



**PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT: NATURAL AND APPLIED SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE (MAJOR AND MINOR)	
QUALIFICATION CODE: 07BOSC	LEVEL: 7
COURSE CODE: MIB701S	COURSE NAME: MICROBIOLOGY
SESSION: JUNE 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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Instructions

1. Answer **all** questions in section A and any **three** questions from section B
2. Answer the questions in the booklet provided
3. Write clearly and neatly
4. All written work **MUST** be done in blue or black ink
5. Mark all answers clearly with their respective question numbers

THIS QUESTION PAPER CONSISTS OF 4 PAGES

(INCLUDING THIS FRONT PAGE)

SECTION A (40)

QUESTION 1 (20)

- 1.1 Define generation time. (2)
- 1.2 Given that the generation time of *E coli* is 20 minutes. Determine the number of *E coli* present after 3 hours if at the beginning there were only two cells. (4)
- 1.3 Discuss the importance of D-value in the food industry. (4)
- 1.4 Detail a procedure you would use to isolate (from wild) and culture an antibiotic producing or an antibiotic resistant microorganism. (10)

QUESTION 2 (20)

- 2.1 Discuss four methods of maintenance and preservation of pure cultures. (8)
- 2.2 A microbiologist technician was given the following selective media –Brilliant green selenite broth to isolate and identify some microorganism in the laboratory. The composition of Brilliant Green Selenite broth are given in the table.

Composition of Brilliant green selenite broth	
Typical formula (g/l)	
Peptone.....	5.0
D-mannitol.....	5.0
Yeast extract.....	5.0
Sodium selenite.....	4.0
Dipotassium phosphate.....	2.65
Monopotassium phosphate.....	1.02
Brilliant green.....	0.05
pH: 7.4+/- 0.2 at 25 degrees	

- 2.2.1 State **one** type of organism isolated with brilliant green selenite broth (1)
- 2.2.2 Evaluate the composition of BSG broth media in relation to its role in isolating and Identification of specific microorganism. (7)
- 2.3 The use of heat in the control of microbial growth and spread is widely used in medical and industrial application. Briefly, give an analysis of the mechanism and its effectiveness in the control of pathogens. (4)

SECTION B**(60)**

Answer any **three** questions from this section. Each question carries 20 marks.

QUESTION 3**(20)**

- 3.1 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. (10)
- 3.2 A student carried out an experiment to demonstrate the growth patterns of bacteria with different oxygen requirements when grown in MacConkey broth. The results the student obtained are shown in Figure 1.

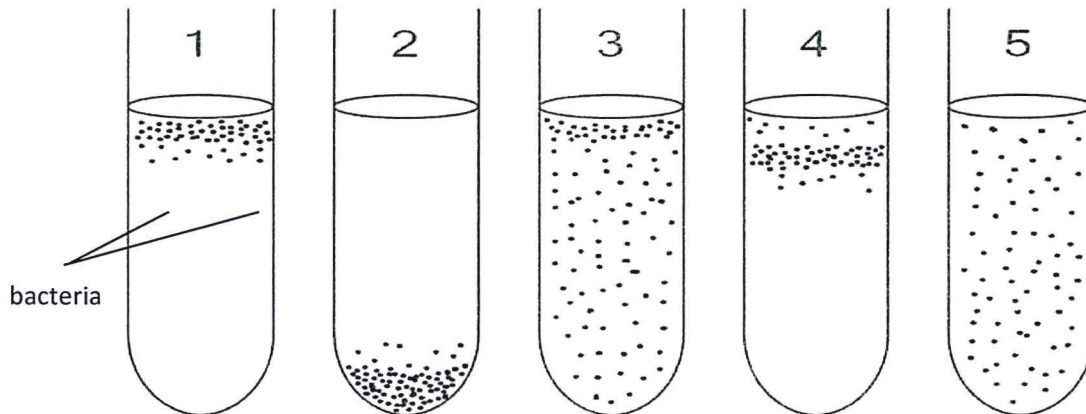


Figure 1: Growth patterns of different bacteria based on oxygen requirements.

Using the information in Figure 1, deduce the different types of bacteria based on the oxygen requirements. (10)

QUESTION 4**(20)**

- 4.1 Describe the principle on which the Gram stain is based. (3)
- 4.2 Explain why the oil immersion objective marked with black rings are immersed in lens oil during use. (2)
- 4.3 Differentiate between Gram positive and Gram-negative bacteria. (5)
- 4.4 Evaluate the use of positive and negative staining techniques in the identification and classification of bacteria. (10)

QUESTION 5 **(20)**

- 5.1 What is a fastidious microorganism? (2)
- 5.1.2 How does the microbiologist overcome the challenges of culturing fastidious microorganism. Give one example in your answer (3)
- 5.2 Discuss the exchange of genetic information in bacteria. (15)

QUESTION 6 **(20)**

- 6.1 Define the term indicator microorganisms and their significance as diagnostic tools in municipal water testing (3)
- 6.2 Explain why it is advisable to monitor Biological Oxygen Demand (BOD) before discharging raw sewage into rivers. (3)
- 6.3 Describe how *Bacillus thuringiensis* or its toxin is used as a pesticide in Agriculture. (6)
- 6.4 Describe the role of lactic acid bacteria in the manufacture of fermented milk products such as cultured milk. (8)

END OF EXAMINATION QUESTION PAPER