

GWANDA STATE UNIVERSITY



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

CROP BREEDING

LCS4209

Final Examination Paper

JUNE 2025

This examination paper consists of Four pages.

Time Allowed: Three (3) Hours

Total Marks: 100

Special Requirements: Calculator

Examiner's Name: 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) Briefly explain the following terms
 - i. Inter-varietal hybridization (2)
 - ii. Vertifolia effect (2)
 - iii. Inbreeding depression (2)
 - iv. Boom and bust cycle (2)
- b) Explain the difference between vertical and horizontal disease resistance in plants (6)
- c) Discuss the importance of germplasm and its role as a genetic resource in plant breeding programs (6)

Question 2

- a) Describe the general steps involved in plant breeding (6)
- b) Explain male sterility and its use in plant breeding (6)
- c) Briefly describe various mechanisms of drought resistance exhibited by plants (6)
- d) Explain the difference between primary and secondary introduction (2)

SECTION B: Answer THREE questions in SECTION B

Question 3

- a) A newly developed maize hybrid has shown excellent performance in preliminary yield trials. Describe the steps involved in evaluating the developed hybrid before its release (15)
- b) Discuss how a released variety is maintained by a breeder. (5)

Question 4

Using the following information calculate Heritability and interpret its meaning (10)

Genotypes	Mean(yield in kgs/plot)	Variance
AA	40.42	3.9
aa	76.43	4.8
Aa	63.23	4.4
AA, Aa, aa	68.5	39.5

- a) Briefly describe the single-seed descent breeding method. In your description, give its advantages and disadvantages (10)

Question 5

- a) Identify the challenges faced in distributing improved cultivars to smallholder farmers in Zimbabwe. Suggest strategies to overcome these challenges (10)
- b) Briefly discuss importance of DUS and VCU test before a new variety is released in Zimbabwe. (10)

Question 6

- a) Explain how marker-assisted selection enhances the precision and efficiency of plant breeding. (10)
- b) Describe any two breeding methods used in cross-pollinated crops. (10)

Question 7

As an assistant plant breeder you are working on developing a maize hybrid variety for higher yield. The yield data obtained after evaluating the developed variety in multi-locational trials is as follows:

Parent A: 5t/ha

Parent B: 7t/ha

Current best high yielding variety: 8.5t/ha

Newly developed F1 hybrid variety: 9t/ha

Using the above information answer the following questions

- a) Calculate mid-parent heterosis (4)
- b) Calculate heterobeltosis (4)
- c) Calculate economic heterosis (4)
- d) What is the type of cross? Give reason for your answer. (3)
- e) Can this new developed variety be released if the only objective for breeding was high yielding, support your answer with relevant reasons. (5)

END OF EXAMINATION PAPER