

UNIVERSITY OF FORT HARE

**Microbial Physiology and Metabolism
MIC 311**

DEGRE EXAMINATIONS

JUNE

2023

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Time: 3 Hours

Subject: Microbial Physiology and Metabolism

Marks: 100

This paper consists of 2 pages including the cover page

Internal Examiners

Mr N. Ntozonke

External Examiners

Prof E Green

INSTRUCTIONS

Answer all questions.

Question 1**[25 marks]**

- 1.1. Briefly describe the historical account that led to the discovery of the cell. Emphasize on the works of Anton von Leewenhoek, Robert Hooke, Robert Brown, Matthias Schleiden, Theodor Schwann and Rudolf Virchow.
[10 marks]
- 1.2. With the aid of a well-labelled diagram, discuss the differences between the Gram positive and Gram-negative bacteria cell wall.
[10 marks]
- 1.3. The action of superoxide dismutase, catalase and peroxidase are essential for the survival of some living cells. With a well-labelled diagram, show how these enzymes keep aerobic cells alive.
[5 marks]

Question 2**[25 marks]**

- 2.1. Compare the characteristics of each of the growth phases (lag, log, stationary, and death) for batch culture and environmental systems.
[15 Marks]
- 2.2. The bacterial cultures for industrial fermentation process needs to be maintained in an exponential phase of growth over a long time while the industry remains operational. Discuss how this can be achieved.
[10 marks].

Question 3**[25 Marks]**

- 3.1. Describe a simple experiment to show that Bacillus cereus or Vibrio cholera are flagellated bacteria.
[10 marks]
- 3.2. Why does turbidity lose reliability at high cell concentrations when the culture reaches the stationary phase?
[5 Marks]
- 3.3. (a) Discuss the best sterilization method, and why that method is preferred compared to other methods.
[2 marks]
- (b) Define the following terms:
[2 Marks each]
- I. Antiseptics
 - II. Disinfectants
 - III. Bacteriostatic
 - IV. bactericidal

Question 4**[25 marks]**

- 4.1 The cell envelops of a Gram-negative bacteria is unique. With the aid of a well-labeled diagram, discuss the plasma membrane and outer membrane of Gram-negative bacteria.
[10 marks]
- 4.2. Describe methods for measurement of cell numbers, include:
(a) application, (b) disadvantages and (c) advantages
[10 marks]
- 4.3 Name three factors that limit microbial growth in a batch culture
[5 marks]