THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

JANUARY – APRIL 2019 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCE (CHEMISTRY)

PART TIME PROGRAMME

CHEM 408: ANALYTICAL CHEMISTRY II

Date: APRIL 2019	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Question one:

(I). Define the following terms used in instrumental techniques
- (a) Retention time
- (b) Aspiration
- (c) Photoelectric effect
- (d) Resolution factor
- (e) Analytical signal **(10 marks)**

(II). Differentiate between the following
- (a) Isocratic and gradient elution
- (b) Reverse phase and normal phase chromatography
- (c) Phosphorescence and fluorescence

(12 marks)

(III) List any two for each one of the following
- (a) Examples of photo detectors
- (b) Dispersing elements
- (c) Ways in which matter interacts with radiation
- (d) Factors that affect analysis by UV Vis spectroscopy

(8 marks

Question 2

(a) Potassium standards gave the following emission intensities at 403.3nm.Emission from the unknown was 417.Find the concentration of potassium and its uncertainty in the unknown

Sample	0	5	10	20	30
Relative emission µg K/mL	0	124	243	486	712

$[12\,marks]$

(b) Explain what is meant by spectral, chemical, ionization and isobaric interference.

$[8\,marks]$

Question 3

(I) To a sample of a protein hydrolysate, an analyst added 1.00mg of tryptophan, which was labeled with ^{14}C and exhibited a counting rate of 584 cpm above background. After this labeled compound was thoroughly mixed with the sample,the mixture was passed through an ion exchange column.The fraction of effluent containing only tryptopan was collected and from it an 18.0 mg sample of pure tryptophan was isolated.The isolated sample had acounting rate of 204 cpm in the same counter.what was the weight in the original sample.

$[5\,marks]$

(II). A 0.6025-g sample was dissolved, and the $Ca^{2+}$and Ba^{2+} ions present were precipitated as $BaC_2O_4 \cdot H_2O$ and $CaC_2O_4 . H_2O$. The oxalates were then heated in a thermogravimetric apparatus leaving a residue that weighed 0.5713 g in the range of 320°C to 400°C and 0.4673 g in the range of 580^0C to 620°C. Calculate the percentage Ca and percentage Ba in the sample. $[6\,marks]$

(III). Describe three methods that can be used to determine the endpoint in potentiometric titration $[9\,marks]$

Question 4

(I) Sketch a printout from a column chromatograph and use arbitrary value to label any three peak. Hence use your values to report the number of theoretical plates (any one peak) and the resolution factor (any two peaks). $[10\,marks]$

(II) Describe the process of Atomization in flame atomic absorption spectroscopy $[5\,marks]$

(III) Explain the steps involved in Analysis $[5\,marks]$

Question 5

Write brief notes on the following

(i) NMR
(ii) MS

(iii) Thermoanalytical techniques
(iv) Radiochemical
(v) Electrochemical techniques $[20\,marks]$

END