



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE IN APPLIED BIOLOGY AND
BIOCHEMISTRY

GENERAL MICROBIOLOGY II (SBB2105)

Special Examination Paper

AUGUST 2024

This examination paper consists of 3 pages

Time Allowed : 3 hours
Total Marks : 100
Special Requirements : Scientific calculator
Examiner's Name : DR N. NLEYA

INSTRUCTIONS

1. Answer **Four (4)** questions. Each question carries 25 marks.
2. Where a question contains subdivisions, the mark value for each subdivision is given in brackets.
3. Illustrate your answer where appropriate with large, clearly labelled diagrams.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
6.	25
TOTAL	100

1. (a) Discuss the following microbial interactions:
 - (i) Commensalism. (3 marks)
 - (ii) Mutualism. (3 marks)
 - (iii) Parasitism. (3 marks)

- (b) Describe how the following environmental factors affect microbial growth:
 - (i) Temperature. (5 marks)
 - (ii) Water availability. (5 marks)

- (c) Explain how aerobic microorganisms overcome oxygen toxicity. (6 marks)

2. (a) A bacterial culture contains 10^5 cell and after 5 hours the population is 10^8 cells.
 - (i) Generation time. (3 marks)
 - (ii) Growth rate. (3 marks)
 - (iii) Number of generations. (3 marks)

- (b) With the aid of diagrams, describe the mechanism of nutrient transport in microbial cells:
 - (i) Passive diffusion. (4 marks)
 - (ii) Facilitated diffusion. (4 marks)
 - (iii) Active transport. (4 marks)
 - (iv) Group translocation. (4 marks)

3. (a) Describe the different categories of microorganisms based on their growth temperature requirements. (15 marks)

- (b) Describe how you would estimate the number of viable cells in a food sample. (10 marks)

4. (a) Discuss the use of physical agents in the control of microorganisms. (15 marks)

- (b) Describe the factors that contribute to antimicrobial resistance. (10 marks)

5. (a) Using examples, describe the stages in the formation of bacterial biofilm. (10 marks)

- (b) Describe the *lac* operon and briefly describe how it operates. (10 marks)

- (c) Explain how a pure culture can be obtained from a mixed bacterial culture. (5 marks)
6. (a) Describe biological significance of plasmids. (10 marks)
- (b) Compare and contrast the cell wall structure of Gram-positive and Gram-negative bacteria. (15 marks)