



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences

Department of Pure & Applied Sciences

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN ANALYTICAL CHEMISTRY

ACH 4309 : DRUG ANALYSIS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2024

TIME: 2 HOURS

DATE: Pick Date Jan 2025

Instructions to Candidates

You should have the following for this examination

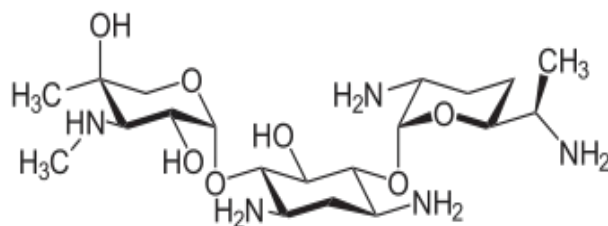
-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

- (a) Briefly explain the term levelling effect as applied to strong mineral acids and bases. (4 marks)
- (b) Provide any THREE advantages of non-aqueous titrations. (3 marks)
- (c) Explain the addition of acetic anhydride to perchloric acid – acetic acid mixture during preparation of the non-aqueous solvent. (4 marks)
- (d) Provide any THREE factors affecting the stability of a complex with reference to the central metal ion. (3 marks)
- (e) Highlight the Beer-Lambert law on absorption spectrophotometry. (2 marks)
- (f) Gentamicin, with the molecular structure provided below, is not expected to be readily absorbed through lipophilic membranes even though it is in the unionized form. Explain this observation.



(4 marks)

(g) Define the following terms in chromatographic separations

(i) Isothermal separation

(2 marks)

(ii) Reversed-phase separation.

(2 marks)

(h) Briefly describe Differential Centrifugation separations.

(6 marks)

Question TWO

(a) Outline the application of complexometric titration using EDTA for the following

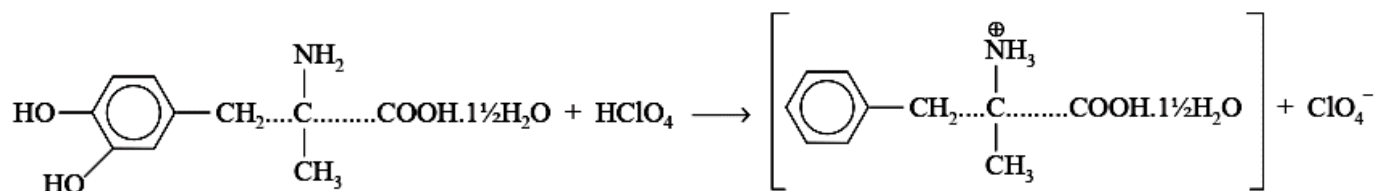
(i) Assay of CaCO_3

(4 marks)

(ii) Assay of Calcium Lactate injection.

(4 marks)

(b) In a non-aqueous titration, 9.2 ml of 0.1 M perchloric acid (HClO_4) was titrated against 0.2 g methyl dopa ($\text{C}_{10}\text{H}_{13}\text{NO}_4$) dissolved in anhydrous formic acid, glacial acetic acid and dioxane mixture. A blank titration obtained 0.3 ml of titrant. Calculate the % purity of methyl dopa, given the molecular mass is 211.24 g.



(7 marks)

(c) Highlight any TWO interferences that may be a source of error in a Karl-Fischer titration.

(5 marks)

Question THREE

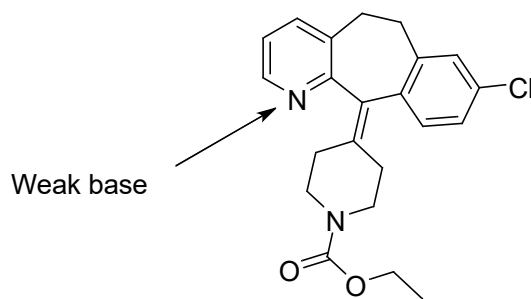
(a) Loratadine is an orally available drug, a weak base, with a pK_a of 5. Given the structure below;

(i) Calculate the % ionization of loratadine in the stomach ($\text{pH} = 2$) and intestine ($\text{pH} = 8$).

(8 marks)

(ii) Based on the calculation in (i) above, from where do you expect loratadine to be absorbed?

(2 marks)



Loratadine: $pK_a = 5$

- (b) Provide TWO advantages and TWO disadvantages of the Kjeldahl method for determination of total nitrogen in organic substances. (6 marks)
- (c) Highlight any TWO factors that affect centrifugal force in a solution subjected to centrifugation. (4 marks)

Question FOUR

- (a) Highlight the importance of the pK_a value and partition coefficient on drug administration. (4 marks)
- (b) (i) Write the solubility equilibrium equation and solubility product of $BaSO_4$ (2 marks)
 (ii) Explain the application of the common ion effect on gravimetric analysis of $BaSO_4$. (8 marks)
- (c) Highlight the principle of immunoassay. (6 marks)

Question FIVE

- (a) Outline the determination of alcohol in galenical preparations by distillation. (8 marks)
- (b) Explain the application of diazotisation titrations in the analysis of drugs. (9 marks)
- (c) 5.8 ml of a Karl-Fischer reagent was required to titrate 0.2 g prednisolone sodium phosphate sample to the amperometric end-point. Calculate the percentage of water (w/w) in the prednisolone sodium phosphate sample. Given the minimum water equivalent is 3.5 mg of water per ml of Karl Fischer reagent. (3 marks)