



University of Ruhuna- Faculty of Technology
Bachelor of Biosystems Technology Honors Degree
Level 2 (Semester II) Examination, November/December 2025
Academic year 2023/2024

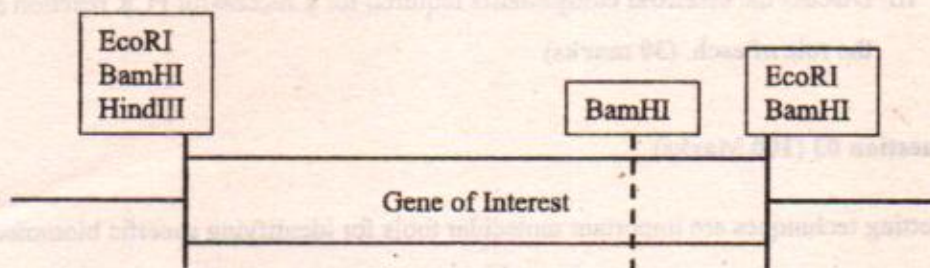
Course Unit: BST 2253 – Gene Technology (Written)

Duration: 2 hours

Answer four (04) Questions only

Question 01 (100 Marks)

A research group found a gene that encodes a protein which delays cancer cell growth. They are now planning to produce this protein on a large scale using molecular cloning techniques. The restriction map of the identified gene is given below.



- I. If they are planning to use **only one** restriction enzyme for the cloning process, what would be the most appropriate enzyme. (5 marks)

- II.
 - a) One researcher suggested that two restriction enzymes is more suitable for the cloning process. Briefly explain the possible reason/s why the researcher suggested to use two restriction enzymes.
 Mention the most suitable restriction enzymes they could use for this cloning. (30 marks)

- b) What **type** of vector do they need to use for this cloning? List the main parts/regions located on this type of vector. (25 marks)
- c) If they use two restriction enzymes for cloning, what are the restriction enzymes they need to use to digest the vector? (10 marks)
- III. Briefly explain why sticky/cohesive ends are more preferred than blunt ends in molecular cloning experiments. (30 marks)

Question 02 (100 Marks)

PCR is one of the most important tools in molecular biology.

- I. Briefly describe the applications of PCR in Molecular Biology. (30 marks)
- II. Outline the main steps of PCR and describe the key events that occur at each stage. (40 marks)
- III. Discuss the **essential components** required for a successful PCR reaction and explain the role of each. (30 marks)

Question 03 (100 Marks)

Blotting techniques are important molecular tools for identifying specific biomolecules.

- I. List **three (03)** advantages of blotting techniques. (15 marks)
- II. Point out **three (03)** limitations of blotting techniques (15 marks)
- III. Discuss the differences **between** the Southern and Western blotting techniques. (70 marks)

Question 04 (100 Marks)

Gene transfer methods are used to deliver recombinant DNA (rDNA) molecules into host cells. These methods are divided into direct transfer methods and indirect transfer methods.

- I. List **one (01) chemical and one (01) physical direct gene transfer method. (10 marks)**

- II.
 - a) Name the **three (03) genetic components** required for *Agrobacterium* - mediated gene transformation? **(15 marks)**
 - b) List the steps of gene transfer into a wounded plant cell by *Agrobacterium*-mediated gene transformation. **(45 marks)**

- III. Write **three (03) methods** used to screen/confirm the transgenic plants. **(30 marks)**

Question 05 (100 Marks)

Write short notes on followings.

- I. CRISPR/Cas9 **(25 marks)**
- II. Requirement of cDNA in cloning eukaryotic genes **(25 marks)**
- III. Importance of selectable markers, screening methods and reporter genes in cloning **(25 marks)**
- IV. Ethical and social implications of gene technology **(25 marks)**

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