

GWANDA STATE UNIVERSITY



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

PLANT BIOTECHNOLOGY

LCS 4105

Final Main Examination Paper

December 2024

This examination paper consists of Three pages.

Time Allowed: Three (3) Hours

Total Marks: 100

Special Requirements: None

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) Briefly explain the following terms
 - i. Restriction Enzyme (2)
 - ii. Totipotency (2)
 - iii. Plasmid (2)
 - iv. Selectable markers (2)
- b) Briefly explain application of tissue culture in plant breeding (6)
- c) Briefly explain cryopreservation of plant genetic resources (6)

Question 2

- a) Explain the applications of plant biotechnology in crop improvement (10)
- b) Briefly explain DNA recombinant technology (6)
- c) Highlight steps involved in meristem culture (4)

SECTION B: Answer THREE questions in SECTION B

Question 3

- a) Discuss the potential applications of CRISPR/Cas9 in crop improvement (8)
- b) Discuss minimum requirements of a gene cloning vector. (6)
- c) Explain the steps involved in plant DNA extraction (6)

Question 4

- a) Imagine you are a plant breeder. Briefly explain how you would develop herbicide-tolerant crops using biotechnology. Discuss the benefits and potential challenges associated with these crops. (12)
- b) Discuss the process of gel electrophoresis and PCR techniques (8)

Question 5

- a) Suppose you are working on developing pest-resistant crops using Bt technology. Describe the process of introducing Bt genes into a crop plant using a vector mediated approach. What precautions would you take to minimize environmental impact? (14)
- b) Describe the steps involved in the biolistic gene transfer approach. (6)

Question 6

Discuss the ethical considerations related to genetically modified crops. In your discussion consider balance between scientific progress, food security, and potential risks to ecosystems (20)

Question 7

Describe the cellular processes involved in DNA replication, transcription, and translation. How are these processes important in crop improvement? (20)

END OF EXAMINATION PAPER