

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE
OF BACHELOR OF SCIENCE IN AGRICULTURE**

BOTA 411: INTRODUCTION TO MOLECULAR GENETICS

STREAM: BSc AGRIC (Y4S1)

TIME: 2 HOURS

DAY/DATE: THURSDAY 25/03/2021

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

Answer all the questions in Section I and **TWO** questions in Section II

Do not write anything on the question paper

SECTION I: COMPULSORY (30 Marks)

1. State the functions of the following enzymes in the DNA replication:
 - (a) Primases. (1 mark)
 - (b) DNA Ligase. (1 mark)
 - (c) DNA gyrase. (1 mark)
 - (d) SSB protein. (1 mark)
2. (a) Compare and contrast the prokaryotic and Eukaryotic promoter. (4 marks)
(b) List the second generation sequencing methods, giving their advantages and disadvantages against the Sanger dideoxyl sequencing method. (5 marks)
3. A particular gene has three allele (A1, A2 and A3). If the three different polypeptides resulting from these alleles can randomly combine with each other in all combinations to form functional protein molecules, each consisting of two of the polypeptides (dimer),

- (a) How many different molecules could possibly be formed in a very large population of this diploid organism? (2 marks)
- (b) Using the symbols given for the three alleles, list the possible protein molecules. (3 marks)
- (c) Write down the maximum number of different protein molecules that could be found in any other organism. (2 marks)
- (d) Give an explanation for the answer given in 3(c) above. (2 marks)
4. The following is a sequence of anticodons.
UAC-CGU-AAC-UCC
- Using the sequence determine the:
- (a) mRNA codons (2 marks)
- (b) Transcribed DNA strand (2 marks)
- (c) Complementary DNA strand (2 marks)

SECTION II (40 marks) Answer any TWO questions

5. (a) Illustrate the lac-operon in *E. coli*. (10 marks)
- (b) Describe the structure of DNA polymerase. (10 marks)
6. (a) Differentiate the three types of DNA structures. (15 marks)
- (b) Describe translation mutation. (5 marks)
7. (a) Describe the mechanisms of terminating translation in prokaryotes. (12 marks)
- (b) Describe the mechanism of splicing in eukaryotic nuclei. (8 marks)
-