



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE  
DEPARTMENT OF ANIMAL SCIENCE

---

BACHELOR OF SCIENCE HONOURS DEGREE IN ANIMAL PRODUCTION AND  
HEALTH

Molecular Biology (NAP 1103)

SEMESTER 1 EXAMINATION

September 2024

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.*

Copyright: Gwanda State University, 2024

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

**Question 1**

- a. Describe the detailed structure of a DNA molecule. [12 marks]
- b.
- i. Describe the molecular structure of RNA. [10 marks]
- ii. Describe the structure of messenger RNA (mRNA) and transfer RNA (tRNA). [4 marks]
- iii. Explain how the structure of mRNA and tRNA support their respective functions in protein synthesis. [4 marks]

**Question 2**

- a. Describe the structure and function of the *lac* operon in *E. coli*. [10 marks]
- b. Outline the functions of regulatory elements involved in eukaryotic gene expression. [8 marks]

**Question 3**

Explain the following types of point mutation, highlighting the potential impact on gene expression:

- i. Missense mutation, [4 marks]
- ii. Nonsense mutation, and [4 marks]
- iii. Silent mutation. [4 marks]

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

**Question 4**

Explain the mechanisms of gene regulation in prokaryotes under the following headings:

- i. Inducible operons, using the *lac* operon as an example. [10 marks]
- ii. Repressible operons, using the *trp* operon as an example. [10 marks]

### **Question 5**

Discuss the process of gene expression in eukaryotes, focusing on:

- i. Transcription and the role of transcription factors. **[8 marks]**
- ii. RNA processing and its importance in mRNA maturation. **[4 marks]**
- iii. The translation process and the role of ribosomes. **[8 marks]**

### **Question 6**

Describe the various types of DNA repair mechanisms and their importance in maintaining genomic stability. **[20 marks]**

---

**END OF QUESTION PAPER**

**Copyright: Gwanda State University, 2024**