UNIVERSITY OF FORT HARE

Microbial Physiology and Metabolism
MIC 311

DEGREE EXAMINATIONS

MAY / JUNE

2025

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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
N Ntozonke

External Examiners
Prof KLM Moganedi

INSTRUCTIONS

Answer all the 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. Discuss the differences between plasma membrane and the outer membrane of Gram-negative bacteria using a well-labelled diagram,

[15 Marks]

Question 2 [25 marks]

2.1. Compare the characteristics of each of the growth phases (lag, log, stationary, and death) for batch culture.

[15 Marks]

2.2. The bacterial cultures for an industrial fermentation process should 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 Prokaryotes may be classified following energy and carbon requirements. Tabulate the four major classifications. Give at least one example of a known prokaryote in each case.

[15 Marks]

3.2 The time taken for a bacterial population to double in size is referred to as bacterial generation time (G). The generation time is represented by the equation seen below; $G = \underline{t}\ 3.3 \log b/B$ Show how this equation above was derived.[10 Marks]

Question 4 [25 marks]

4.1 Discuss the differences between the Gram positive and Gram-negative bacteria cell wall using a well-labelled diagram.

[10 Marks]

4.2. Describe 3 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]