



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

BIOTECHNOLOGY APPLICATIONS (PST 6135)

Main Examination Paper

November 2024

This Examination Paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: None

Internal Examiner: Mr W Ndaba

External Examiner: Dr P Manyanga

INSTRUCTIONS

1. Answer any 4 questions.
2. Each question carries 25 marks.
3. Start each question on a new page.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5	25
TOTAL	100

QUESTION 1

- 1 (a) Outline the process of creating a recombinant DNA molecule in biotechnology. (10 marks)
- (b) Describe how insulin is produced using recombinant DNA. (10 marks)
- (c) Explain the advantages of using human insulin genes to produce insulin. (5 marks)

QUESTION 2.

- 2 (a) Discuss the various applications of biotechnology in agriculture, medicine, industry, food production and the environment. (15 marks).
- (b) Explain the principle of Enzyme Linked Immunosorbent Assay (ELISA), clearly stating the types used to detect antigens in biological samples. (10 marks)

QUESTION 3

- 3 (a) Analyse the potential risks and benefits of genetically modified organisms. (10 marks)
- (b) Describe the mode of action of the Bt toxin on insect pests. (5 marks)
- (c) Describe Biosafety levels 1,2,3 and 4 (BSL 1, BSL2, BSL3 and BSL 4) and the facility design associated with each level. (10 marks)

QUESTION 4

- 4 (a) Define bioinformatics and explain its significance in modern Biology. (10 marks)
- (b) Explain how gene technology is applied in:
1. Genetic screening
 2. Genetic fingerprinting
 3. Gene therapy
- (10 marks)

QUESTION 5

- 5 (a) Discuss the role of patents in the commercialisation of biotechnological inventions, stating the challenges associated with patenting biotechnological inventions. (15 marks)
- (b) Discuss the functions and powers of the Biotechnology Authority in Zimbabwe. (10 marks)

END OF QUESTION PAPER