NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE IN BIOTECHNOLOGY

ANIMAL BIOTECHNOLOGY (SBT4105)

Main Examination Paper

DECEMBER 2024

This examination paper consists of 3 pages

Time Allowed	:	3 hours.
Total Marks	:	100
Special Requirements	:	NONE
Examiner's Name	:	DR F.T. TAKAWIRA

INSTRUCTIONS

1. Answer four **(4)** questions. Each question carries 25 marks.
2. Where a question contains subdivisions, the mark value for each subdivision is given in brackets.
3. Illustrate your answer where appropriate with large, clearly labelled diagrams.

MARK ALLOCATION

QUESTION	MARKS
1.	**25**
2.	**25**
3.	**25**
4.	**25**
5.	**25**
6.	**25**
TOTAL	**100**

1. (a) Explain how gene editing tools such as CRISPR-CAS9 enable precise modifications to the genome and outline their potential applications in animal breeding and biotechnology (15 marks)

(b) Discuss the ethical implications of genetically engineered organisms for human health, animal welfare and environmental sustainability. (10 marks)

2. (a) Define **IVF-ET, ZIFT, GIFT, ICSI** and **AI** in animal biotechnology. (10 marks)

(b) Compare and contrast the different types of assisted reproductive technologies used in animal breeding. (15 marks)

3. (a) Describe the principle of light production during detection in pyrosequencing. (5 marks)

(b) Write short notes on the following:

(i) Indirect ELISA. (3 marks)

(ii) Competitive ELISA. (3 marks)

(iii) Sandwich ELISA. (4 marks)

(c) Distinguish between RT-qPCR and conventional PCR. (10 marks)

4. Write an essay on the classical and molecular markers used in animal breeding.

5.(a) Outline the different modes of action and effects of probiotics in animals. (5 marks)

(b) Write short notes on the different categories of feed additives, highlighting their applications. (10 marks)

(c) Describe the production of recombinant bovine somatotrophin. (10 marks)

6.(a) List 5 culture media that are commonly used in mammalian cell culture. (5 marks)

(b) Discuss the principles and applications of mammalian cell culture in animal biotechnology, highlighting their advantages and limitations. (20 marks)

END OF EXAMINATION