



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

B.Sc. Degree in Applied Biology

Third Year Semester I Examination – September/October 2019

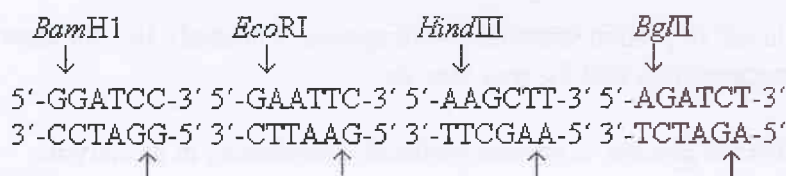
BIO 3201 – MOLECULAR BIOLOGY

Time: Two (02) hours

Answer FOUR (04) questions. You will be provided with a calculator

1. a). Write a brief account on restriction endonucleases, their primary features and their extensive use as a modern molecular biology tool. **(60 marks)**

b). Below are the recognition sites of four restriction enzymes:



Which pair of these enzymes will create compatible (complementary) sticky ends? What is the sequence of this compatible sticky end? **(20 marks)**

c). A newly discovered restriction endonuclease has an 8-base recognition sequence. Approximately how many fragments of the wombat genome (approximately 4.2×10^8 bp in size) would you expect if you digested it with this enzyme?

(20 marks)

2. The following is a DNA sequence of the wild type allele of gene Z that you want to amplify using the polymerase chain reaction (PCR).



- a) What are the essential components to conduct a PCR reaction? State the function of each of these components.

(30 marks)

- b) Pick and write the correct set of primers from the options below, which you would use for PCR reaction in part (a)

Set 1: 5'TACACTTATACTTTC3' and 3'GTAAACCGCGCATTAG5'

Set 2: 5'CTCGAGGTGAATAT3' and 3'CCGCGCATTAGCTAT5'

Set 3: 5'GAGTTACACTTATAC3' and 3'TGGCGAGTAATCGATA5'

(10 marks)

- c) In the PCR reaction, you need a three-step reaction cycle, which results in a chain reaction that produces an exponentially growing population of identical DNA molecules. Each step of a reaction cycle is performed at a specific temperature i.e. 95°C for Step 1, 55°C for step 2 and 70°C for Step 3. Briefly explain why the three steps are performed under different temperatures and describe the PCR process. Use diagrams if necessary.

(60 marks)

3. a) Discuss the process of Prokaryotic DNA replication using *E.coli* as a model organism.

(60 marks)

- b) Contrast this with the DNA replication process of Eukaryotic organisms

(40 marks)

4. Discuss the process of Eukaryotic DNA transcription. In your discussion, include a description about post-transcriptional modification. Use diagrams if required.

(100 marks)

5. a) Describe the levels of protein structure (use diagrams if needed). In your answer, explain why proteins spontaneously fold the way they do.

(30 marks)

- b) Briefly describe the process of protein synthesis (translation) in prokaryotic organisms

(40 marks)

- c) Certain protein synthesis inhibitors such as Aminoglycoside and Tetracycline class antibiotics are known to be selectively toxic against prokaryotic organisms. Using your knowledge of Prokaryotic translation molecular machinery, briefly describe why such antimicrobial agents are selectively toxic against Prokaryotic organisms only.

(30 marks)

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