

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE

AGRI 421: INTRODUCTION TO MOLECULAR GENETICS

STREAMS: BSC AGRIC (Y4S1)

TIME: 2 HOURS

DAY/DATE: FRIDAY 06/12/2019

2.30 P.M. – 4.30 P.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. Explain the following terms:
 - (i) Presence absence variation. (2 marks)
 - (ii) Copy number variation. (2 marks)
2. State the functions of the following enzymes in DNA replication:
 - (a) DNA polymerase I (1 mark)
 - (b) DNA polymerase III (1 mark)
 - (c) DNA Ligase (1 mark)
 - (d) DNA gyrase (1 mark)
 - (e) SSB protein (1 mark)
3. Illustrate why the genetic code shows degeneracy. (5 marks)
4. (a) The following interrupted length of DNA constitutes a gene in a eukaryotic organism.

3'-TACCGACCC.....TGCATT-5'
5'-ATGGCTGGG.....ACGTAA-3'

Giving reasons, indicate which side of the DNA duplex (left to right) is transcribed?

(3 marks)

- (b) The following DNA sequence represents part of a transcribed gene.
TACCCCCACGAGTTATATATACGGGGGGTTAAACTCCATCATCAT

If all the nucleotide triplets that contain a C constitute intron DNA and all others exon:

- (i) Show the RNA transcript. (5 marks)
(ii) Show the processed mRNA. (5 marks)
(iii) List the amino acids synthesis from the above gene transcript. (3 marks)

SECTION II (40 MARKS)

5. (a) Briefly describe Rho-independent termination method of transcription in eukaryotes. Indicate the important features of this mechanism. (10 marks)

- (b) Describe the mechanisms of splicing in eukaryotic nuclei. (10 marks)

6. (a) Illustrate the lac-operon in *E. coli*. (10 marks)

- (b) List the enzyme that would be produced constitutively by each of the following genotypes. (10 marks)

- (i) . (4 marks)

- (ii) . (3 marks)

- (iii) . (3 marks)

7. (a) Discuss the point mutations that occur in DNA sequences encoding proteins. (10 marks)

- (b) Describe the gene editing. (10 marks)
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