



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER
MAIN EXAMINATIONS**

FOR THE DEGREE OF B.SC (CHEMISTRY)

COURSE CODE: SCH 221

COURSE TITLE: ANALYTICAL CHEMISTRY I

DATE: 4/10/2021

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES:

Answer **question ONE** and **any TWO** of the remaining

KIBABII observes ZERO tolerance to examination cheating

Question 1 [30 Marks]

- i. Explain how analytical chemistry differs from the other major branches of chemistry [3 Marks]
- ii. List three types of errors in analytical measurements [3 Marks]
- iii. Citing a relevant example, describe propagation of errors [4 Marks]
- iv. Discuss the importance of method validation in analytical chemistry [4 Marks]
- v. Highlight two reasons why it is important to define the analytical problem [4 Marks]
- vi. Define structural analysis as applied in analytical chemistry [2 Marks]
- vii. Explain why it is important to determine the precision of analytical measurements [4 Marks]
- viii. Highlight the importance of proper sample handling [3 Marks]
- ix. Define confidence interval [3 Marks]

Question 2 [20 Marks]

Your firm has been tasked with monitoring the soil around the Kibabii University dumpsite

- a. List the steps you will follow in carrying out the exercise [10 Marks]
- b. Describe the sampling strategy you will employ to obtain accurate results [4 Marks]
- c. What strategies will you employ to ensure you obtain reproducible results [6 Marks]

Question 3 [20 Marks]

- i. Describe each of the following types of analysis [8 Marks]
 - a. Qualitative analysis
 - b. Quantitative analysis
 - c. Characterization analysis
 - d. Fundamental analysis
- ii. Explain some of the considerations to be applied during sample handling and storage [3 Marks]
- iii. Explain three sources of error on the analytical measurements and strategies to minimize them [9 Marks]

Question 4 [20 Marks]

When performing a routine analysis, a researcher recorded the following data for Cr standard with a concentration of 90 ppm

Run	Conc. (ppm)
1	88
2	72
3	90
4	93
5	86

Determine

- i. The minimum and maximum absolute and relative errors [8 Marks]
- ii. Whether the lowest and highest readings can be rejected as outliers at either 90 or 95 confidence levels [12 Marks]

Question 5 [20 Marks]

The content of calcium carbonate, an insoluble basic analyte in limestone, is analyzed by back titration. 0.2160 g of the sample is powdered and dissolved in 50.0 mL of 0.103M HCl solution. The reaction mixture is heated and stirred to ensure a rapid and complete reaction between the CaCO_3 and the HCl. After cooling, the remaining HCl is back titrated with 21.0 mL of 0.0978 M NaOH.

Determine

- i. The mass of calcium carbonate in the limestone sample [14 Marks]
- ii. The The % carbon content of the sample [6 Marks]

Table of Critical Values of Q

N	Q _{crit} (CL:90%)	Q _{crit} (CL:95%)	Q _{crit} (CL:99%)
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568

