



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BSFQA15S, BSFQA16Sev YR2 SII

ACH 4214: INSTRUMENTAL AND PHYSICOCHEMICAL METHODS OF ANALYSIS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date May 2016

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 is compulsory and any other two questions.

Do not write on the question paper.

QUESTION ONE

- a) A laboratory procedure calls for 250 mL of an approximately 0.10 M solution of NH_3 . Describe how you would prepare this solution using a stock solution of concentrated NH_3 (14.8 M). (2 marks)
- b) Define the following terms as used in sampling plan for a given data;
- Stratified random sampling. (2 mark)
 - Cluster sampling. (2mark)
 - Random sampling. (2 mark)
- c) Describe how you would prepare the following three solutions:
- 500 mL of approximately 0.20 M NaOH using solid NaOH; (1 marks)
 - (c) 2 L of 4% v/v acetic acid using concentrated glacial acetic acid. (1 marks)

- d) Outline the sources and ways of minimizing gross errors. **(4marks)**
- e) Draw a schematic diagram showing all the basic components of UV Visible spectrophotometer. **(5 marks)**
- f) Differentiate the following terms as s as used in chromatography
- i. Mobile phase and stationery phase. **(2 marks)**
 - ii. Thin layer chromatography and preparative thin layer chromatography. **(2 marks)**
- g) A solution that was 4.14×10^{-3} M in X had a transmittance of 0.126 when measured in a 2.00cm cell. What concentration of X would be required for the transmittance to be increased by a factor of 3 when a 1.00cm cell was used.**(3 marks)**
- h) Explain why is spectrofluorometry potentially more sensitive than spectrophotometry **(2 marks)**
- i) Outline how thin layer chromatography TLC used for both qualitative and quantitative analysis **(2 marks)**

QUESTION 2

- a) A student obtained the following data for the different spectroscopic instruments from six different universities; MKU (3), KU (8), UON (6), JKUAT (10), TUM (4), and MMUST (5). Determine the following measures of dispersion;
- i. Mean deviation. **(2 marks)**
 - ii. Mean **(2 mark)**
 - iii. Range **(2 mark)**
 - iv. Standard deviation. **(2 marks)**
 - v. Variance **(2marks)**
- b) Discuss the merits and demerits of instrumental methods of analysis. **(6 marks)**
- c) Discuss the advantages and disadvantages of using median as a measure of central tendencies for a given data. **(4 marks)**

QUESTION 3

- a) Discuss two hyphenated chromatographic systems citing advantages of each compared to normal systems. (8 marks)
- b) Differentiate between photometry and colorimetry. (3 marks)
- c) Outline three qualitative applications of gravimetric and titrimetric analysis. (3marks)
- d) Explain the differences between the following agents used in flame atomic Absorption/emission
 - i. releasing agent (2marks)
 - ii. protective agent (2marks)
 - iii. ionization suppressor(2marks)

QUESTION 4

- a) Outline the process standard addition as used in calibration procedures (8 marks).
- b) Discuss the four main applications of titrimetric analysis in food samples, giving n example for each case. (12 marks)

QUESTION 5

- a) Define the following terms;
 - i. Voltammetry (2 mark)
 - ii. polarography (2 mark)
 - iii. Stripping voltametry (2 mark)
- b) Clearly describe the titrimetric procedure for the determination of hardness in waste water (10 marks)
- c) Explain why small amount of buffer used during analysis. (4 marks)