



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**SCHOOL OF HEALTH AND APPLIED SCIENCES**

**DEPARTMENT OF BIOLOGY, CHEMISTRY AND PHYSICS**

<b>QUALIFICATION : BACHELOR OF SCIENCE</b>	
<b>QUALIFICATION CODE: 07BOSC</b>	<b>LEVEL: 7</b>
<b>COURSE CODE: MIB701S</b>	<b>COURSE NAME: MICROBIOLOGY</b>
<b>SESSION: JUNE 2023</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100 MARKS</b>

<b>FIRST EXAMINATIONS OPPORTUNITY QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	DR. MUNYARADZI ZIVUKU
<b>MODERATOR:</b>	PROF. JANE MISIHAIRABGWI

<b>INSTRUCTIONS</b>	
<ol style="list-style-type: none"><li>1. There are FIVE questions on this paper. Answer ALL the questions.</li><li>2. The number of marks are given in brackets ( ) at the end of each question or part question.</li><li>3. Write clearly and neatly.</li><li>4. Number the answers clearly.</li></ol>	

**THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)**

**SECTION A****[40]****QUESTION 1****(20)**

- 1.1 Differentiate between Gram positive and Gram-negative bacteria. (4)
- 1.2 "Bacteria show a great deal of diversity in their requirements for oxygen". Evaluate the categories or groups of bacteria based on oxygen requirements. (8)
- 1.3 Describe the main stages of bacterial growth curve. (8)

**QUESTION 2****(20)**

- 2.1 Differentiate between selective media and differential media. (2)
- 2.2 Table 1.0 below shows the composition of Mannitol Salt Agar (MSA) which is used as both a selective and differential media.

<b>Composition of Mannitol Salt agar</b>	
<b>Typical formula</b>	<b>Concentrations (g/l)</b>
Beef Extract	1.0
Peptospecial	10.0
Sodium Chloride	75.0
Mannitol	10.0
Phenol red	0.025
Agar	15.0
pH = 7.4 at 25 <sup>0</sup> C	

**Table 1.0: Composition of Mannitol Salt Agar (MSA)**

- (i) Evaluate the role of the ingredients in MSA. (4)

- (ii) Discuss how MSA is able to select and differentiate specific microorganism. (4)
- 2.3 What is the basis of a pure culture technique? (2)
- 2.4 Imagine you are working as a Junior microbiologist in a new pharmaceutical research institute laboratory. Your supervisor asks you to isolate *Penicillium notatum* from soil. Detail how you would isolate and cultivate a microorganism for use in pharmaceutical industry soil. (8)

**SECTION B [60]**

**QUESTION 3 (20)**

- 3.1 Given that *E. coli* has a generation time of 20 minutes. Determine the microbial population after 3 hours given that the initial population was having only three cells. (4)
- 3.2 Briefly discuss the mechanism of how each of the following methods are used for the control of microbial growth.
- 3.2.1 Heat (4)
- 3.2.2 Radiation (4)
- 3.3 At some point in the development of microbiology, there was a challenge of linking the causative agent of the disease to the disease itself. Briefly outline the various lines of proof used by Robert Koch to link the pathogen and the disease. (8)

**QUESTION 4 (20)**

- 4.1 Define the term indicator microorganisms with examples and their significance as diagnostic tools in municipal water testing (4)

- 4.2 Explain why it is advisable to monitor BOD before discharging raw sewage into rivers. (4)
- 4.3 Outline the main characteristics to be considered when selecting a microorganism for industrial use. (4)
- 4.4 Briefly discuss *Bacillus thuringiensis* or its toxin is used as a pesticide in agriculture. (8)

**QUESTION 5 (20)**

- 5.1 Discuss FIVE methods of maintenance and preservation of pure cultures. (10)
- 5.2 Outline the role of lactic acid bacteria in the manufacture of fermented milk products such as Gouda cheese. (10)

END OF QUESTION PAPER