NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

PST 6838 ADVANCED BIOLOGICAL SCIENCE TECHNIQUES

Main Examination Paper **First Semester**

November 2024

This Examination Paper consists of 2 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: None

Internal Examiner: Mr W E Ndaba

External Examiner: Dr P Manyanga

INSTRUCTIONS

1. Answer ANY four questions
2. Each question carries **25 marks.**
3. Sub-division marks are shown in brackets.
4. Begin each question on a new page.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5	25
TOTAL	100

1. Describe the principle and applications of each of the following techniques:
    a. centrifugation, and [13]
    b. chromatography. [12]
2.
    a. Outline Beer's Law and its assumptions. [10]
    b. The concentration of a yeast tRNA aqueous solution is 10 M. The absorbance of this solution is 0.209 when this solution is placed in a 1.00 cm cuvette at 258nm.
        i. Calculate the absorptivity of the yeast tRNA solution. [3]
        ii. Calculate the absorbance of a 5M yeast tRNA solution? [3]
        iii. What will be the absorbance if the path length of the original tRNA solution is increased to 5.00 cm? [3]
        iv. Calculate the concentration of a solution with an absorbance of 0.351. [3]
    c. An absorbance at 600 nm (A_{600}) value of 0.95 is equivalent to a bacterial concentration of 8.0×10^8 cells/ml. What is the bacterial cell concentration if the A_{600} reading for a bacterial suspension is 0.218? [3]
3. Discuss factors influencing mobility of particles in electrophoresis. [25]
4.
    a. Explain how you would prepare 200ml of 0.8% agarose gel. [15]
    b. There is 60g of NaOH. (MM of NaOH = 40g/Mol)
        i. How many moles is 60g NaOH? [2]
    c. If 60g of NaOH is dissolved in 500ml of double distilled water,
        i. Calculate the % concentration of the solution. [2]
        ii. Calculate the molarity of the solution. [2]
        iii. If the solution in 4c. is diluted to 750ml, calculate its new molarity. [2]
        iv. If the solution in 4c. is left in the sun to evaporate to 400ml, what will be the new concentration of NaOH in it? [2]
5.
    a. Discuss how the different types of ELISA differ in terms of their protocols and applications? [12]
    b. What are the components of a PCR reaction, and what roles do they play? [13]

End of Examination