**FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE**

**DEPARTMENT OF ANIMAL PRODUCTION AND HEALTH**

**BACHELOR OF SCIENCE HONOURS DEGREE IN ANIMAL PRODUCTION AND HEALTH**

**Molecular Biology (NAP 1103)**

**SEMESTER 1 EXAMINATION**

**June 2023**

| | |
|---|---|
| **Time Allowed:** | **3 hours** |
| **Special Requirements:** | **None** |
| **Examiner's Name:** | **K. Mafunga** |

***Instructions to Candidates:***

1. *The paper consists of six questions, answer **ALL** questions in **Section A** and **ANY TWO** in **Section B**.*
2. *Marks for each question are shown in brackets. Where a question has subdivisions, the marks for each subdivision are given.*
3. *Illustrate your answer, where applicable, with large clearly labelled diagrams.*

**MARK ALLOCATION**

| **QUESTION** | **MARKS** |
|---|---|
| SECTION A | **60** |
| SECTION B | **40** |
| **TOTAL ATTAINABLE MARKS** | **100** |

***This paper consists of three printed pages including this one.***

**SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION**

**Question 1**

a. Explain the importance of gene mutations in agriculture. **[6 marks]**

b. Describe the following types of point mutation:

   i. Missense mutation **[2 marks]**

   ii. Nonsense mutation **[2 marks]**

   iii. Silent mutation. **[2 marks]**

c. Using diagrams, describe the following types of gene mutation:

   i. Translocation **[3 marks]**

   ii. Deletion **[3 marks]**

   iii. Substitution **[3 marks]**

   iv. Insertion. **[3 marks]**

**Question 2**

a. Describe the anatomy of:

   i. Lactose (*lac*) operon **[8 marks]**

   ii. Tryptophan (*trp*) operon. **[8 marks]**

b. Describe the regulation of gene expression in prokaryotes under the following headings:

   i. Tryptophan (*trp*) operon. **[10 marks]**

   ii. Lactose (*lac*) operon). **[10 marks]**

**SECTION B: ANSWER ANY TWO QUESTIONS IN THIS SECTION**

**Question 3**

c. Describe the structure of a DNA molecule. **[8 marks]**

d. Describe the process of DNA replication. **[12 marks]**

**Question 4**

Describe the process of gene expression in eukaryotes under the following headings:

   i. Transcription **[8 marks]**

ii. Post-transcriptional modification **[4 marks]**

iii. Translation. **[8 marks]**

**Question 5**

Describe the mechanisms of DNA damage and repair. **[20 marks]**

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**END OF QUESTION PAPER**