

Chemistry 2222, Quantitative Analysis

Problem Set 2. Calculations in Titrimetric Analysis. Summer 2008. Answer Key

Please complete the example problems and recommended exercises in Ch 11 before attempting these problems.

1. A  $\text{Ba}(\text{OH})_2$  solution was standardized by titration against 0.1020 M HCl, 36.11 mL of the base being required to neutralize 50.00 mL of the acid. Calculate the molarity of the  $\text{Ba}(\text{OH})_2$  solution.
2. A 0.9220-g sample of potassium acid phthalate required 44.56 mL of barium hydroxide solution for titration. Calculate the molar concentration of the barium hydroxide.
3. A 1.2486-g sample of impure oxalic acid dihydrate,  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ , required 32.16 mL of 0.1202 M NaOH for titration to the phenolphthalein end point (both protons neutralized). Calculate the percent oxalic acid dihydrate in the sample.
4. Calculate the range of weights of THAM which would require 40 to 50 mL for titration with 0.10 M HCl.
5. A 1.896-g sample of impure sodium carbonate is dissolved in water and diluted to exactly 100 mL. A 25.00-mL aliquot of the resulting solution requires 36.72 mL of 0.1045 M HCl for titration to the bromcresol green endpoint (carbonate is converted to carbonic acid). Calculate the percent sodium carbonate in the sample.
6. A 3.662-g sample of coal was burned in a tube furnace and the liberated  $\text{SO}_2$  was collected in dilute  $\text{H}_2\text{O}_2$ , which converts the  $\text{SO}_2$  to sulfuric acid:  
$$\text{SO}_2(g) + \text{H}_2\text{O}_2(aq) \rightarrow \text{H}_2\text{SO}_4(aq)$$
  
A 25.00-mL portion of 0.01204 M NaOH was added to the resulting solution of  $\text{H}_2\text{SO}_4$ , and the excess base was back-titrated with 8.52 mL of 0.01023 M HCl. Report the sulfur in the coal sample as
  - 1) ppm S.
  - 2) ppm  $\text{FeS}_2$  (iron pyrite is a major form of sulfur in coal).

Answers:

1. 0.0706 M
2. 0.05066 M
3. 19.52 %
4. 0.48 g to 0.61 g
5. 42.90%
6. a) 936 ppm S  
b) 1751 ppm  $\text{FeS}_2$