



# TECHNICAL UNIVERSITY OF MOMBASA

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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.**

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### QUESTION ONE

- a) A laboratory procedure calls for 250 mL of an approximately 0.10 M solution of  $\text{NH}_3$ . Describe how you would prepare this solution using a stock solution of concentrated  $\text{NH}_3$  (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. ( 2 mark)
  - 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  $4.14 \times 10^{-3}$  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)