

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
SCIENCE IN BIOMEDICAL SCIENCE AND TECHNOLOGY**

BMET 350: BIOMEDICAL TECHNIQUES

STREAMS: BSC. BMET

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 23/04/2025

11.30 A.M. – 1.30 P.M.

INSTRUCTIONS

- **Answer Question ONE and Any other TWO Questions**

Question One (30 marks)

- Define radio-ligand assays and explain how they are utilized in the identification and quantitative measurement of biological constituents. (5 marks)
- Explain the key principles behind the operation of an ultracentrifuge. (5 marks)
- Describe the advantages and disadvantages of the different types of rotors used in centrifuges. (5 marks)
- Briefly describe the chemical structure of Agarose and explain how the gel is prepared. (5marks)
- Describe the Coomassie Brilliant Blue staining procedure used for visualizing proteins after separation by gel electrophoresis. (5 marks)
- Describe the application of spectrophotometry in determining enzyme activity and biomolecule concentration. (5 marks)

Question Two (20 marks)

- a. Consider being tasked with developing an ELISA to detect a novel viral antigen in a patient's serum samples. Detail the steps you would take, from designing the assay to interpreting the results. (10 marks)
- b. Describe the common applications of ELISA in medical diagnostics. (10 marks)

Question Three (20marks)

- a. Describe the principle, applications and the type of samples that can be analyzed using Isoelectric focusing. (10 marks)
- a. Describe N-terminal analysis in protein characterization and how it contributes to elucidating primary structure and understanding protein function. (10 marks)

Question Four (20 marks)

- a. You are tasked with separating a specific cellular organelle using differential centrifugation. The protocol you are following requires a relative centrifugal force (RCF) of 15,000 x g. The centrifuge you will be using has a rotor with a maximum radius of 10 cm.
 - i. Calculate the required revolutions per minute (RPM) to achieve the desired RCF. Show your calculations, including the formula used and the units. (5 marks)
 - ii. Explain why it is important to use RCF instead of RPM when comparing centrifugation protocols across different centrifuges. (5 marks)
 - b. You are given a mixed sample containing genomic DNA, RNA, and proteins. Design and describe in detail a protocol to separate and purify each of these components. (10 marks)
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