

1/6/23



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**FIRST YEAR SECOND SEMESTER
MAIN EXAMINATIONS**

**FOR THE DEGREE OF BED SCIENCE, BSC CHEMISTRY AND BSC
BIOLOGY,**

COURSE CODE: SCH 122

COURSE TITLE: INTRODUCTION TO ANALYTICAL CHEMISTRY

DATE: 19/04/2023

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES:

- Answer **Question ONE (Compulsory)** and any other **TWO (2)** questions
- Indicate answered questions on the front cover of your answer booklet
- Start each question on a new page and make sure the question's number is written on each page

TIME: 2 Hours

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1 [30 Marks]

- i. Define analytical chemistry [2 Marks]
- ii. Explain the difference between analytical chemistry and chemical analysis [4 Marks]
- iii. The temperatures of two bodies measured by a thermometer are
 $t_1 = (20 \pm 0.5)^\circ\text{C}$ and $t_2 = (50 \pm 0.5)^\circ\text{C}$.
Calculate the temperature difference and the error therein. [5 Marks]
- iv. Define back titration [2 Marks]
- v. Explain the importance of a titration curve [2 Marks]
- vi. Define inflection point and explain how it relates to the equivalence point [4 Marks]
- vii. Highlight the equations employed to determine the equation for parabolic functions [6 Marks]
- viii. Discuss the different types of error observed in analytical measurements [2 Marks]
- ix. Identify 3 fields where analytical chemistry can be applied [3 Marks]

Question 2 [20 Marks]

A physical quantity x is given by $x = \frac{a^2 b^2}{c \sqrt{d}}$. If the percentage errors of measurement in a , b , c and d are 4%, 2%, 3% and 1% respectively, calculate the percentage error in the calculation of x .

Question 3 [20 Marks]

- i. Discuss the advantages of curve fitting over interpolation [2 Marks]
- ii. The following data was gathered during an experimental analysis. Determine the linear equation that best describes the data [8 Marks]

x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64

- iii. Fit a second degree polynomial to the following data and plot the data on the provided graph paper showing the data points and fitted curve [10 Marks]

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Question 4 [20 Marks]

A mixture containing only KCl and NaBr is analyzed by the Mohr method. A 0.3172-g sample is dissolved in 50 mL of water and titrated to the Ag_2CrO_4 end point, requiring 36.85 mL of 0.1120 M AgNO_3 . A blank titration requires 0.71 mL of titrant to reach the same end point.

Determine the %w/w KCl in the sample.

Question 5 [20 Marks]

- i. Hydrogen and chlorine react according to the equation $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$ 3 mole of H_2 and 2 mole of Cl_2 are placed in a vessel and sealed. Determine the composition of the vessel when the reaction is complete [6 Marks]
- ii. Your class has been tasked with determining the concentration of salts in borehole water. Highlight
 - a. The steps you will take to obtain the results [5 Marks]
 - b. the possible sources of error in the presented results and indicate a mitigation measure for each error. [9 Marks]

PERIODIC TABLE OF THE ELEMENTS

1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
				VB	VIB	VIIIB	VIIIIB			IB	IIB							
H 1.008																	He 4.00	
3 Li 6.94	4 Be 9.01												5 B 10.81	6 C 12.01	7 N 14.1	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29	
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 201.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226.02	89 *Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)								