MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

SECOND YEAR SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (PUBLIEC HEALTH)

ENS 234: ENVIRONMENTAL GENETICS

DATE: 14/3/2022 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

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

SECTION A

QUESTION ONE (COMPULSORY)

a) Describe how information on genetic predisposition can be obtained in the study of gene–environment interactions (3 marks)

b) Distinguish betweem transition and transversion base substitutions (3 marks)

c) Explain how the ability of DNA to replicate provides a mechanism for heredity (3 marks)

d) Outline the factors that determine the success of d*e novo* microbial genome sequencing in environmental genetics (3 marks)

e) Identify the key components of the exposome (3 marks)

f) Explain how Nucleotide Excision Repair (NER) works to replace multiple base damage to a DNA strand (3 marks)

g) Give examples of environments where microbial populations have been profiled successfully using metagenomic approaches (3 marks)

h) Outline the distinguishing feature of cross-sectional studies of the interactions between a genotype and an environmental risk factor (3 marks)

i) Describe how ionizing radiations as environmental agents are capable of generating DNA damage (3 marks).

j) Besides culture, outline the other methods that can be used for sample enrichment prior to shotgun analysis (3 marks)

SECTION B

QUESTIONS TWO (20 MARKS)

Describe how base analogs and oxidative radicals damage DNA

QUESTIONS THREE (20 MARKS)

Give a detailed description of the following models of relations between a genotype and an environmental risk factor

a. The genotype exacerbates the effect of the risk factor (10 marks)

b. Both the exposure and the genotype are required to raise risk (10 marks)

QUESTIONS FOUR (20 MARKS)

Describe the parts of a DNA nucleotide

QUESTIONS (20 MARKS)

Discuss the major steps that comprise 16S rRNA gene sequencing experiments in environmental metagenomics