KISII UNIVERSITY

UNIVERSITY EXAMINATIONS
SPECIAL EXAMINATION
THIRD YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF EDUCATION SCIENCE
SECOND SEMESTER 2021/2022
(JULY, 2022)

CHEM 351: ANALYTICAL CHEMISTRY II

STREAM: Y3 S2   **TIME: 2 HOURS**

DAY: FRIDAY, 11.30 AM – 1.30 PM   **DATE: 22/07/2022**

INSTRUCTIONS:

1. *Do not write anything on this question paper.*
2. *Answer ALL Questions in section A and any TWO Questions in Section B.*

SECTION A

1a) Discuss theory and the use of polarography in the determination of inorganic cations.

(3 marks)

b) Differentiate between the following terminologies as used by analytical chemists. (7 marks)

i) Sensitivity and selectivity

ii) Systematic error and Random error

iii) Random sampling and analytical sampling

iv) Trace analysis and structural analysis

c) Describe theory of High Performance Liquid Chromatography (HPLC) and its uses. (3 marks)

d) Explain main functions of the nebulizer in the Atomic Emission Spectroscopy (AES). (3 marks)

e)Explain 3 major factors that determine Retention Factor (RF) in TLC.   (5 marks)

 f) Clinical analyst wanted to determine the concentration of sodium ion in blood of hypertension patient and obtained the following data in ppm:

19.8, 20.2, 18.6, 19.5, and 29.9,

i) Determine whether 29.9 is an outlier in the data collect using 3d, Q test.   (2 marks)

ii) Determine the Relative standard deviation (RSD) of the validated data.   (3 marks)

g) Describe major steps in chemical analysis.   (4 marks)

h) Describe the instrumentation of AAS and explain how it's different from AES (3 marks)

I) Which are three major interferences encountered in Atomic emission spectroscopy (AES)
                                                                                   (3 marks)

 j) Outline 3 advantages of gravimetric analysis over titrimetric analysis.   (3 marks)

k) Explain 2 uses of the confidence Limits.   (2 marks)

SECTION B

2 a) A chemist carried out analysis to determine the percentage of calcium in unknown sample using two methods, a gravimetric method and a new method. The replicate determinations of calcium is as follows:

Gravimetric method: **2.1, 1.9, 2,3, 2.2, 1.8 %**

New method: **2.4, 2.5, 2.7, 2.3, 2.2 %**

Determine whether the two methods of analysis differ significantly at 95% confidence limit using student t-test.   (10 marks)

b) Discuss the major factors to consider in selecting method of chemical analysis. (5 marks)

3. (a) Discuss theory and the applications of gravimetry in the determination of Ca^{2+} inorganic cations as a versatile analytical method.   (5 marks)

(b) Discuss the principle of Gas Chromatography (GC)? Highlight its major differences with HPLC? (5 marks)

(c) In the method to determine the percentage of gold in ore obtained from kakamega gold mines by cold vapour AAS. The following values were obtained for a standard reference material containing 33.7%.

Mercury data: 33.9, 27.4, 27.1, 26.9, 27.2 %

Is there any evidence of systematic errors in the obtained data? (5 marks)

4. (a) Discuss theory and the applications of Thin Layer Chromatography (T.LC) in the determination of purity of a newly discovered cancer drug from other organic extracts as versatile analytical method. (5 marks)

b) Substance A and B were found to have retention times 26.40 min and 27.63 min respectively. O n a 30 cm column. An unretained species passed through the column in 1.32 mins. The peak widths (at base) for A and B were 1.12 and 1.22 mins respectively. Calculate;

i) The column resolution. (3 marks)

ii) The Average number of plates of the column. (3 marks)

Iii) The plate height. (2 marks)

iv) The length of the column required to achieve resolution of 1.5. (2 marks)