



MACHAKOS UNIVERSITY

University Examinations for 2024/2025 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR DEGREE IN
BACHELOR OF EDUCATION (SCIENCE)
BACHELOR OF EDUCATION (SPECIAL NEED)

SBT401: GENERAL GENETICS

DATE: 21ST JANUARY, 2025

TIME: 8.30 AM - 10.30 AM

INSTRUCTIONS:

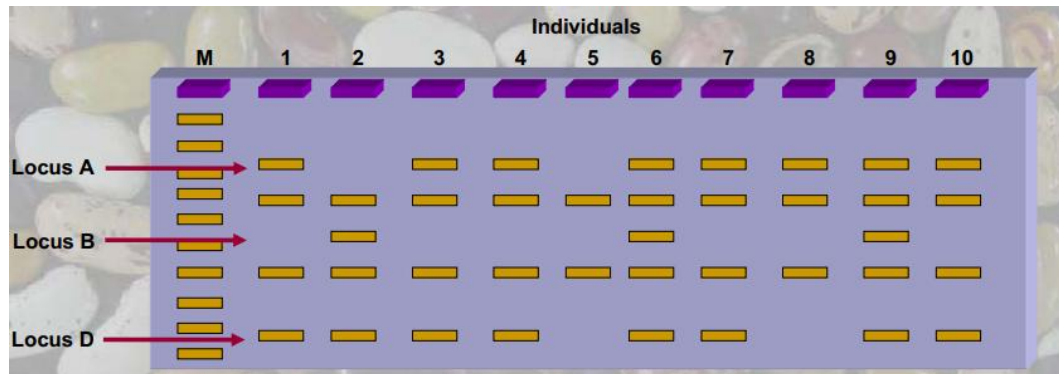
- Answer question **ONE (Compulsory)** and **any other TWO** questions
- Use clean well labelled diagrams wherever appropriate

QUESTION ONE (30 MARKS)

- Describe the events in Telophase 1. (3 marks)
- Outline three features of a structured genetic population. (3marks)
- Describe two types of nonrandom mating in a population. (3 marks)
- Calculate the allelic loss when the total population is 100 and 90% have homozygous dominant gene. (3 marks)
- Using illustration distinguish between complete and incomplete genetic dominance.(3 marks)
- Use graph and an equation to describe Haldane and Kosambi mapping functions. (3 marks)
- Describe Morgan's experiment on the inheritance using *Drosophila Melanogaster*.(3marks)
- Describe the steps in linkage mapping in plants. (3 marks)
- Outline the limitations of two-point linkage analysis. (3marks)
- A population has the following genotypes and the number of individuals: $A_1A_1=20$ individuals, $A_1A_2 =10$ individuals, $A_2A_2=70$ individuals. Calculate the observed frequency for each genotype if the population has two (2) codominant markers. (3 marks)

QUESTION TWO (20 MARKS)

Study the diagram below representing the gel electrophoresis technique results on the PCR products of a multiple dominant alleles.



Determine the frequencies of each allele at each locus.

QUESTION THREE (20 MARKS)

Discuss Composite Interval Mapping (CIM) in quantitative Trait Loci mapping.

QUESTION FOUR (20 MARKS)

In a population of Monkeys in Karura Forest, the observed number of individuals with the gene coding for mpox disease resistance was found to be 134 for homozygous dominant, 270 for heterozygous individuals and 156 homozygous recessive. However it was expected to be 125, 250 and 125 for the homozygous dominant, heterozygous individuals and homozygous recessive respectively. Determine the polarity of the Hardy-Weinburg equilibrium when the given Chi-square is 4.5 and the degree of freedom is 1.

QUESTION FIVE (20 MARKS)

Determine the percentages and ratios of selfed genotypes from 4th to 10th generations for an organism that has undergone Selfing breeding system.