GWANDA STATE UNIVERSITY

FACULTY OF LIFE SCIENCES

DEPARTMENT OF CROP SCIENCE

BACHELOR OF SCIENCE (HONOURS) DEGREE IN CROP SCIENCE

LCS 2109 GENETICS AND PLANT BREEDING

FIRST SEMESTER EXAMINATION

FEBRUARY 2022

This examination paper consists of 3 pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **Statistical tables**

Examiner's Name: **Dr. T Goche**

INSTRUCTIONS

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

MARK ALLOCATION

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

SECTION A: ANSWER ALL QUESTIONS (60 MARKS)

QUESTION ONE

a) Define classical plant breeding (2 Marks)
b) Distinguish between phenotype and genotype (2 Marks)
c) Why is genetic variation essential in plant breeding (6 Marks)
d) Giving examples, distinguish between incomplete dominance and codominance (4 Marks)
e) What is the expected genotype ratio after a monohybrid cross of heterozygous carriers of a lethal gene (4 Marks)

QUESTION TWO

a) Explain the meaning of the following terms, citing relevant examples
   i. Heterosis (4 Marks)
   ii. Heritability (4 Marks)
   iii. Inbreeding depression (4 Marks)
   iv. Gene linkage (4 Marks)
   v. Trihybrid cross (4 Marks)

b) Discuss variations in chromosome number and structure. (8 Marks)

QUESTION THREE

a) Define the term molecular marker (2 Marks)
b) List four features of an ideal molecular marker (4 Marks)
c) What are the advantages and disadvantages of using microsatellites (4 Marks)
d) Explain two applications of molecular markers in plant breeding (4 Marks)

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION FOUR

a) With the aid of clearly labelled diagrams, describe the process of meiosis. (10 Marks)

b) What is the biological significance of independent assortment and crossing over? (4 Marks)

c) Explain three differences between mitosis and meiosis. (6 Marks)

QUESTION FIVE

Discuss gene interactions under the following sub-headings

a) Allelic genes (10 Marks)

b) Non-Allelic genes (10 Marks)

QUESTION SIX

In the garden pea, yellow cotyledon colour is dominant to green, and inflated pod shape is dominant to the constricted form. Considering both of these traits jointly in self- fertilized dihybrids, the F2 progeny appeared in the following numbers:

193 green, inflated
184 yellow, constricted
556 yellow, inflated
61 green, constricted

Do these genes assort independently? Support your answer using Chi-square analysis. (20 Marks)

End of examination paper