



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATION FOR DIPLOMA IN SCIENCE LABORATORY
TECHNOLOGY
1st YEAR 2nd 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 regia, 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)