

UNIVERSITY OF FORT HARE

MIC 221

SUPPLEMENTARY EXAMINATIONS

DECEMBER

2024

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Time: 3 Hours

Subject: Soil and Environmental Microbiology

Marks: 100

This paper consists of 2 pages including the cover page

Internal Examiners

Dr. N Nontongana

Mr. N Ntozonke

External Examiners

INSTRUCTIONS

- 1. Answer all the questions.**

Question 1**(25 Marks)**

- 1.1 Differentiate between foodborne diseases and waterborne diseases and give 1 causative agent for each (04 Marks)
- 1.2 List 3 methods used in Environmental Microbiology for the identification and enumeration of microorganisms and describe the principle of each method (15 Marks)
- 1.3 What are the three major steps of the polymerase chain reaction (06 Marks)

Question 2**(25 Marks)**

- 2.1 What are the five interactive factors in soil formation? (5 Marks)
- 2.2 Describe the microbial flora of the soil (10 Marks)
- 2.3 Explain the 2 beneficial and 3 detrimental interactions among soil microorganisms (10 Marks)

Question 3**(25 Marks)**

- 3.1 List 4 chemical contaminants that are routinely found in soil and groundwater concerning the chemical class, their frequency of occurrence, and the bioremediation status (12 Marks)
- 3.2 Discuss the three important processes responsible for most of the nitrogen fixation in the biosphere. (9 Marks)
- 3.3 Explain the role of *Nitrosomonas* and *Nitrobacter* in the Nitrogen cycle. (4 Marks)

Question 4**(25 Marks)**

In its elemental form, Sulphur cannot be utilized by plants or animals.

- 4.1 Discuss the following steps in the Sulphur cycle.
4.1.1 Decomposition of organic compounds.
4.1.2 Oxidation of hydrogen Sulfide (H₂S).
4.1.3 Oxidation of elemental Sulfur (S⁰).
4.1.4 Reduction of Sulfates (SO₄²⁻). (12 marks)
- 4.2 Describe the role of soil microorganisms when they serve as biogeochemical agents and state the name of the overall process. (3 Marks)
- 4.3 Summarise the microbiological events as different tropical niches develop in the Winogradsky Column. (10 marks)