



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**  
**UNIVERSITY EXAMINATION**  
**BIOLOGICAL SCIENCES**  
**4th YEAR 2<sup>ND</sup> SEMESTER 2019/2020 ACADEMIC YEAR**  
**REGULAR**

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**COURSE CODE:**

**SCH: 410**

**COURSE TITLE: Techniques in Organic Chemistry Laboratory**

**EXAM VENUE:**

**STREAM: (BSc BIO)**

**DATE:**

**EXAM SESSION:**

**TIME:**

**2.00 HOURS**

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**Instructions:**

- 1. Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

## SECTION A

### QUESTION ONE (Compulsory) (30 marks)

- a) Name two levels by which substances interact with light (2 marks)
- b) How can individual components in a sample be identified using the AES technique? (4 marks)
- c) Briefly describe what you understand by the following terms as applied in chromatography:
- i. Stationary phase,
  - ii. mobile phase,
  - iii. analyte,
  - iv. flow rate (5 marks)
- d) Differentiate between Size-Exclusion and Ion-Exchange chromatography in relation to: their applications, stationary phases and their separating principles. (6 marks)
- e) Explain the importance and give three methods of calibration. (8 marks)
- f) Name two methods of separation (chromatography) under high performance chromatography and explain their differences and their advantages. (6 marks)
- g) Define the term hyphenated techniques in the analysis of chemical samples and name two methods and give their advantages over the traditional method of analysis (4 marks)

### QUESTION TWO (20 marks)

- a) Name the three broad categories into which chemical analysis can be subdivided and a brief description of their applications. (6 marks)
- b) Under the three broad categories there are techniques that are applied for analysis depending on different interactions of the analyte. Name four of them (4 marks)
- c) Name and give brief description of three techniques applied in the microscopic analysis and state their advantages. (5 marks)
- d) Name four methods of calibration and state why it is an important process in the analysis of samples. (5 marks)

### QUESTION THREE (20 marks)

- a) With an aid of a simple diagram explain “Electro-magnetic Spectrum”. Give a short comparison between Ultra Violet (UV), Visible (Vis) and Infra Red (IR) ranges for energy, frequency and wavelength (8 marks)
- b) Name six types of detectors used in Gas Chromatography (6 marks)
- c) Both Ion-Exchange and Size-Exclusion chromatography are analytical methods in which substances interact with light at molecular level. State their differences in relation to: their applications and their separating principles. (6 marks)

### QUESTION FOUR (20 marks)

- a) Define the following terms as applied in instrumental methods of analysis (8 marks)
  - i. Detectors
  - ii. Transducers
  - iii. Sensors
  - iv. Chemical sensor
- b) Name four Thermal analytical techniques and give a brief explanation of what they are used to measure. (8 marks)
- c) Define primary X-rays and explain how X-rays are generated. (4 marks)

**QUESTION FIVE (20 marks)**

- a) The principle of operation of both Microwave and Infrared spectroscopy are almost the same with some small variations. Give a brief explanation of they operate and explain their difference; showing when/where Microwave spectrometry is most suitable. (8 marks)
- b) Briefly state the uses of the following parts found in various analytical instruments: Detectors, Transducers and Sensors (6 marks)
- c) List three techniques applied under analysis using X-rays. (6 marks)