



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

Department of Pure & Applied Sciences

UNIVERSITY EXAMINATION FOR:
BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY
ACH 4313: SURFACE AND COLLOID CHEMISTRY
SUPPLEMENTARY/SPECIAL EXAMINATION

SERIES: JULY 2025

TIME: 2 HOURS

DATE: Pick Date Select Month 2025

Instructions to Candidates

You should have the following for this examination supplementary

Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt question ONE (Compulsory) and any other TWO questions. Do not write on the question paper.

QUESTION ONE

- a) Define the following terms as used in colloidal chemistry
- (i) Osmotic pressure (2 marks)
 - (ii) Lyophilic sol (2 marks)
 - (iii) Adsorptive (2 marks)
 - (iv) Adsorbent (2 marks)
- b) Highlight any THREE differences between chemisorption and physisorption (6 marks)
- c) (i) Describe critical micelle concentration (cmc) (2 marks)
- (ii) Explain how the following factors influence adsorption
- I. Nature of gas (2 marks)
 - II. Temperature (2 marks)
- d) Describe any THREE ways of classifying colloidal systems (6 marks)
- e) State any FOUR applications of adsorption (4 marks)

QUESTION TWO

- a) Distinguish between
- Lysol and aerosol
 - Reversible and irreversible colloidal systems (4 mks)
- b) Distinguish between uni-molecular and multi-layer adsorption isotherms (4 marks)
- c) Describe any four characteristics of colloidal systems (12 marks)

QUESTION THREE

- a) (i) Define foams (1 mark)
(ii) Describe any TWO factors that affect foam stability (4 marks)
- b) Explain how the following factors enhances emulsion stability (15 marks)
(i) Electric double layer repulsion
(ii) Low interfacial tension
(iii) Narrow droplet-size distribution
(iv) Strong and elastic interfacial film
(v) High viscosity

QUESTION FOUR

- a) Define the following terms:
(i) Fractional coverage (2 marks)
(ii) Adsorption isotherm (2 marks)
- b) Explain the following:-
(i) In the osmotic pressure method for macromolecular mass determination, the data are normally extrapolated to infinite dilution. (3 marks)
(ii) The molecular mass determined by the osmotic pressure method is often referred to as the “Number average molecular mass”. (2 marks)
- c) The osmotic pressures of a sample of polyisobutylene in cyclohexane at 25°C at several concentrations are as follows:

c, g.mL ⁻¹	0.020	0.015	0.010	0.0075	0.0050	0.0025
Π , bar	0.0118	0.0067	0.0030	0.00175	0.00091	0.00035

Determine the number average molecular mass of the sample.

$$\{R=0.08314\text{L}\cdot\text{bar}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}\}$$

$$\lim_{c \rightarrow 0} \left(\frac{\pi}{c} \right) = \frac{RT}{M}$$

(11 marks)

QUESTION FIVE

- a) The adsorption of carbon monoxide on mica at 90° K gave the following results

Pressure, mmHg	105	453	545	791	1059
Volume adsorbed (cm ³)	1300	1630	1680	1780	1830

Show that the data fit the Langmuir adsorption isotherm. $\theta = KP_a \div (1 + KP_a)$ (9 marks)

- b) Define “molar heat of adsorption” (1 mark)
c) With the aid of diagrams describe the types of adsorption isotherms (10 marks)