



ELIZADE UNIVERSITY

ILARA-MOKIN

ONDO STATE

FACULTY: BASIC AND APPLIED SCIENCES

DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES

SECOND SEMESTER EXAMINATIONS

2013/2014 ACADEMIC SESSION

COURSE CODE: CHM 202
COURSE TITLE: Analytical Chemistry
DURATION: 1 hour and 30 minutes

A rectangular box containing a handwritten signature in cursive script, which appears to read "J. Hillhouse".

HOD's SIGNATURE

TOTAL MARKS: 60

PRACTICAL EXAM

INSTRUCTIONS:

This paper consists of two sections;

- Answer only one (1) question in Section A
- Answer all the questions in section B
- Remember to fill in your personal details on the first page of the answer booklet.

SECTION A [30 marks]

Question One

Specimen A is a solution of an impure salt of NaOH. Titrate 25 cm³ of the solution with 0.05 M sulphuric acid using phenolphthalein indicator 2 drops. At the phenolphthalein end point record the titred value (V_pcm³), then add methyl orange indicator (2 drops) into the solution and continue the titration to the end point. Note and record the titred values (V_mcm³).

- a. Write the equation of the reaction completed at the two end points and derive the following

$$\text{relationships: } \quad VCO_3^{2-} = 2(V_m - V_p)$$

$$VOH = 2V_m - V_p$$

- b. What are the disadvantages of attempting to use sodium hydroxide as a standard base
c. From your result evaluate the total Alkalinity, hydroxide and carbonate content
d. Calculate the percentage of hydroxide converted to carbonate using relationship:

$$\% \text{ Conversion} = \frac{\text{Carbonate Content} \times 100}{\text{Total Alkalinity}} \quad [30 \text{ marks}]$$

Question Two

Specimen B is an impure sample of sodium chloride. Carefully weigh 0.5g of the sample and dissolve it in 100cm³ of distilled water. Add a pinch of calcium carbonate and make further addition until effervescence ceases and introduce 1 to 2 cm³ of 5 % potassium chromate and titrate with standard silver nitrate to the first permanent appearance of a brick red colour due to silver chromate. Record the volume of AgNO₃ used. Repeat the procedure in triplicate and find the average titred value..

Calculate following:

- a. A. Number of moles of chloride
b. Percentage of NaCl in the sample
- [30 marks]

SECTION B: Theory to Practical [30 marks]

1. Samples of water sourced from a well located within the bitumen deposit Zone of Agbabu in Odigbo Local Govt. Area were analysed for iron using spectrophotometric analysis. The results show the following levels of iron in parts per million: 144, 157, 135, 141, 162. Determine the mean, median, standard deviation, Coefficient of Variation, Range and Estimated Standard Deviation

(Use the Table below where necessary)

[17 marks]

N	2	3	4	5	6	7	8	9	10	11	12
k	0.89	0.59	0.49	0.43	0.39	0.37	0.35	0.34	0.32	0.32	0.31

2. A given analytical test was performed five times. The results of the analysis are represented by the following values: 6.738, 6.738, 6.737, 6.739, and 6.738%. Would you say that these results are precise? Can you say that they are accurate? [2 marks]
3. Predict the molarity and the normality of the following:
- The molarity of a solution prepared by diluting 10.00 mL of a 4.281M solution to 50.00 mL [3 marks]
 - The molarity of a solution of NaOH that has 0.491 g dissolved in 400.0 mL of solution? [3 marks]
 - The normality of a solution of sulfuric acid if it is used as in the below following and there are 0.248mol dissolved in 250.0 mL of solution? [3marks] $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
 - What is the corresponding normality of 1M H_2SO_4 [2 marks]