NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

# FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

## SCHOOL OF HEALTH SCIENCES

## DEPARTMENT OF CLINICAL HEALTH SCIENCES

| | |
|---|---|
| **QUALIFICATION: BACHELOR OF MEDICAL LABORATORY SCIENCES** | |
| **QUALIFICATION CODE:** 08BMLS | **LEVEL:** 6 |
| **COURSE CODE:** CLC611S | **COURSE NAME:** CLINICAL CHEMISTRY 2A |
| **SESSION:** JUNE 23 | **PAPER:** THEORY |
| **DURATION:** 3 HOURS | **MARKS:** 105 |

| **FIRST OPPORTUNITY EXAMINATION QUESTION PAPER** | |
|---|---|
| **EXAMINER(S)** | **MS CARA MIA DUNAISKI** |
| **MODERATOR:** | **DR MUNYARADZI MUKESI** |

| **INSTRUCTIONS** |
|---|
| 1. Answer ALL the questions.<br>2. Write clearly and neatly.<br>3. Number the answers clearly. |

## PERMISSIBLE MATERIALS

1. CALCULATOR

**THIS QUESTION PAPER CONSISTS OF 5 PAGES** (Including this front page)

## SECTION A [20]

### QUESTION 1 [10]

Analyze the statements below and provide the best possible answer. Only write the question number and corresponding answer.

| | | |
|---|---|---|
| 1.1 | Name the basic SI unit for luminous intensity. | (1) |
| 1.2 | Explain the function of buffer solutions. | (1) |
| 1.3 | Identify the method for obtaining cerebrospinal fluid for clinical chemistry analysis. | (1) |
| 1.4 | Give the formula which describes the measure of spread of numbers in a set of data from its mean value. | (1) |
| 1.5 | A patient serum result for Total protein ran outside the linear range of the instrument. The serum was diluted 1 in 10 and re-run. The reanalysed result is 0.215mmol/L. What is the final patient result? | (1) |
| 1.6 | What name is given to a piece of laboratory equipment that utilizes the most accurate means to measure controls, standards and patient samples in volumes ≤1mL? | (1) |
| 1.7 | Body temperature is 98.6°F. What is the temperature in Celsius? | (1) |
| 1.8 | List THREE chemical analytes most affected by IV contamination. | (3) |

### QUESTION 2 [10]

Outline the principles of the following analytical techniques:

| | | |
|---|---|---|
| 2.1 | Gas Chromatography/Mass Spectrometry (GC/MS) | (2) |
| 2.2 | Enzyme-Multiplied Immunoassay Technique (EMIT) | (2) |
| 2.3 | Two-Dimensional Electrophoresis | (2) |
| 2.4 | Ion-exchange chromatography | (2) |
| 2.5 | Atomic emission spectrophotometry | (2) |

## SECTION B [35]

### QUESTION 3 [10]

MW: Na -23; Cl – 35.5; C – 12; H – 1; O - 16

Showing all necessary working and formula explain how the following solutions are made:

3.1 A 2.15L solution of 0.9% NaCl (w/v) (2)

3.2 1200mL of a 1.2M solution of NaOH (2)

3.3 0.05M HCL solution from 250 mL of a 10M HCl (2)

3.4 The molarity of a 800mL solution of 25g NaOH (2)

3.5 115mL of a 0.6M solution of NaOH from 5L of a 1.3M stock solution (2)

### QUESTION 4 [10]

The following are results of an evaluation for an Infectious Mononucleosis IgG Point of Care Testing (POCT) device which is new to Namibia. Review the results (Table 1) and calculate the following:

4.1 Positive predictive value (2)

4.2 Negative predictive value (2)

4.3 Diagnostic specificity (2)

4.4 Diagnostic sensitivity (2)

4.5 Efficiency (2)

**Table 1.** Diagnostic efficacy test results

| Group | Negative result | Positive result |
|---|---|---|
| People without infectious mononucleosis | 920 | 15 |
| infectious mononucleosis | 5 | 10 |

## QUESTION 5 [15]

Presented below are the results (Figure 1) of daily quality control for serum cholesterol measurement.

The control has a mean of 200 mg/dL and standard deviation of 4.0 mg/dL.

| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc. (mg/dL) | 200 | 205 | 195 | 202 | 186 | 207 | 194 | 209 | 200 | 196 | 190 | 204 | 196 | 207 | 200 | 205 | 209 | 197 | 196 | 198 | 197 | 195 | 198 | 199 | 191 | 197 | 190 | 202 |

**Figure 1.** Daily quality control for serum cholesterol measurement

5.1 Plot a Levey-Jennings chart of the data above (Graph paper is attached at the end of the question paper). (5)

5.2 Identify and interpret Westgard rules violated in this graph. (10)

# SECTION C [50]

## QUESTION 6 [10]

Discuss the technique of electrophoresis, measurements and quantification of protein bands and its application in the medical laboratory.

## QUESTION 7 [10]

Briefly discuss the areas in the measurement systems of spectrophotometers where errors may arise (Denote the measurement and give a description).

## QUESTION 8 [10]

The laboratory manager has asked you to introduce a new method in the laboratory. Propose the managerial information you would consider in the method selection process.

## QUESTION 9 [10]

Nephelometry is a tool used in immunology laboratories for testing levels of proteins that are important to effective immune responses. Describe how antigen-antibody complexes, are measured in a blood sample using nephelometry.

**QUESTION 10** **[10]**

A safety data sheet, material safety data sheet, or product safety data sheet is an important component of product stewardship, occupational safety and health, and spill-handling procedures. Outline the information which should appear MSDS (material safety data sheet) and justify why the MSDS is crucial in the handling of chemicals. (10)

## END OF EXAMINATION