

**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 AND BIOTECHNOLOGY**

**LCS 4108**

**Final Main Examination Paper**

**December 2024**

This examination paper consists of Three pages.

**Time Allowed: Three (3) Hours**

**Total Marks: 100**

**Special Requirements: Calculator**

**Examiner's Name: Mr. D Dube**

**INSTRUCTIONS**

1. Answer **all** questions in Section A
2. Answer **Three (3)** questions in Section B

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
<b>SECTION A</b>	<b>40</b>
<b>SECTION B</b>	<b>60</b>
<b>TOTAL ATTAINABLE MARKS</b>	<b>100</b>

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**SECTION A: Answer ALL questions in SECTION A.**

**Question 1**

- a) Briefly explain the following terms
  - i. Plant introduction (2)
  - ii. Selection intensity (2)
  - iii. Germplasm (2)
  - iv. Biosafety (2)
- b) Briefly explain three main objectives of plant breeding during climate change era. (6)
- c) Explain the procedure of hybrid seed production using male sterile lines in maize crop (6)

**Question 2**

- a) Distinguish between pure line selection and mass selection in crop improvement (10)
- b) Briefly explain different types of germplasm sources used in Crop breeding (6)
- c) Interpret the meaning of the symbols (A/B//C) as used in Plant Breeding (4)

**SECTION B: Answer THREE questions in SECTION B**

**Question 3**

- a) Explain how molecular markers can be used in a breeding program for disease resistance? Give suitable examples. (15)
- b) Explain the process of varietal release for a newly developed sorghum variety. (5)

**Question 4**

- a) Briefly describe the various modes of reproduction prevalent in cultivated plants and discuss their significance in plant breeding. (10)
- b) A farmer in Insiza wants to grow genetically modified (GM) cotton resistant to bollworms. As a crop scientist what advice would you give to the farmer on the potential benefits and risks of Genetically Modified Bt cotton?  
(10)

## Question 5

- a) Briefly explain classes of improved seeds recognized in Zimbabwe (10)
- b) Explain the meaning of Broad sense heritability = 0.5 and Broad sense heritability = 0.9 giving suitable examples. (4)
- c) Describe the steps involved in evaluating maize germplasm for fall army worm resistance. (6)

## Question 6

Discuss the differences between the bulk breeding procedure and the backcross breeding procedure. (20)

## 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: 4 tons per hectare

Parent B: 6 tons per hectare

Current best yielding commercial variety: 10 tons per hectare

Newly developed F1 hybrid variety: 8 tons per hectare

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 higher yields? Support your answer with relevant reasons. (5)

**END OF EXAMINATION PAPER**