

Supra

## Acid-base Eq. ⑩ Buffers ①

① What is the pH of a solution that is 0.405 M  $\text{HCOOH}$  and 0.326 M  $\text{HCOONa}$ .  $K_a \text{HCOOH} = 1.8 \times 10^{-4}$ .

$$[\text{H}_3\text{O}^+] = K_a \times \frac{\{\text{acid}\}}{\{\text{base}\}}$$

$$= 1.8 \times 10^{-4} \times \frac{(0.405)}{(0.326)}$$

$$= 2.24 \times 10^{-4}$$

$$-\log 2.24 \times 10^{-4}$$

$$\boxed{\text{pH} = 3.65}$$

$$\text{pH} = \text{p}K_a + \log \frac{\{\text{base}\}}{\{\text{acid}\}}$$

$$\text{pH} = (-\log 1.8 \times 10^{-4}) + \log \frac{(0.326)}{(0.405)}$$

$$= 3.74 + \log 0.805$$

$$= \boxed{3.65}$$

② How many grams of ammonium sulfate must be dissolved in 0.100 L of 0.350 M  $\text{NH}_3$  to make a buffer of pH 10.05?  $K_b \text{NH}_3 = 1.8 \times 10^{-5}$

$$[\text{H}_3\text{O}^+] = K_a \times \frac{\{\text{acid}\}}{\{\text{base}\}}$$

$$*K_a = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}}$$

$$= 5.6 \times 10^{-10}$$

$$8.91 \times 10^{-11} = 5.6 \times 10^{-10} \times \frac{\{\text{acid}\}}{0.350 \text{ M}}$$

$$* \text{Antilog of } 10.05 = 8.91 \times 10^{-11}$$

$$\{\text{acid}\} = 5.6 \times 10^{-2} \text{ M}$$

$$\text{g } (\text{NH}_4)_2\text{SO}_4 = 5.6 \times 10^{-2} \frac{\text{mol}}{\text{L}} \times 0.100 \text{ L} \times \frac{1 \text{ mol } (\text{NH}_4)_2\text{SO}_4 \times 132 \text{ g}}{2 \text{ mol } \text{NH}_4^+ \quad 1 \text{ mol } (\text{NH}_4)_2\text{SO}_4}$$

$$= \boxed{0.37 \text{ g}}$$