



**JARAMOGI OGINGA ODONGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES**  
**UNIVERSITY EXAMINATION FOR DIPLOMA IN SCIENCE LABORATORY**  
**TECHNOLOGY**  
**1<sup>st</sup> YEAR 2<sup>nd</sup> SEMESTER 2023/2024 ACADEMIC YEAR**  
**MAIN REGULAR**

---

**COURSE CODE: SLD 1104**

**COURSE TITLE: Laboratory Instrumentation**

**EXAM VENUE:**

**STREAM: Diploma Science**

**DATE:**

**TIME:**

**EXAM SESSION:**

---

**INSTRUCTIONS:**

- 1. Answer question 1 (Compulsory) in section A and ANY other 5 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.**
- 4. Some important information, formulas and the periodic table are found on the last page of this question paper**

## SECTION A: Compulsory

### Question 1

- a) After every laboratory session, students are required to write a report describing what happened during the training. Briefly discuss the type of information required under the following subtopics.
- i. Aim or objective (2 marks)
  - ii. Theory or introduction (2 marks)
  - iii. Equipment; materials and chemicals (2 marks)
  - iv. Methodology (2 marks)
  - v. Results (2 marks)
  - vi. Discussion (2 marks)
  - vii. Errors and their sources (2 marks)
  - viii. Data sheet (2 marks)
- b) During laboratory practical sessions, it is important to document all process in a laboratory note book, which is a property of the laboratory. Describe in brief some of the impotencies of a laboratory notebook. (2 marks)
- c) Cleanliness in the laboratory is an important maintenance aspect required from a laboratory technician. Describe importance and procedure of the following processes during the cleaning:
- i. Sorting of dirty glassware/materials (2 marks)
  - ii. Cleaning solvents (acids, bases, aqua ragia, organic etc) (3 marks)
  - iii. Dusting (3 marks)
  - iv. Greasing (3 marks)
  - v. Drying (3 marks)
  - vi. Packaging and storage (3 marks)

- vii. Disposal of used chemicals (2 marks)
- d) Briefly describe the following sections on most laboratory Instruments
  - i. Detectors (2 marks)
  - ii. Transducers (2 marks)
  - iii. Resistivity (2 marks)
  - iv. Sensors (2 marks)

**Section B. Answer any SIX questions**

**Question 2**

- e) Differentiate the following instrument calibration methods:
  - i. Comparison with Standards (2 marks)
  - ii. External-Standard Calibration (2 marks)
  - iii. Standard-Addition Methods (2 marks)
  - iv. The Internal-Standard Method (2 marks)
  - v. Standard curves (2 marks)

**Question 3**

Provide a brief explanation on how the following machines work:

- i. UV-Vis (2 marks)
- ii. Nuclear magnetic resonance spectroscopy NMR (2 marks)
- iii. Atomic Absorption Spectrometer (AAS) (2 marks)
- iv. Mass Spectrometer (MS) (2 marks)
- v. Analytical Balance (2 marks)

**Question 4**

- a) Discuss preliminary troubleshooting procedures for the following machines in chemical analysis.
  - i. Beam balance (2 marks)

- ii. Analytical balance (2 marks)
- iii. UV-Vis machine (2 marks)
- iv. Thermometer (2 marks)
- v. pH meter (2 marks)

### **Question 5**

Discuss briefly how the following chromatographic techniques are used in qualitative and quantitative sample analysis (use of diagrams in illustrations is allowed)

- i. Thin Layer chromatography (TLC) (3 marks)
- ii. Preparative glass chromatography (3 marks)
- iii. Column Chromatography (4 marks)

### **Question 6**

Describe in brief both maintenance and how the following laboratory equipment work.

- i. High-performance liquid chromatography (5 marks)
- ii. Gas Chromatography (5 marks)

### **Question 7**

Describe in brief the types of detectors used in the following instruments:

- i. Mass Spectrometer (3 marks)
- ii. High-performance liquid chromatography (3 marks)
- iii. Gas Chromatography (4 marks)

### **Question 8**

Discuss in brief how one can achieve production of the following glass apparatus

- i. Centre bulbs (2 marks)

- ii. End bulbs (2 marks)
- iii. U – tubes (2 marks)
- iv. T – piece (2 marks)
- v. Y – tubes (2 marks)

**Question 9**

Provide a brief description of the following as used in laboratory set up:

- i. Standard operating procedures (SOPs) (2 marks)
- ii. Stock solution (2 marks)
- iii. Labelling of reagents (2 marks)
- iv. Chemical security and safety (4 marks)

**Question 10**

- a) Provide a brief explanation on the following:
  - i. Glass blowing safety measures (5 marks)
  - ii. Glass blowing equipment (5 marks)