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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

Bachelor of Science Honors in Microbiology
Fourth Year – Semester I Examination – July/August 2023

MIB 4206 - MOLECULAR BIOTECHNOLOGY

Time: Two (02) hours

Answer ALL questions.

1. a) List **five (05)** biotechnology interventions that have contributed to improve the food industry. **(20 marks)**

   b) Critically evaluate the production of GMOs (genetically modified organisms) in addressing the challenges posed by the global food crisis. **(80 marks)**

2. a) Justify the need for the modification of the *Agrobacterium* Ti plasmid for routine cloning purposes. Use suitable labelled diagrams in your answer. **(40 marks)**

   b) After several seasons of cultivation, a commercially grown transgenic Bt rice variety has encountered two issues. Investigators have reported the development of resistance among the target insect pest population, as well as the horizontal transfer of the Bt gene to wild rice varieties. If you have been appointed as the leader of a research group to solve this problem, propose a detailed process for designing a new transgenic Bt rice to rectify these problems. **(60 marks)**

3. a) List **five (05)** molecular interventions to improve gene expression of a cloned gene in prokaryotes systems. **(20 marks)**

   b) Justify the importance of expressing a protein as a fusion protein in a host organism. **(30 marks)**

   c) Gene Y is expressed naturally under a constitutive promoter. If the desired expression is during the stationary phase of the host bacterial growth curve, design a process to achieve it using a regulatable promoter of your choice. **(50 marks)**

4. a) Explain briefly the key challenges associated with NGS technology. **(30 marks)**

   b) You have been provided with two human lung tissue samples. One of the tissue samples was taken from a suspected cancerous tumor area, while the other was taken from a normal, healthy area of the lung. Using your knowledge of NGS technology, design an experiment to evaluate the gene expression pattern of the two tissue samples. **(70 marks)**

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