



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF SPATIAL PLANNING AND NATURAL RESOURCE MANAGEMENT**

**UNIVERSITY EXAMINATION FOR THE DEGREE OF  
BACHELOR OF ARTS IN PLANNING**

**4<sup>TH</sup> YEAR SEMESTER II 2021/2022 AUGUST EXAM**

## **MAIN EXAMINATION**

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**COURSE CODE:** PNB 1408

**COURSE TITLE:** ENVIRONMENTAL MICROBIOLOGY

**VENUE:** **STREAM:** B.SC WATER RESOURCE  
MANAGEMENT PLANNING 4.2

**DATE:** **EXAM SESSION:**

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**Instructions:**

- 1. Answer Question ONE (COMPULSORY) and ANY other 2 questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

- Q1. a) i) Outline the procedure used for isolation pure cultures of microorganisms (5 Marks)  
ii) Explain the major chemical applications in Gram staining of bacteria (4 Marks)  
iii) How is enrichment procedure used in isolation and culturing of bacteriophages (5 Marks)
- b) i) Using a diagram, explain how a spread plate is made for culturing bacteria (4 Marks)  
ii) Explain the activities associated with stationary phase of bacterial growth (3 Marks)  
iii) Explain the generation time and its importance in bacteriological studies (3 Marks)
- c) i) Explain the potential effects of pH in the growth of microorganisms (3 Marks)  
ii) Discuss the advantages of using Membrane Aerated Biofilm Reactor (MABR) in wastewater treatment (3 Marks)
- Q2. a) Describe the effect of temperature and oxygen availability on the growth of microorganisms (10 Marks)  
b) Discuss the nutritional requirements of bacteria with respect to energy source, carbon source and minerals (10 Marks)
- Q3. a) Discuss the unique characteristics exhibited by cyanobacteria in relation to bacterial classification (10 Marks)  
b) Describe the structure and characteristics of bacteriophages (10 Marks)
- Q4. a) Discuss the transmission of diseases in recreational waters through fecal material bacteria and protozoa (10 Marks)  
b) Outline the multiple factors that may trigger the microbial antibiotic production (5 Marks)  
c) Explain how the application of radiation is used for the control of microorganisms (5 Marks)
- Q5. a) Discuss the general concept of immune response with focus on innate and adaptive mechanisms (15 Marks)  
b) Describe the anatomical structure of the human immune system (5 Marks)