



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: BCE 2234
COURSE	: ANALYTICAL CHEMISTRY
SEMESTER/SESSION	: 1- 2024/ 2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE

ANALYTICAL CHEMISTRY (BCE 2234)

QUESTION 1

- (a) Explain a millimole and millimolar mass. (4 marks)
- (b) Point out two **(2)** examples of units derived from the fundamental base on SI units. (4 marks)
- (c) Calculate the number of moles of the indicated species in: (15 marks)
- (i) 4.96 g of B_2O_3
 - (ii) 333 mg of $Na_2B_4O_7 \cdot 10H_2O$
 - (iii) 8.75 g of Mn_3O_4
 - (iv) 167.2 mg of CaC_2O_4
 - (v) 40.0 g of $NaCl$

QUESTION 2

- (a) Determine types of systematic errors. (5 marks)
- (b) Select an error at least two **(2)** ways in which a systematic error might occur while using a pipet to transfer a known volume of liquid. (6 marks)
- (c) Explain the steps commonly employed in an analytical procedure. (7 marks)

QUESTION 3

- (a) Calculate the mean and median of each of the following sets data. (18 marks)
Determine the deviation from the mean for each data point within the sets and find the mean deviation for each set:
- (i) 0.0110 0.0104 0.0105
- (ii) 188 190 194 187
- (iii) 39.83 39.61 39.25 39.68
- (b) Calculate the pH for the titration of 50.0 mL of 0.1M HCl with 0.1 M NaOH.
- (i) 0 mL (4 marks)
- (ii) 10.0 mL (4 marks)
- (ii) 90.0 mL (4 marks)
- (iii) 100.0 mL (4 marks)
- (iv) 110.0 mL (4 marks)
- (c) By referring to (b), sketch the titration curve that obtained from the titration. (5 marks)

ANALYTICAL CHEMISTRY (BCE 2234)

QUESTION 4

(a) Explain the following term:

- (i) Stationary phase (2 marks)
- (ii) Mobile phase (2 marks)
- (iii) Retention time, t_R (2 marks)

(b) Determine the detector in gas chromatography. (6 marks)

(c) In a Gas Chromatography analysis with capillary column (25 m length x 0.32 mm ID; 0.25 μm thickness), the data are recorded as below:

Solution or mixture	Retention time, t_R	Relative peak area	Peak base width
Methanol (t_0)	18.0 s	-	-
n-hexane	1.98 min	16.4	0.19 min
Toluene	2.224 min	45.2	0.23
n-dodecane	7.93 min	30.2	0.79

According to data, determine:

- (i) The capacity factor, k' , for *n-hexane* and *toluene* (4 marks)
- (ii) Number of theoretical plate, N , (by using *n-hexane's* peak) (2 marks)
- (iii) The height of capillary plate (mm/plate) (2 marks)
- (iv) Resolution, R_s , for *n-hexane* and *toluene's* peaks (2 marks)

-----End of question-----

[illegible]

