



# MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF ENVIRONMENTAL SCIENCES

ENS 433 ENVIRONMENTAL BIOTECHNOLOGY

DATE: 23/7/2019

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

- a) Evaluate THREE biological components of a biosensor (3 marks)
- b) Outline SIX advantages of microbial - based bioremediation (3 marks)
- c) Describe the interdependence of the three main areas of enzyme catalysis in environmental biotechnology (3 marks)
- d) Describe three bioremediation processes that occur as a result of microbial metabolism (3 marks)
- e) Describe gene structure (3 marks)
- f) Using an example describe the role of microbial vector in environmental biotechnology (3 marks)
- g) Describe the following: (3 marks)
  - i. Xenograft
  - ii. Allograft
  - iii. Isograft
- h) Explain THREE methods of accessing germline in biotechnology (3 marks)
- i) In the context of environmental biotechnology describe any three RNA based nucleotides (3 marks)
- j) Describe the salient features of the genetic codes (3 marks)

## **SECTION B**

### **QUESTION TWO**

Discuss biomarkers & bioindicators in environmental biotechnology (20 marks)

### **QUESTION THREE**

You have just been employed as the lead environmental officer to design a bioremediation program of a field with excessive pollution of zinc, copper and lead. Describe in a stepwise procedure of the design (20 marks)

### **QUESTION FOUR**

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

### **QUESTION FIVE**

Discuss the use of plasmids in environmental biotechnology (20 marks)