



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**  
**FOURTH YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR DEGREE**  
**OF BACHELOR OF SCIENCE IN FOOD SECURITY**

---

**2024/2025 ACADEMIC YEAR**

**COURSE CODE:** AAB 3421

**COURSE TITLE:** BIOTECHNOLOGY IN AGRICULTURE

**EXAM VENUE:**

**DATE:**

**STREAM:** BSC. FOOD SECURITY

**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. What is biotechnology and how is it important in crop improvement? (4 Marks)
2. Differentiate between conventional breeding and genetic modification? (2 Marks)
3. Explain TWO ways through which biotechnology has been used to improve animal production. (4 Marks)
4. State the importance of tissue culture technology in Plant genetic Engineering. (2 Marks)
5. Demonstrate the use of *Agrobacterium tumefaciens* in Plant genetic engineering. (4 Marks)
6. List the four categories of markers used in plant breeding and biotechnology. (4 Marks)
7. Explain TWO limitations of Marker-Assisted Selection in crop improvement. (4 Marks)
8. What are haploids and how are they significant in crop improvement? (3 Marks)
9. Outline three key principles of the Cartagena Protocol, with respect to Biosafety, on the safe use and management of biotechnology and GMOs. (3 Marks)

**SECTION B [ 40 Marks]**

**Answer Any two questions in this section**

10. Describe the various applications of biotechnology in crop improvement, highlighting their role in enhancing crop productivity, nutritional quality and environmental adaptability. (20 Marks)
11. Discuss socio-ecological and ethical issues regarding the application of modern biotechnology in agricultural production. (20 Marks)
12. Justify the importance of biosafety regulations in the development and commercialization of genetically modified organisms (GMOs). (20 Marks)