



MACHAKOS UNIVERSITY

University Examinations 2022/2023 academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ENVIRONMENT AND NATURAL RESOURCE
MANAGEMENTS)

ENS 433 ENVIRONMENTAL BIOTECHNOLOGY

DATE:

TIME:

Instructions

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

SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

- a) Describe the role of post transcription processing of mRNA (3 marks)
- b) Outline the three biological components of biosensors (3 marks)
- c) Outline three microorganism and their uses in bioremediations (3 marks)
- d) Describe immobilization and a biotransformation in bioremediations (3 marks)
- e) With example explain microbial cells auto-oxidation (3 marks)
- f) Outline the role of Flavobacterium in bioremediation (3 marks)
- g) Describe the bioremediation of Chromium (3 marks)
- h) Describe the components of microbial community in activated sludge (3 marks)
- i) Evaluate 3 features of a bacterial plasmid vectors that makes them suitable for monitoring recombinant DNAs (3 marks)
- j) Describe 3 environmental impacts of genetically modified organism (3 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

- a) Discuss the mechanisms of microbial cell based bioremediation (10 marks)
- b) Discuss the use of lactose in monitoring bacterial contaminations (10 marks)

Questions three (20 marks)

Illustrate a biotechnological process based bioremediation.

QUESTION FOUR (20 MARKS)

In a step by step process describe the use of plants in heavy metal bioremediation.

QUESTIONS FIVE (20 MARKS)

The following DNA sequence has been extracted from the segment of DNA region that codes for hemoglobin:

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GTGAACGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACTACA
TGGTGCATCTGACTCCTGAGGAGAAGTCTGCCGTTACTGCCCTGTGGGGCAAGGTGAAC
GTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACCCTTGGACCCA
GAGGTTCTTTGAGTCCTTTGGGGATCTGTCCACTCCTGATGCTGTTATGGGCAACCCTAA
GGTGAAGGCTCATGGCAAGAAAGTGCTCGGTGCCTTTAGTGATGGCCTGGCTCACCTGG
ACAACCTCAAGGGCACCTTTGCCACACTGAGTGAGCTGCACTGTGACAAGCTGCACGT
GGATCCTGAGAACTTCAGGCTCCTGGGCAACGTGCTGGTCTGTGTGCTGGCCCATCACT
TTGGCAAAGAATTCACCCCACCAGTGCAGGCTGCCTATCAGAAAGTGGTGGCTGGTGT
GGCTAATGCCCTGGCCCACAAGTATCACTAATATCAGAAAGTGGTGGCTGGTGTGGCTA
ATGCCCTGGCCCACAA
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Discuss the gene structure by deducing the open reading frame, the tRNA sequence and the amino-acid sequence