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# **KIBABII UNIVERSITY**

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER  
MAIN EXAMINATIONS**

**FOR THE DEGREE OF B.Sc (CHEMISTRY)**

**COURSE CODE: SCH 323**

**COURSE TITLE: INSTRUMENTAL ANALYTICAL CHEMISTRY AND  
QUALITY CONTROL**

**DATE: 1/10/2021**

**TIME: 2:00-4:00PM**

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**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 the difference between analytical chemistry and chemical analysis [4 Marks]
- ii. With examples differentiate between qualitative and quantitative measurements [4 Marks]
- iii. Highlight the importance of analytical quality control [4 Marks]
- iv. Describe the unique perspectives brought about by hyphenated techniques [4 Marks]
- v. Describe the properties measured in each of the following techniques [4 Marks]
  - a. Electrochemical analysis
  - b. Nuclear Magnetic Resonance
- vi. Highlight the differences between classical and instrumental analysis [3 Marks]
- vii. Describe the types of liquid chromatography [3 Marks]
- viii. Highlight the sources of error in analytical analyses [4 Marks]

### Question 2 [20 Marks]

- i. Explain the importance of chromatography as an analytical technique [2 Marks]
- ii. Describe a typical TLC experiment [10 Marks]
- iii. List 4 chromatographic techniques and their unique characteristics [8 Marks]

### Question 3 [20 Marks]

- i. Describe method validation [4 Marks]
- ii. Identify the type of analysis (qualitative, quantitative, characterization or fundamental) required for each of the following problems and explain your answer. [16 Marks]

Note that some problems may require multiple analysis

  - a. A hazardous waste disposal site leaking contaminants into ground water
  - b. Detection of a forgery in an art museum
  - c. Preparation of an indicator for an acid-base titration
  - d. Evaluation of the amount of carbon dioxide emitted by motor vehicles

### Question 4 [20 Marks]

- i. Draw a schematic diagram of a UV-Vis spectrometer and explain the principle of analysis [10 Marks]
- ii. Describe the experimental procedure for the determination of the concentration of methylene blue dye using UV-Vis [10 Marks]

### Question 5 [20 Marks]

A pharmaceutical company is interested in extracting biologically active compounds from the roots of a locally used medicinal plant.

- i. Identify and describe the problem [6 Marks]
- ii. Describe the important factors to be considered when designing the experiment [10 marks]
- iii. Identify 2 instrumental techniques to be applied in the analysis [4 Marks]
- iv. Identify 2 instrumental techniques to be applied in the analysis [4 Marks]