

APR 2025

**BINDURA UNIVERSITY OF SCIENCE EDUCATION
BIOLOGICAL SCIENCES DEPARTMENT
HBScBioTec
ANIMAL BIOTECHNOLOGY (BTEC 237/BTEC 418/BZH 408)**

**EXAMINATION
2 HOURS (100 MARKS)**

INSTRUCTIONS

Answer **FOUR** questions. You **MUST** answer **QUESTION 1** (Section A) and any **THREE** questions from Section B. Each question carries **25 MARKS**. Where a question contains subdivisions, the mark value of each subdivision is given in brackets. Illustrate your answers, where appropriate, with large, clearly labelled diagrams. You should not spend more than thirty minutes on each question.

SECTION A (COMPULSORY)

1. Describe a procedure used to sequence an insulin gene using any **ONE** short-read next generation sequencing (NGS) technology.

SECTION B

2. a) Outline the steps used to produce the sheep Dolly. (15 marks)
 b) Explain the ethics associated with human gene cloning. (10 marks)
3. a) Outline the use of artificial embryo twinning in cloning cows. (13 marks)
 b) Write notes on cation lipid mediated gene transfer. (12 marks)
4. Describe the use of microinjection and electroporation techniques in the production of hepatitis B virus vaccine.
5. Using HIV as an example, discuss the applications of gene therapy in human disease.
6. Discuss the ethical considerations in using animals for research.

END OF EXAMINATION QUESTION PAPER