



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**

**SECOND YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE
DEGREE OF BACHELOR OF SCIENCE AGRICULTURAL EXTENSION
EDUCATION**

2023/2024 ACADEMIC YEAR

REGULAR

COURSE CODE: SBB 9207

COURSE TITLE: Molecular Cell Biology

EXAM VENUE:

STREAM: Agricultural Extension Education

DATE:

EXAM SESSION:

TIME: 2 HOURS

Instructions:

- 1. Answer ALL the questions in section A and any TWO in section B.**
 - 2. Candidates are advised not to write on question paper.**
 - 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**
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SECTION A [30 MARKS]

Answer ALL questions in this Section.

- 1 a. Explain how antibiotic resistance genes is used in cloning a plasmid (1 mark)**
- b. Explain the three possible models of DNA replication. (3 marks)**

- c. Explain how the Lac Operon is regulated when lactose is absent from the environment. **(3 marks)**
- d. What are Watson-Crick base pairs and how are they important? **(3 marks)**
- 2 a. What are the disadvantages of invitro techniques? **(4 marks)**
- b. State factors involved in transcriptional regulation. **(2 marks)**
- c. Highlight three common types of mutations that can alter the genetic code. **(4 marks)**
3. a. Using a diagram explain how genes are structured to ensure their expression **(4 marks)**
- b. Briefly explain steps involved in Agro bacterium-mediated gene transfer. **(4 marks)**
- c. State two direct gene transfer methods. **(2 marks)**

SECTION B [40 MARKS]

Answer any TWO QUESTIONS in this Section.

Q3. (a) You have extracted DNA fragment from a plant sample. Describe the steps involved in Polymerase Chain Reaction for further molecular experiments. **(12 marks)**

(b) Enumerate various steps that will involve cloning of the above DNA fragment into *Escherichia coli* for downstream experiments. **(8 marks)**

Q4. (a) Describe the 3-dimensional structure of DNA. **(8 marks).**

(b) Discuss protein structure including peptides bonds, protein folding and the higher ordered structure (primary-quaternary structure). **(12 marks)**

Q5. Transcription and translation are two main processes in gene expression. Discuss in details these two processes. **(20 marks)**