

GWANDA STATE UNIVERSITY



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

**BACHELOR OF SCIENCE HONOURS DEGREE IN HORTICULTURE AND CROP
PRODUCTION**

GENETICS AND PLANT BREEDING NHC 2104

Final Main Examination Paper

December 2024

This examination paper consists of Three pages.

Time Allowed: Three (3) Hours
Total Marks: 100
Special Requirements: Statistical tables, calculator
Examiner's Name: Mr D Dube

INSTRUCTIONS

1. Answer **all** questions in Section A
2. Answer **Three** questions in Section B

MARK ALLOCATION

QUESTION	MARKS
SECTION A	40
SECTION B	60
TOTAL ATTAINABLE MARKS	100

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SECTION A: ANSWER ALL QUESTIONS IN SECTION A

Question 1

- a). Distinguish Between
 - i). Allopolyploid and Autopolyploid (2)
 - ii). Trisomic and triploid (2)
 - iii). Homomorphic and Heteromorphic Self-incompatibility (2)
 - iv). Qualitative and Quantitative traits (2)
- b). Briefly explain marker assisted plant breeding (4)
- c). Explain the theory of chromosomal inheritance following Mendel's Laws (8)

Question 2

- 2a. Describe different types of gene interactions (8)
- b). Explain different mechanisms promoting Allogamy in plants (8)
- c). Briefly explain megasporogenesis in plants (4)

SECTION B: ANSWER THREE (3) QUESTIONS IN SECTION B

Question 3

- a. Compare sexual and asexual modes of reproduction in plants. (4)
- b). Distinguish between coupling phase and repulsion phase of gene linkage (4)
- c). Describe the factors that may alter the gene and genotype frequency in a Mendelian population (12)

Question 4

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

Question 5

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 F₁, ii) gametes produced by F₁, iii) the genotypes and phenotypes of F₂ and test cross progeny? (20)

Question 6

- a) An isolated field of maize is found to be segregating for yellow and white seed coat colour. Allele for Yellow colour is dominant over recessive allele for white colour. A random sample of 1000 kernels revealed that 960 were yellow. Following Hardy-Weinberg law find
- i) the allelic frequency estimates for this Mendelian population. (6)
 - ii) The genotypic frequency for this population (6)
 - iii) The number of kernels for dominant homozygous (4)
 - iv) The number of kernels for recessive homozygous (4)
 - v) The number of kernels for heterozygous (4)

Question 7

7. In the garden pea, yellow seed coat colour is dominant to green, and Round seed shape is dominant to the wrinkled form. In crossing F₁ dihybrids (heterozygous for Round and Yellow) with a test cross (homozygous recessive for green and wrinkled), the Test cross progeny appeared in the following numbers:

195 green, round

180 yellow, wrinkled

205 yellow, Round

120 green, wrinkled

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