KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 104: INTRODUCTION TO LAB PROCEDURES IN ANALYTICAL AND ORGANIC CHEMISTRY

DATE: WEDNESDAY 28TH MARCH 2012 **TIME: 11.00 A.M. – 1.00 P.M.**

INSTRUCTIONS

Answer ALL questions

Statistical Tables are attached. Show how you obtained your answers in all Calculations

Q1. a) Clearly differentiate between the terms 8 mks

(i) Accuracy and precision

(ii) Determinate and indeterminate errors

(iii) Reproducibility and repeatability

(iv) Theoretical equivalence and end point

b) An analysis of a blood sample to determine the level of haemoglobin in an anemic patient was done in a government hospital. Replicate determination of the analysis gave the following data: 11.47, 11.40, 11.49, 11.30, 11.44, 12.42 %

(i) Calculate the coefficient of variation of the data 2 mks

(ii) Calculate the 95 % confidence limits of the mean for these results. 3 mks

(iii) Is there evidence of any systematic errors at 95 % CL? 4 mks

Q2. (a) (i). What are the favorable conditions necessary for precipitation 4 mks

(b) The calcium in a 200 ml sample of natural water was determined by precipitating the cation as CaC_2O_4. The precipitate was filtered, washed and ignited in a crucible with an empty mass of 26.600g. The mass of the crucible plus CaO (56.077 g/mol) was 26.7134g. Calculate the concentration of Ca (40.078 g / mol) in water in units of grams per 100 ml of the water. 6 mks

(c) What is meant by a good precipitate? 2 mks

(d) List any two sources of impurities during precipitation and explain how these can be minimized. 6 mks

(e) Calculate (i) the P^{OH} of 2.0×10^{-2} M solution acetic acid
($Ka=1.76 \times 10^{-6}$) 5mks

Q3. (a) Why is separation important in analysis 1 mk

(b) List any five factors to be considered in selecting a method of analysis 5 mks

(c) An analysis was done by a new analytical method and results compared to data obtained using the standard method as shown below:

New Method	20.0	11.9	18.9	19.8	18.7
Standard method	19.5	18.9	19.7	19.4	

(i) State the null hypthothesis 1 mk

(ii) Do the precision of the two methods significantly at 95 % CL 3mks

(iii) Do the means of the two methods differ? 4 mks

(iv) Use 4d test to determine if 11.9 is an outlier 3 nks

Q4. (a) List the requirements of titration 3 mks

(b) State one reason for each of the following statement. 4 mks

(i) A primary standard should have a high formula weight

(ii) Why back titration would be used.

(iii) Average deviation is not preferred as a measure of precision

(iv) Digestion of a preciptate

(c) 25.0 cm^3 of seawater was diluted to 250 cm^3 in a graduated volumetric flask. A 25.0 cm^3 aliquot of the diluted seawater was pipetted into a conical flask and a few drops of potassium chromate(VI) indicator solution was added. On titration with 0.100 mol dm^{-3} silver nitrate solution, 13.8 cm^3 was required to precipitate all the chloride ion.

[Atomic masses: Na = 23, Cl = 35.5]

(i) Give the ionic equation for the reaction of silver nitrate and chloride ion. 1mk

(ii) Calculate the moles of chloride ion in the titrated 25.0 cm^3 aliquot. 2mks

(iii) Calculate the molarity of chloride ion in the diluted seawater. 2 mks

(iv) Calculate the molarity of chloride ion in the original seawater. 2 mks

(v) Assuming that for every chloride ion there is a sodium ion, what is the theoretical concentration of sodium chloride salt in g dm^{-3} in seawater? 2 mks

d) State two aims of analysis 2 mks