JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE ANDTECHNOLOGY
SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

FOURTH YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ANIMAL SCIENCE

2024/2025 ACADEMIC YEAR

COURSE CODE: AAB 3421

COURSE TITLE: Gmos, Biosafety And Bioethics

EXAM VENUE:

DATE:

STREAM: BSC. ANIMAL SCIENCE

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in section A and ANY other 2 Questions in section B.**
2. **Candidates are advised not to write on question paper.**
3. **Candidates must hand in their answer booklets to the invigilator.**

Section A[30 Marks]
Answer ALL questions in this Section.

1. Explain the role of restriction enzymes and DNA ligases in the process of genetic engineering. (4 Marks)
2. Explain the following gene delivery methods in transgenic animal production. . (4 Marks)
   (a) Microinjection
   (b) Lipofection
3. State the use of selectable marker gene in genetic engineering. (2 Marks)
4. Describe the instances where genetic engineering has been applied in the following areas. . (6 Marks)
   (a) Bioremediation
   (b) Production of functional foods
   (c) Edible vaccines
5. Outline the advantages of Clustered Regularly Interspaced Short Palindromic Repeats and CRISPR-associated protein 9 (CRISPR/Cas9) technology over traditional gene-editing techniques. (3 Marks)
6. Relate how the production and use of genetically modified organisms may lead to a loss of biodiversity. (3 Marks)

7. Non-target gene transfer with respect to herbicide resistant gene can lead to the emergence of superweeds. What strategies can be used to prevent the development of superweeds? . (3 Marks)
8. Risk assessment is essential in identifying potential hazards associated with handling microbes in genetic engineering.
   (a) Identify the risk groups associated with recombinant DNA technology process. (3 Marks)
   (b) What biosafety measures can be used to mitigate risk associated with the above-mentioned risk groups? (3 Marks)

SECTION B [40 Marks]
Answer Any Two Questions in section

9. Discuss how Genetically Modified Organisms can contribute to sustainable agriculture and improve the quality of life for smallholder farming communities in Africa. . (20 Marks)

10. While plant genetic engineering has progressed mush faster and with broader acceptance, transgenic animal production still lag behind. Discuss the key factors that have hindered advancement of transgenic animal production, focusing on technical, ethical and regulatory challenges. (20 Marks)

11. (a) What challenges hinder the implementation of effective biosafety management for GMOs and biotechnology in Kenya? (10 Marks)
(b)How can Kenya strengthen its biosafety management system to ensure the safe use of GMOs and biotechnology? (10 Marks)