

## SCH 4U - Titration Problems

1. How many milliliters of  $0.200 \text{ kmol/m}^3$  NaOH are required to neutralize  $50.0 \text{ mL}$  of  $0.100 \text{ kmol/m}^3$  HCl?
2. What is the molarity of an  $\text{H}_2\text{SO}_4$  solution,  $25.0 \text{ mL}$  of which is completely neutralized by  $45.0 \text{ mL}$  of  $0.100 \text{ kmol/m}^3$  NaOH solution
3. A solution is prepared by dissolving  $0.0370 \text{ g}$  of  $\text{Ba}(\text{OH})_2$  and  $0.855 \text{ g}$  of KOH in  $50.0 \text{ mL}$  of solution. How many mL of  $0.500 \text{ kmol/m}^3$  HCl are required to react with a  $25.0 \text{ mL}$  sample of this solution?
4. What is the concentration of a NaOH solution if  $32.20 \text{ mL}$  is needed to titrate a  $1.10 \text{ g}$  sample of potassium biphthalate ( $\text{KHC}_8\text{H}_4\text{O}_4$ )?
5. What is the percentage of  $\text{KHC}_8\text{H}_4\text{O}_4$  in an impure sample,  $1.00 \text{ g}$  of which requires  $25.0 \text{ mL}$  of  $0.100 \text{ kmol/m}^3$  NaOH for neutralization?
6. How many mL of  $0.100 \text{ kmol/m}^3$  NaOH are required to react completely with  $0.400 \text{ g}$  of oxalic acid dihydrate ( $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ )?
7. How many mL of  $1.50 \text{ kmol/m}^3$   $\text{H}_2\text{SO}_4$  are required to neutralize a solution containing  $32.0 \text{ g}$  of NaOH?
8. What volume of  $0.020 \text{ kmol/m}^3$   $\text{H}_2\text{SO}_4$  is required to react completely with  $20.0 \text{ mL}$  of  $0.0400 \text{ kmol/m}^3$  NaOH?
9. A  $15.20 \text{ mL}$  sample of vinegar has a specific gravity of  $1.060$  and requires  $42.40 \text{ mL}$  of  $0.3460 \text{ kmol/m}^3$  NaOH for titration to the endpoint. What is the percentage by mass of acetic acid ( $\text{HC}_2\text{H}_3\text{O}_2$ ) in the vinegar?
10. An impure sample of  $\text{Ba}(\text{OH})_2$  with a mass of  $0.500 \text{ g}$  was added to  $50.00 \text{ mL}$  of  $0.100 \text{ kmol/m}^3$  HCl. The excess HCl was titrated with  $7.50 \text{ mL}$  of  $0.200 \text{ kmol/m}^3$  NaOH. What was the percentage of  $\text{Ba}(\text{OH})_2$  in the sample?

Answers:

1. $25.0 \text{ mL}$	2. $0.0900 \text{ M}$	3. $15.7 \text{ mL}$
4. $0.167 \text{ M}$	5. $51.1 \%$	6. $63.4 \text{ mL}$
7. $267 \text{ mL}$	8. $20.0 \text{ mL}$	9. $5.469 \%$
10. $60.0 \%$		