



UNIVERSITY EXAMINATIONS

SECOND SEMESTER 2023/2024 ACADEMIC YEAR

**SECOND YEAR EXAMINATION FOR THE DEGREE OF
BACHELOR OF BIOMEDICAL SCIENCE AND
TECHNOLOGY (BMED)**

BMED 222: LABORATORY TECHNIQUES 1

STREAM: R

TIME: 2 HRS

DAY: WEDNESDAY [8.30A.M – 10.30A.M] DATE: 17/04/2024

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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Instruction

- i. Answer **ALL** questions in Section **A** and **ANY TWO** question in Section **B**
- ii. Illustrate your answers with diagrams where applicable

SECTION A: 40 MARKS**QUESTION ONE**

Distinguish between the following terms

- a) Mobile phase and stationary phase in chromatography (2 Marks)
- b) Fluorimetry and manometry (2 Marks)
- c) Acids and bases (2 Marks)

QUESTION TWO

Define Standard Operation Procedures and their significance in the laboratory (4mks)

QUESTION THREE

- a) Derive the Henderson-Hasselbalch equation using hypothetical weak acid $HA_{(aq)}$ (4 Marks)
- b) Outline the uses of this equation (2 Marks)
- c) Explain the properties of a good buffer with good buffering capacity (2 Marks)
- d) Write short notes on amino acids as good biological buffers (2 Marks)

QUESTION FOUR

- a) Explain the operation principles of the following techniques
 - i. Molecular exclusion chromatography (3 Marks)
 - ii. Affinity chromatography (3 Marks)
- b) Outline the application of High-Performance Liquid Chromatography (4 Marks)

QUESTION FIVE

A specific buffer solution contains an equal concentration of X^- and HX . The K_b for X^- is 10^{-10} . What is the pH of the buffer solution? (5 Marks)

QUESTION SIX

Describe spectrophotometry technique (5 Marks)

SECTION B: 30 MARKS

QUESTION SEVEN

- a) Briefly describe the principle behind gas chromatography and list the types of species that can be separated using this technique **(10 Marks)**
- b) Explain why gas-liquid chromatography is extensively used compared to gas-solid chromatography **(5 Marks)**

QUESTION EIGHT

- a) Citing examples, discuss the application of radioisotopes in biomedical research **(10 Marks)**
- b) What general principles should be applied in the selection of patients and healthy volunteers in biomedical research? **(5 Marks)**

QUESTION NINE

- a) Identify the most powerful buffer systems in animal body **(3 Marks)**
- b) Discuss ways in which respiratory system affects blood pH **(10 Marks)**
- c) Name any two disorders that may occur when body buffer system do not work **(2 Marks)**