(13)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
SUPPLIMENTRY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: SCH 313

COURSE TITLE: ANALYTICAL CHEMISTRY II

DURATION: 2 HOURS

DATE: 13/1/2022 **TIME: 8-10AM**

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 **5** printed pages. Please Turn Over

Question one

(i) Extraction has widely been used in modern analysis for separating and concentrating elements. State any two advantages of extraction. (2marks)

(ii) Succinic acid was shaken up with a mixture of water and ether. The concentrations of the acid in the two layers are as follows per 10 ml of solution.

In water layer	0.0244	0.071	0.121
In ether layer	0.0046	0.013	0.022

(a) Find out the distribution coefficient in each case. (3mks)

(b) Calculate the average distribution coefficient. (1mk)

(iv) An analyte and an interferent can be separated if there is a significant difference in at least one of their chemical or physical properties. The table below provides list of several separation techniques, indicate the basis of separation technique exploited in each case. (4 marks)

	Separation technique	Basis of separation
1	Dialysis	
2	Centrifugation	.
3	Solvent Extraction	
4	Distillation	

(v) List three types of gravimetric analysis. (3 marks)

(vi) State two applications of precipitation gravimetry. (2 marks)

(vii State four advantages of gravimetric analysis (4 marks)

(viii) A certain barium halide exist as a hydrated salt $BaX_2.\ 2H_2O$. where X is the halogen. The barium content of the salt can be determined by gravimetric methods.). 0.265g of the halide was

dissolved in 200cm3 of water and excess sulphuric (Vi) acid was added. The mixture was heated at boiling point for 45 min. the precipitate barium sulphate was filtered off washed and dried.

The mass of the precipitate obtained was 0.2533g. Determine the molecular mass of X. (Ba =137, S = 32, O = 16) (4 marks)

(ix) Discuss the basic principles of volumetric analysis. (4 marks)

(X) determine the molecular mass of unknown mono basic acid whose 0.5 grams is neutralized by 26.23 ml of 0.08M sodium hydroxide solution. (4 marks)

Question two

(i) Define the following terms as used in chromatography (4 marks)

a. Retention time

b. Stationary phase

c. Mobile phase

d. Flow rate

(ii) Which term tell as about compound identity (qualitative aspect) (2 Marks)

(iii) Which term tell as how much of compound is there (quantitative aspect) (2 Marks)

(iv) State and explain basic components of gas chromatography instruments. (10 marks)

(v) State two applications of gas chromatography. (2 marks)

Question three

(i) State the importance of separation technique to an analytical chemist (1 mark)

(ii) Briefly describe the following the following separation techniques and in each state its application. (9 marks)

a) Filtration

b) Dialysis

c) Size exclusion chromatography

(iii) Define the term extraction (1 mark)

(iv) A water sample contains 5mg each of an organic pesticides and ionic herbicide which are to be separated by extraction in methyl benzene. Given the pesticide distribution ratio D for methyl benzene/water is 50. Calculate E for;

i. One extraction of $10cm^3$ water with $5cm^3$ methyl benzene. (3marks)

ii. 3 extractions of same $10cm^3$ water with $5cm^3$ of methyl benzene.

(4marks)

(v) Explain two applications of distillation as an analytical method (2marks)

Question four.

(i) What is meant by the following terms (3marks)

a. elution

b. Retention time

c. mobile phase

(ii) State three causes of band broadening (3 marks)

(iii) Describe the fundamental difference between adsorption and partition chromatography

(4marks)

(iv) Distinguish between normal phase chromatography and reversed phase chromatography.

(2 marks)

(vi) Name two Common detectors used in gas chromatography (2 marks)

(vii) The distances travelled by five compounds and the solvent front after a TLC separation on silica gel were as follows:

Compound Distance travelled,	cm
solvent	12.5
methyl stearate	9.1
Cholesterol	1.5
a-tocopherol (vitamin E)	5.6
squalene (hydrocarbon)	10.3

Calculate the Rf values of each compound. (4marks

(viii) State two applications of thin layer chromatography (2marks)