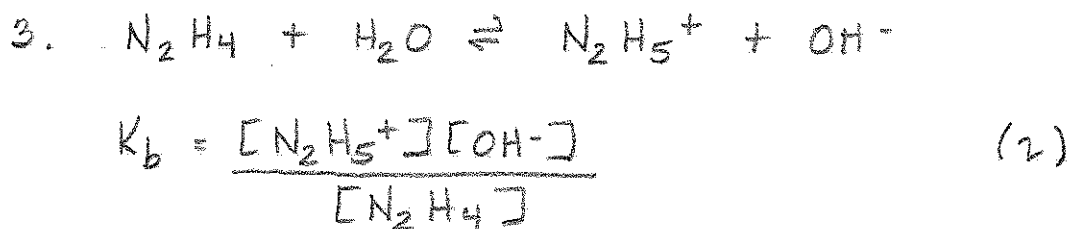
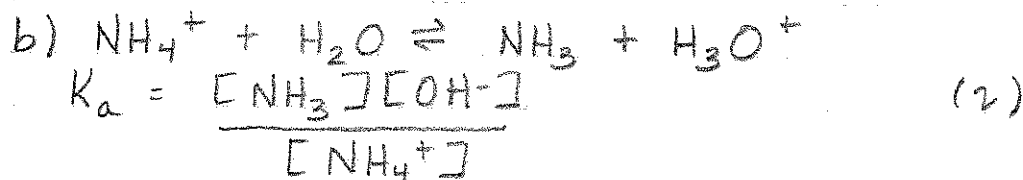
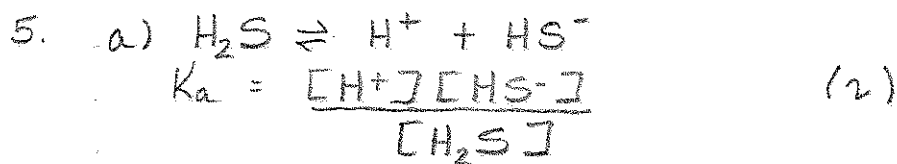


19.3

1. strong base, weak base, weak acid, strong acid (4)



4. HCO_3^- , H_2PO_4^- , HCOOH , HOOCCOOH (4)



6. a) 4
b) 2 (5)
c) 1
d) 5
e) 3

$$7. K_b = \frac{[\text{C}_6\text{H}_5\text{NH}_3^+][\text{OH}^-]}{[\text{C}_6\text{H}_5\text{NH}_2]} \quad (1)$$

$$8. K_a = \frac{[4.2 \times 10^{-3} \text{ M}]^2}{[0.1 - 4.2 \times 10^{-3}]} = 1.8 \times 10^{-4} \quad (1)$$

$$9. K_a = \frac{[\text{H}^+][\text{C}_6\text{H}_5\text{COO}^-]}{[\text{C}_6\text{H}_5\text{COOH}]}$$

$$6.3 \times 10^{-5} = \frac{[\text{H}^+][\text{C}_6\text{H}_5\text{COO}^-]}{[0.20 \text{ M}]} \quad (1)$$

$$(6.3 \times 10^{-5})(0.20 \text{ M}) = [\text{H}^+][\text{C}_6\text{H}_5\text{COO}^-]$$

$$[\text{H}^+] = 3.5 \times 10^{-5} \text{ M} \quad (1)$$

$$10. K_a = \frac{[6.3 \times 10^{-6} \text{ M}]^2}{[0.10 \text{ M} - 6.3 \times 10^{-6}]} = 4.0 \times 10^{-10} \quad (2)$$

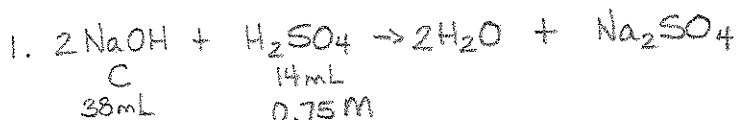
SECTION 19.4 NEUTRALIZATION REACTIONS

1. What is the molarity of a sodium hydroxide solution if 38 mL of the solution is titrated to the end point with 14 mL of 0.75M sulfuric acid?
2. If 24.6 mL of a $\text{Ca}(\text{OH})_2$ solution is needed to neutralize 14.2 mL of 0.0140M $\text{HC}_2\text{H}_3\text{O}_2$, what is the concentration of the calcium hydroxide solution?
3. A 12.4 mL solution of H_2SO_4 is completely neutralized by 19.8 mL of 0.0100M $\text{Ca}(\text{OH})_2$. What is the concentration of the H_2SO_4 solution?
4. What volume of 0.12M $\text{Ba}(\text{OH})_2$ is needed to neutralize 12.2 mL of 0.25M HCl?
5. A 55.0-mg sample of $\text{Al}(\text{OH})_3$ is reacted with 0.200M HCl. How many milliliters of the acid are needed to neutralize the $\text{Al}(\text{OH})_3$?

