TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BSFQA15S YR2 SII

ACH 4214: INSTRUMENTAL AND PHYSICOCHEMICACL METHODS OF ANALYSIS

END OF SEMESTER EXAMINATION

SERIES: APRIL2016

TIME: 2HOURS

DATE: Pick DateMay2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions. Attempt question one which's compulsory and any other two questions..

Do not write on the question paper.

QUESTION 1

a) A concentrated solution of aqueous ammonia is 28.0% w/w NH_3 and has a density of 0.899 g/mL. What is the molar concentration of NH_3 in this solution? (2 marks)

b) The concentration of β-carotene in ppm values for local beverages was found to be; 13, 14, 18, 28, 10, 6.5, 44.5 and 11.5.Calculate: Range, Mean deviation, variance, standard deviation.(6 marks)

c) Determine whether the smallest value is an outlier at 90% confidence limit for the following data; 1.5, 11.0, 10.5, 9.9, 13.6, and 12.6, given that tabulated value is 5.8.(3 marks)

d) Outline the sources and ways of minimizing systematic errors. (4marks)

e) Draw a schematic diagram showing all the basic components of gas chromatography. (4 marks)

f) Differentiate the following conditions as used in high performance liquid chromatography (HPLC);

i. Gradient elution and isocratic elution. (2 marks)

ii. Reversed phase and normal phase chromatographic separation. (2 marks)

g) A 10-mL volumetric pipet was calibrated following the outlined procedure of using a balance calibrated with brass weights having a density of 8.40 g/cm3. At 25 °C the pipet was found to dispense 9.9736 g of water. What is the actual volume dispensed by the pipet? (2 marks)

h) Outline three methods of selecting and evaluating the end point in titrimetric reactions. (3 marks)

i) Outline how thin layer chromatography (TLC) can used for both qualitative and quantitative analysis (2 marks)

QUESTION 2

a) A sample of an ore was analyzed for Cu^{2+} as follows. A 1.25-g sample of the ore was dissolved in acid and diluted to volume in a 250-mL volumetric flask. A 20-mL portion of the resulting solution was transferred by pipet to a 50-mL volumetric flask and diluted to volume. An analysis showed that the concentration of Cu^{2+} in the final solution was 4.62 ppm. What is the weight percent of Cu in the original ore? (8 marks)

b) Discuss any four factors to be considered when selecting an analytical method of analysis. (8 marks)

c) Discuss the advantages and disadvantages of using mean as a measure of central tendencies for a given data**. (4 marks)**

QUESTION 3

a) Outline four criteria used to classify the separation techniques (4 marks)

b) Differentiate between precipitation and electrogravimetry. (4 marks)

c) Outline three quantitative applications of gravimetric and titrimetric analysis. (3marks)

d) State beers law and explain the two broad limitations of the law.(4marks)

e) A 5.00 x10^{-4} M solution of an analyte is placed in a sample cell that has a path length of 1.00 cm. When measured at a wavelength of 490 nm, the absorbance of the solution is found to be 0.338. What is the analyte's molar absorptivity at this wavelength?(5marks)

QUESTION 4

a) With the aid of a schematic diagram, outline the process occurring during the atomization process of liquid sample in atomic absorption spectroscopy analysis. (10 marks).

b) Discuss the four main applications of HPLC in food analysis, giving an example for each case. (10 marks)

QUESTION 5

a) Differentiate the following terms as used in analysis;
   i. Primary reagent and secondary reagent.(2 marks)
   ii. Matrix matching and standard additions (2 marks)
   iii. Protocol and method of analysis (2 marks)
   iv. Polychromatic and monochromatic radiation (2 marks)

b) Clearly describe the titrimetric method for determining the total proteins in bread sample. (12 marks)