



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF CROP SCIENCE

BACHELOR OF SCIENCE (HONOURS) DEGREE IN CROP SCIENCE

LCS 2109 GENETICS AND PLANT BREEDING

FIRST SEMESTER EXAMINATION

SEPTEMBER 2023

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Statistical tables

Examiner's Name: D. Dube

INSTRUCTIONS

- 1. Answer all questions in Section A**
- 2. Answer only three questions in Section B**

MARKS ALLOCATION

Question	Marks
Section A	40
Section B	60
Total Attainable marks	100

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

Question One

- a) Distinguish Between
 - i. Mitosis and meiosis (2)
 - ii. Trisomic and monosomic (2)
 - iii. Deletion and duplication (2)
 - iv. Codominance and partial dominance (2)
- b) Determine the different gametes produced by the following F₁ dihybrid: AaBb (4)
- c) Explain the theory of chromosomal inheritance following Mendel's Laws (8)

Question Two

- a) Briefly explain
 - i. Any two allelic gene interactions (4)
 - ii. Any two non-allelic gene interactions. (4)
- b) Explain different mechanisms that promotes allogamy in plants (8)
- c) Briefly explain domestication of cultivated plants (4)

SECTION B: ANSWER THREE QUESTIONS IN SECTION B

Question Three

- a) Describe the various modes of reproduction in cultivated crops (4)
- b) Distinguish between Coupling phase and repulsion phase of gene linkage (4)
- c) Describe the activities that may alter the gene and genotype frequencies in a Mendelian population (12)

Question Four

- a) Briefly explain male sterility highlighting different types of male sterility (10)
- b) Discuss variations in chromosome number and structure. (10)

Question Five

- a) Briefly explain 5 features of an ideal marker (10)
- b) Explain how Genetic variation can be created in a breeding program (10)

Question Six

A tall bean plant with yellow seeds is crossed with a dwarf plant with green seeds. If tall and yellow traits are completely dominant over dwarf and green respectively, what will be the; i) genotype and phenotype of F_1 , ii) gametes produced by F_1 , iii) the genotypes and Phenotypes of F_2 and test cross progeny? (20)

Question Seven

In the garden pea, yellow seed coat colour is dominant to green, and Round seed shape is dominant to the wrinkled form. In crossing F_1 dihybrid (heterozygous for Round and Yellow) with a test cross (homozygous recessive for wrinkled and green), the Test cross progeny appeared in the following numbers:

155 Round, green

145 wrinkled, yellow

205 Round, yellow

195 wrinkled, green

Is the gene for seed shape linked with the gene for seed colour? Support your answer using Chi-square test analysis. (20)

END OF EXAMINATION PAPER