



MACHAKOS UNIVERSITY

University Examinations for 2022/2022 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (.....)

ENS 234: ENVIRONMENTAL GENETICS

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) Explain the rationale for the study of gene–environment interactions (3 marks)
- b) Explain how the structure of DNA provides a mechanism for heredity (3 marks)
- c) Describe the utility of metatranscriptome information in environmental genetics (3 marks)
- d) Give examples of exceptions to the central dogma concept (3 marks)
- e) Explain how inflammation induces genomic alterations (3 marks)
- f) Distinguish between a case–control and cohort study of gene by environment interaction (3 marks)
- g) Describe three factors that affect the frequency of mutation (3 marks)
- h) Explain the role of Base Excision Repair (BER) in DNA repair (3 marks)
- i) Describe the effect of pyrimidine dimers (3 marks)
- j) Describe the two types of microbial whole-genome sequencing in environmental metagenomics (3 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTION TWO (20 MARKS)

Discuss environmental agents capable of damaging DNA

QUESTION THREE (20 MARKS)

Discuss the following models of relations between a genotype and an environmental risk factor

- a) The genotype increases the expression of the risk factor (10 marks)
- b) The risk factor exacerbates the effect of the genotype (10 marks)

QUESTION FOUR (20 MARKS)

Discuss the types of gene mutations and their functional effects.

QUESTION FIVE (20 MARKS)

Discuss the major steps in shotgun high through-put sequencing in environmental metagenomics.