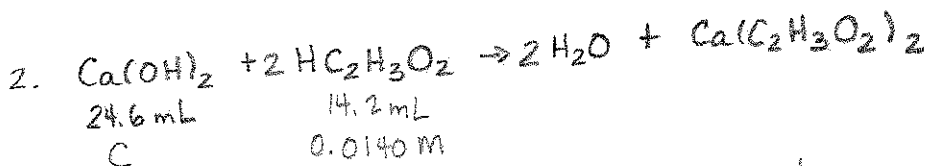
SECTION 19.5 SALTS IN SOLUTION

1. A buffer solution is prepared by mixing together equal quantities of formic acid, HCHO_2 , and sodium formate, NaCHO_2 . Write equations that show what happens when first acid, and then base, is added to this buffer solution.
2. Complete the following rules.
 - a. strong acid + strong base \rightarrow
 - b. strong acid + weak base \rightarrow
 - c. weak acid + strong base \rightarrow

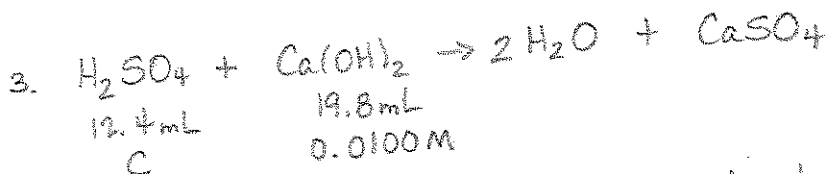
19.4



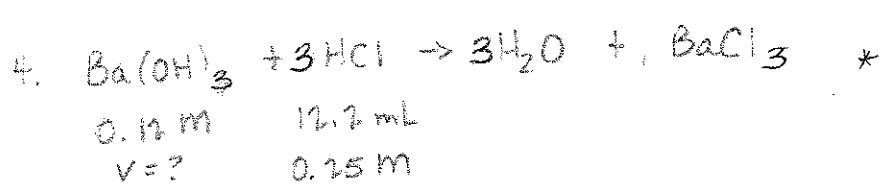
$$C_{\text{NaOH}} = 14\text{mL} \times \frac{0.75\text{ mol}}{\text{L}} \times \frac{2\text{ mol}}{1\text{ mol}} \times \frac{1}{38\text{mL}} = 0.55\text{ mol/L}$$



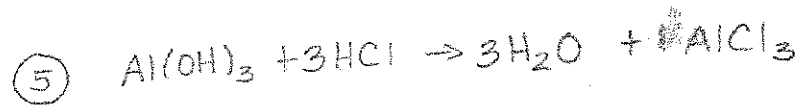
$$C_{\text{Ca}(\text{OH})_2} = 14.2\text{mL} \times \frac{0.0140\text{ mol}}{\text{L}} \times \frac{1\text{ mol}}{2\text{ mol}} \times \frac{1}{24.6\text{mL}} = 4.04 \times 10^{-3}\text{ mol/L}$$



$$C_{\text{H}_2\text{SO}_4} = 19.8\text{mL} \times \frac{0.0100\text{ mol}}{\text{L}} \times \frac{1\text{ mol}}{1\text{ mol}} \times \frac{1}{12.4\text{mL}} = 1.60 \times 10^{-2}\text{ mol/L}$$



$$V_{\text{Ba}(\text{OH})_2} = 12.2 \text{ mL} \times \frac{0.25 \text{ mol}}{1000 \text{ mL}} \times \frac{1 \text{ mol}}{3 \text{ mol}} \times \frac{\text{L}}{0.12 \text{ mol}} = 8.5 \times 10^{-3} \text{ L}$$



$$V_{\text{HCl}} = \frac{55.0 \text{ g}}{78.01 \text{ g}} \times \frac{3 \text{ mol}}{1 \text{ mol}} \times \frac{\text{L}}{0.200 \text{ mol}} = 10.6 \text{ mL}$$

19.5

- 2. a) neutral
- b) acidic
- c) base