KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
SPECIAL/ SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF B.SC (SCIENCE)

COURSE CODE: SCH 313:

COURSE TITLE: ANALYTICAL CHEMISTRY

DURATION: 2 HOURS

DATE:15/11/2022   **TIME: 8:00AM-10:00AM**

INSTRUCTIONS TO CANDIDATES
- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **6** printed pages. Please Turn Over

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Question One (30 marks)

a) Explain why separation techniques are necessary in the study of analytical chemistry.
(2mks)

b) Apart from change in physical state, name other physicochemical properties upon which separation and concentration of species are based.
(4mks)

c) You are required to separate components of a mixture based on change of physical state. Outline three techniques which you can use to accomplish this task.
(3mks)

d) Discuss the basis of size exclusion chromatography as a separation technique.
(3mks)

e) Explain how selectivity is achieved in solvent extraction

f) Differentiate among the following as used in gravimetric analysis:
   i.   Electrogravimetry
   ii. Volatizationgravimetry
   iii. Particulate gravimetry
(2mks)
(2mks)
(2mks)

g) Controlling particle size is very vit l in order to obtain a good precipitate. What are the stages involved in this proce is?
(3mks)

h) State two application of acid base titration.
(2mks)

i) Differentitate between column and planar chromatography.
(4mks)

Question two (20 marks)

Thin layer chromatography is one of the chromatographic techniques commonly used by analysts. Discuss this technique under the following headings:
   i.   Principles
   ii. Solvents used
   iii. Applications
(4mks)
(2mks)
(3mks)

a) Discuss the instrumentation for gas chromatography.
(5mks)

b) State any four applications of HPLC.
(4mks)

Question three (20 marks)

a) In order to determin the concentration of a standard an analyst can do it directly or indirectly. Explain how this can be done:
   i.   Direct method
   ii. Indirect method
(4mks)
(4mks)

b) Sketch a conductometric titration curve for a strong acid and a strong base (3mks)

c) An analyst is requires to carry out an experiment using 5 litres of 0.1M sodium carbonate. Advice the analyst how the solution should be prepared from a primary standard.
(3mks)

d) Redox titration is an important titrimetric techinique. State its applications (6mks)

Question four (20 marks)

a) Batch and continuous extraction are methods used in solvent extraction. Briefly explain hoe each one of them works:
   i.   Batch extraction
                                                   (5mks)
   ii.   Continuous extraction
                                                   (5mks)

b) The amount of solute remaining in the aqueous phase is readily calculated for any number of extractions with equal volumes of organic solvents form the equation

$$C_{(aq)n} = \left[\frac{V_{aq}}{(DV_{0} + V_{aq})} \right]^n$$ define each of the terms in the equation.   (5mks)

c) For a complete removal of 0.1g of iodine from 50cm³ of an aqueous solution of iodine and sodium chloride is required. Assuming D for carbon tetrachloride water is 85, then for a single extraction and three extractions with 25cm³ of CCl₄ calculate the amount of solute remaining in the aqueos phase. (5mks)