MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FIRST YEAR FIRST SEMESTER & SECOND YEAR FIRST SEMESTER

BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

SBC 120: INTRODUCTION TO GENETICS

DATE: 17/3/2022 **TIME : 2:00 – 4:00 PM**

Instructions

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

SECTION A

i. Differentiate the following terms (3 marks)
   a. Genotype
   b. Phenotype
   c. Gene action

ii. Describe environmental sex determination in organisms (3 marks)

iii. Explain how nonrandom mating affect genetic equilibrium in a population (3 marks)

iv. Explain additive gene action in organism (3 marks)

v. Explain the principle of independent assortment (3 marks)

vi. Give the feature of a multiple allele (3 marks)

vii. Differentiate between lethal genes and Epistasis (3 marks)

viii. Briefly explain the methods used to test mendelian inheritance (3 marks)

ix. Explain why Mendel is said to be the father of genetics (3 marks)

x. Explain three main types of natural selection in a population (3 marks)

QUESTION 2

a. Describe the assumptions of the Hardy-Weinberg equilibrium model (10 marks)
b. Describe the of epistatic gene interaction that are possible in organism (10 marks)

QUESTION 3

a. A woman with a normal vision whose father was colour blind marries a man with normal vision whose father was also colour blind. This couple has a colour blind daughter with normal complement of chromosomes. Is infidelity suspected? Explain your answers with appropriate illustrations (10 marks)
b. Differentiate between Heterochromatin and euchromatin (10 marks)

QUESTION 4

a. Explain the application of genetics in agriculture and medicine (10 marks)
b. A four-o'clocks *Mirabilis Jalapa* plant which is homozygous for red flowers was crossed with a homozygous white flowered plant, the plants of the F_1 generation produce pink flowers. However, when two hybrid plants with pink flowers, the F2 generation plants produced red flowered, pink flowered and white flowered plants in the ratio 1:2:1. Using appropriate illustrations explain type of gene action involved (10 marks)

QUESTION 5

Discuss the importance of genetic variation for evolution in a population (20 marks)