



# MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR supplementary EXAMINATION FOR  
BACHELOR OF SCIENCE IN ENVIRONMENT AND NATURAL RESOURCE  
MANAGEMENTS

ENS 433 ENVIRONMENTAL BIOTECHNOLOGY

DATE: 14/3/2022

TIME: 8:30 – 10:30 AM

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## INSTRUCTIONS

1. Answer Question 1 (compulsory) and **any two** questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

## SECTION A

### QUESTION ONE (30 MARKS)

- i) Evaluate THREE biological components of a biosensor (3 marks)
- ii) Outline THREE advantages of microbial - based bioremediation (3 marks)
- iii) Describe the interdependence of the three main areas of enzyme catalysis in environmental biotechnology (3 marks)
- iv) Describe three bioremediation processes that occur as a result of microbial metabolism (3 marks)
- v) Describe Augmentation in environmental bioremediation (3 marks)
- vi) Using an example describe the role of microbial Vector in environmental biotechnology (3 marks)
- vii) Describe the following: (3 marks)
  - a. Xenograft
  - b. Allograft
  - c. Isograft
- viii) Explain THREE methods of accessing germline in biotechnology (3 marks)
- ix) In the context of environmental biotechnology describe any three RNA based nucleotides (3 marks)
- x) Describe the salient features of the genetic codes (3 marks)

## SECTION B

### QUESTIONS TWO (20 MARKS)

Discuss biomarkers & bioindicators in environmental biotechnology.

**QUESTION THREE (20 MARKS)**

You have just been employed to design a bioremediation program of a field with excessive pollution of zinc, copper and lead. Describe how you can employ the use of biotechnology to clean up the field.

**QUESTIONS FOUR (20 MARKS)**

- a) Using schematic diagram where possible describe a microbial based bioreactor (10 marks)
- b) Discuss any advanced methods of waste – water biotreatments (10 marks)

**QUESTIONS FIVE (20 MARKS)**

Discuss the use of plasmids in environmental biotechnology.