_3\text{NO}_2(\text{aq})]}$$

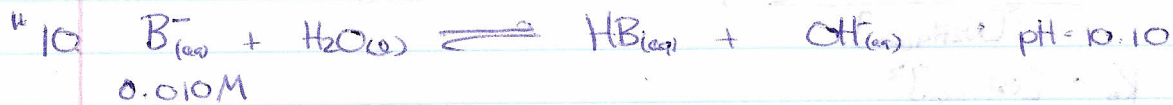
$$[\text{H}_3\text{O}^+(\text{aq})] = \sqrt{(1.4 \times 10^{-5}) [0.010]}$$

$$[\text{H}_3\text{O}^+(\text{aq})] = 3.7 \times 10^{-4} \text{ M}$$

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

$$\text{pH} = -\log [3.7 \times 10^{-4}]$$

$$\text{pH} = 3.43$$



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

$$\text{pOH} = 14.00 - 10.10$$

$$\text{pOH} = 3.90$$

$$[\text{OH}^-(\text{aq})] = 10^{-\text{pOH}}$$

$$[\text{OH}^-(\text{aq})] = 10^{-3.90}$$

$$[\text{OH}^-(\text{aq})] = 1.26 \times 10^{-4} \text{ M}$$

$$K_b = \frac{[\text{HB}(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{B}^-(\text{aq})]}, \quad [\text{HB}(\text{aq})] = [\text{OH}^-(\text{aq})]$$

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

$$K_b = \frac{[1.26 \times 10^{-4}]^2}{[0.010]}$$

$$K_b = 1.6 \times 10^{-6}$$