



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
TECHNOLOGY IN APPLIED CHEMISTRY
BTAC

ACH 4205: METHODS OF CHEMICAL SEPARATION

SPECIAL/SUPPLEMENTARY EXAMINATION

OCTOBER 2013 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

Question ONE

a) Explain the following terms used in separation methods

- (i) Cross flow
- (ii) Dralysis
- (iii) Separation mechanism
- (iv) Membrane fouling
- (v) Supercritical fluid chromatography

(10marks)

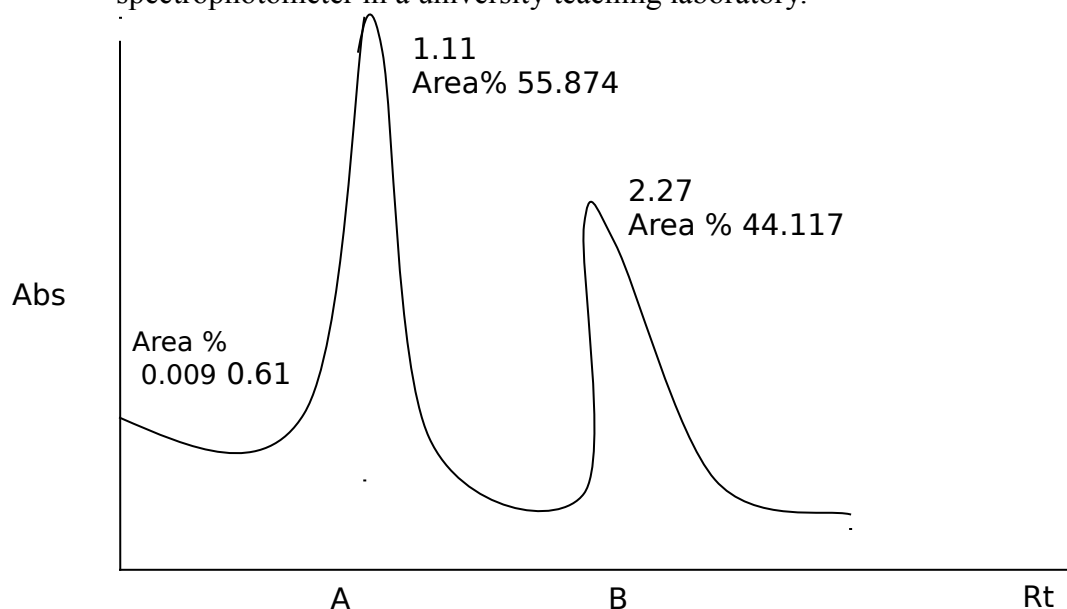
b) In a separation process a mixture of protein, sucrose and sodium chloride in a solution

another, devise a combination of membrane processes to accomplish the same. **(4marks)**

- c) (i) Explain the feed pretreatment for reverse osmosis **(4marks)**
(ii) Why is the pretreatment for reverse osmosis. **(4marks)**
- d) List THREE chromatographic techniques based on sorption mechanisms **(3marks)**
- e) Give THREE applications of Affinity chromatography. **(3marks)**
- f) Differentiate between the following terms
- (i) Flow injection analysis (FIA) and segmented flow analysis (SFA).
(ii) Osmosis and reverse osmosis **(4marks)**

Question TWO

- a) Study the chromatogram below of a mixture of two compounds A and B run on a GC spectrophotometer in a university teaching laboratory.



- (i) What is the retention time of compound A and B? **(2marks)**
- (ii) Which compound is present in larger amount? **(1mark)**
- (iii) Which compound has the lower boiling point? **(1mark)**
- (iv) If the column temperature is raised what would happen to the retention times of A and B **(2marks)**
- (v) Compound B is suspected to be actane. Provide supporting evidence to support the hypothesis. **(4marks)**
- b) Describe the separation mechanisms of components of a mixture in a GC Column.

(5marks)

- c) Water and ethanol can be separated by pervaporation. Explain. **(5marks)**

Question THREE

- a) Describe any FIVE separation modes and their application used in HPLC chromatography **(10marks)**
- b) Explain the following terms as used in HPLC separation.
- (i) Resolution
 - (ii) Efficiency
 - (iii) Selectivity
- c) List any FOUR materials used in production of membranes in microfiltration. **(4marks)**

Question FOUR

- a) Explain the following terms
- (i) Membrane flux
 - (ii) Retention
 - (iii) Gel polarization
- b) Describe the procedure for the non-destructive integrity test for membranes referred to as molecular weight cut off (MWCO) test. **(5marks)**
- c) Outline the steps involved in a membrane system. **(5marks)**
- d) Using a simple diagram explain the basic principles in capillary electrophoresis.

(4marks)

Question FIVE

- a) Describe the process of electrodialysis with at least two applications. **(10marks)**
- b) Apart from solid phase other phases can be used in membranes. Explain such other

phase.

(6marks)

- c) Explain the application of size exclusion chromatography in characterizations. **(4marks)**