INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 2/SEMESTER 1
COURSE CODE: BSE2101
NAME: ENVIRONMENTAL MICROBIOLOGY

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Answer all questions in this section (compulsory)

Question 1:

1. Describe the lag phase of a typical microbial growth curve in a batch culture system. (5 marks)
2. Explain one key environmental or cellular change that characterizes each phase. (5 marks)
3. Differentiate between chemoautotrophs and chemoheterotrophs based on their sources of energy and carbon. (5 marks)
4. Provide one specific environmental example of a microorganism belonging to each group. (5 marks)
5. State why nitrification is crucial for plants. (5 marks)
6. Outline the three major domains of life as proposed by Carl Woese. (5 marks)
7. Explain the primary molecular characteristic used to distinguish the Archaea from the Bacteria. (5 marks)
8. Identifying the two main groups of bacteria involved in nitrification and the specific nitrogen compounds they convert. (5 marks)

Question 2:

1. Explain the exponential phase of a typical microbial growth curve in a batch culture system. (5 marks)
2. Differentiate between chemoautotrophs and

chemoheterotrophs based on their sources of energy and carbon. (5 marks)

3. Describe two distinct types of extremophiles. (5 marks)
4. Define bioremediation with an example. (5 marks)
5. Explain the difference between aerobic and anaerobic biodegradation. (5 marks)
6. Describe the process of nitrification in the nitrogen cycle. (5 marks)
7. State why nitrification is crucial for plants. (5 marks)
8. Outline the five classes of microorganisms. (5 marks)

SECTION B

Answer only three (3) questions from this section

Question 1:

1. Provide a complete classification of micro-organisms into the five groups and explain the features of each group (20 Marks)

Question 2:

1. Explain how each of the following environmental factors affects microbial growth

    a) U.V radiation (5 Marks)

    b) Temperature (5 Marks)

    c) pH (5 Marks)

    d) oxygen (5 Marks)

Question 3:

1. Describe the processes of mitosis and meiosis in microbial cell division (20 Marks)

Question 4:

1. Draw the natural microbial growth curve and explain the following phases (20 Marks)

    a) Lag phase

    b) Exponential phase

    c) Stationary phase

    d) Death phase

Question 5:

1. As an environmentalist, fully explain to locals of your village how micro- organisms are of use in industries (20 Marks)

Question 6:

1. Discuss the following microbe interactions;

        a) plant – microbe (10 Marks)

b) animal – microbe (10 Marks)

Question 7:

a) Describe the concept of the rhizosphere.(10 marks) b) Explain why the microbial community in the rhizosphere is typically much denser and more active than in the bulk soil. (10 marks)

Question 8:

a) Define the term symbiosis.(4 marks)

b) Provide a detailed description of the mutualistic relationship between rhizobia bacteria and leguminous plants, focusing on the formation of root nodules. (10 marks)

c) Describe the process of nitrification in the nitrogen cycle. (6 marks)

Question 9:

a) Discuss the overall significance of the microbial nitrogen cycle in global ecosystem health. (10 marks)

b) Describe in detail the two separate microbial processes of Nitrification and Denitrification, including the specific organisms and compounds involved in each. (10 Marks)

Question 10:

a) Describe the use of Constructed Wetlands for treating wastewater. (10 marks)

b) Explain the primary roles of the microbial biofilms that develop on the submerged root systems of the plants in contaminant removal . (10 Marks)

Question 11:

a) Describe the mechanisms through which microorganisms degrade organic pollutants in the environment. (10 marks)
b) Discuss the factors affecting the rate and efficiency of microbial biodegradation in soils and aquatic systems. (10 marks)

Question 12:

a) Explain the concept of bioremediation and describe the different types (in-situ and ex-situ). (10 marks)
b) Discuss the limitations and challenges of applying bioremediation in contaminated environments. (10 marks)