



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (BTAC) BTAC 2024S

ACH 4205: METHODS OF CHEMICAL SEPERATION

SPECIAL SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2HOURS

DATE: 20Jul2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE Question(s). Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE

- a) Outline four criteria of classifying of separation techniques citing an example for each criterion. (4 marks)
- b) Differentiate between the following terms as used in chromatography.
- i. Isocratic and gradient elution. (2 marks)
 - ii. Void time and retention time. (2 marks)
 - iii. Packed column and open tubular column (2 marks)
- c) Differentiate between the following terms
- i. Reverse osmosis and Nano filtration (4marks)
 - ii. Homogenous barrier and microporous barrier in membranes. (4marks)
 - iii. Stripping and back washing (2 marks)

- e) Discuss the three types of motion of molecules through barriers in membranes. **(6 marks)**
- f) Outline two methods for the procedure used in packing a column used in column chromatography **(2 marks)**
- g) Explain the term partition coefficient as used in extraction method of separation **(2 marks)**

QUESTION TWO

- a) Discuss the working principle of supercritical fluid liquid chromatography as a method of separations in analytical chemistry citing its major applications. **(6 marks)**
- b) Define the following terms used in chromatography as a separation technique.
- i. Retardation factor **(2 marks)**
 - ii. Detecting or visualizing reagents **(2 marks)**
 - iii. Affinity chromatography **(2 marks)**
- c) Describe the procedure of separating amino acids using thin layer chromatography (TLC) outlining the qualitative and quantitative information obtained from TLC. **(8 marks)**

QUESTION THREE

- a) Discuss the three driving forces of transport in the membrane separation process. **(9 marks)**
- b) Outline the various steps of casting a polymeric membrane of cellulose acetate clearly indicating the casting requirements. **(7 marks)**
- c) Explain the following terms as used chromatography separation.
- i. Resolution **(2 marks)**
 - ii. Retention time **(2 marks)**

QUESTION FOUR

- a) Outline four characteristics of a good membrane used in separation process. **(4 marks)**
- b) Discuss the bubble point test procedure for wetted filter. **(6 marks)**
- c) Explain the separation principle behind the following methods of separation citing an example for each method.
- i. Fractional crystallization **(2 marks)**

- ii. Extraction using separating funnel (2marks)
- iii. Decantation (2 marks)
- iv. Magnetic separation (2 marks)

QUESTION FIVE

a) Differentiate between the following terms

- i. Flow injection analysis (FIA) and reverse flow injection (4 marks)
- ii. Liquid chromatography and supercritical fluid chromatography. (4marks)
- iii. Gas solid chromatography and Gas liquid chromatography (4 marks)

b) Describe the mobile phase and application for each of the following separation modes in High performance liquid chromatography (HPLC)

- i) Reversed phase. (2 marks)
- ii) Normal phase (2 marks)
- iii) Ion-exchange (2 marks)
- iv) Size exclusion (2 marks)