(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

MAIN EXAMINATIONS
MAIN CAMPUS

FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
MASTERS OF SCIENCE IN MOELECULAR BIOLOGY

COURSE CODE: SBB 815

COURSE TITLE: ADVANCED MOLECULAR GENETICS

DATE: FRIDAY, 14TH JANUARY 2022 **TIME: 8:00 – 11:00 A.M.**

INSTRUCTIONS TO CANDIDATES

Answer 3 questions QUESTION 1 COMPULSARY

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over.

1. Below are partial DNA sequences of four leaf rust disease (LR) alleles. Answer the questions below based on these sequences.

   ATC GGG TTC TTT GTG GTG TTT TTA TCT GTG CTT CCC TAT GCA

   ATC GGG TTC TTG TGG TGT TTT TAT CTG TGC TTC CCT ATG CAC

   ATC GGG TTC TTT GTG GTG TTT GTA TCT GTG CTT CCC TAT GCA

   ATC GGG TTC TTT GTG GTG TTT TAA TCT GTG CTT CCC TAT GCA

   i) Below each sequence, write the mRNA sequence that would be produced during transcription (4 Marks)

   ii) Assuming the top allele is from an unaffected plant and the others are from affected plants, what type of mutation is found in each of the lower three alleles? What major type of point mutation is NOT found in these sequences? (5 Marks)

   iii) Under the mRNA sequence, write the protein produced during translation. Refer to the translation table in attached. (6 Marks)

   iv) For each of the lower three alleles, describe how the protein produced is different from that of the unaffected individual. (3 Marks)

   v) Do you think the differences in these protein sequences will affect the function of each of the proteins? Why or why not? (3 Marks)

   vi) You are a scientist at an up-and-coming plant research center and have identified a region of the Leaf Rust disease (LR) gene that you would like to target for gene silencing. First, though, you must amplify that region and test its behavior with indicator plants. In the space below, describe a procedure that would allow you to amplify a specific 476 base pair region of your gene of interest. Include in the discussion/ illustration the principle behind the process and the key enzyme involved. (9Mks)

2. Explain the function and the regulation of the operon system in bacteria in reference to
   a. Repression
   b. Activation
   c. anti-sense control

3. Distinguish between the following Non-Mendelian inheritance
   a. Co-dominance (7 Marks)
   b. Incomplete dominance (6 Marks)
   c. Epistasis (7 Marks)

4. Discuss any two the genetic disorders associated with Non-Mendelian inheritance (20 Marks)