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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL & PHYSICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION SCIENCE**

**4th YEAR 2ND SEMESTER 2016/2017 ACADEMIC YEAR**

**REGULAR**

**COURSE CODE: SCH 410**

**COURSE TITLE: TECHNIQUES IN ORGANIC CHEMISTRY LABORATORY**

**EXAM VENUE: AUDITORIUM STREAM: BSc (education)**

**DATE: 14/12/16 EXAM SESSION: 2.00 – 4.00PM**

**TIME: 2 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.**

**QUESTION 1 (30 MARKS)**

1. What do you understand by the term “Electro-magnetic Spectrum” and give a short comparison between Ultra Violet UV), Visible (Vis) and Infra Red (IR) ranges for energy, frequency and wavelength (4 marks)
2. Highlight the differences between atomic emission and plasma emission spectroscopy. (4 marks)
3. Name four techniques by which substances interact with light at molecular level (4 marks)
4. Name four categories into which HPLC technique can be divided. (4 marks)
5. Name three techniques applied in the Microscopic analysis. (6marks)
6. Define the term hyphenated techniques as applied in GC and name two of them (4 marks)
7. Name some of the components in an NMR instrumentation, applications and the disadvantages of this technique (4 marks)

**QUESTION 2 (20 MARKS)**

1. The interaction of light (electro-magnetic radiation) with substances and subsequent energy transfer ends with three main processes namely: absorption, fluorescence and emission. Briefly give a description of these processes. (6 marks)
2. Draw an outline of the instrumentation of an Atomic Absorption Spectrometer showing the components present in the instrument. (8 marks)
3. Name six types of detectors used in Gas Chromatography (6 marks)

**QUESTION 3 (20 MARKS)**

1. Name two techniques applied in gas chromatography and explain their differences. (4 marks)
2. Name four Thermal analytical techniques and give a brief explanation of what they are used to measure. (8 marks)
3. Define primary X-rays and explain how X-rays are generated. (4 marks)
4. What are the differences and similarities between the earlier version of IR and the current FT-IR? (4 marks)

**QUESTION 4 (20 MARKS)**

1. List three techniques applied under analysis using X-rays. (6 marks)
2. With a diagram explain how column chromatography can be used for preparative purposes of samples for further chemical analysis and identification (6 marks)
3. What is the main principle and application and disadvantages of Ultraviolet-Visible techniques in spectroscopy (8 marks)

**QUESTION 5 (20 MARKS)**

1. Differentiate between Inductively coupled plasma and Atomic Emission spectroscopy techniques citing the main advantage of the former. (5 marks)
2. 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, stationary phases and their separating principles. (6 marks)
3. The principle of operation of both Microwave and Infrared spectroscopy are almost the same with some small variations. Give a brief explanation of this difference and when Microwave spectrometry is most suitable. (5 marks)
4. Size Exclusion Chromatography can be classified into two categories based on the nature of the columns: name them and explain their differences. (4 marks)