RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Applied Biology
Fourth Year – Semester I Examination – January/February 2021

MIB 4205 – TECHNIQUES & STRATEGIES OF MOLECULAR BIOLOGY

Time: Two (02) hours

Answer ALL questions.

1. a) Elaborate why confocal laser-scanning microscopy (CLSM) yields better resolved micrographs when compared to traditional fluorescence microscopy. **(30 marks)**

   b) Hypothesize that a key electron transfer protein of a newly isolated *Pseudomonas* sp. bacterium is localized into its outer membrane. Describe the **general workflow** of an experiment that you will do to test this hypothesis using the green fluorescent protein (GFP) (excitation/emission pair – 395nm/509nm) as a fluorescent reporter and CLSM as the detection system. Assume that you have the means to genetically manipulate the electron transfer protein in question. **(70 marks)**

2. In a hypothetical genetic disease, a gene consisting of 43 exons has a nucleotide deletion in the 15th exon resulting in a frameshift mutation leading to a complete loss of protein expression. It has been confirmed that the cDNA encoding the 15th exon only contributes to an outer structural domain rather than the active site of the protein. Using CRISPR-Cas9 genome editing technology, propose a potential therapeutic strategy to treat the genetic disease. **(100 marks)**

3. Review the technical aspects, strengths and weaknesses of the two most commonly used protein separation techniques used in modern proteomics studies. **(100 marks)**

4. Explain briefly how phage display technique can be utilized to identify cellular receptors that viruses exploit to enter cells. **(100 marks)**

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