

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR
OF SCIENCE IN BOTANY

BOTA 413: MICROBIAL AND MOLECULAR GENETICS

STREAMS: BSC (BOTA)

TIME: 2 HOURS

DAY/DATE: TUESDAY 11/04/2023

11.30 A.M. – 1.30 P.M.

INSTRUCTIONS:

1. (a) Using appropriate diagram describe the chemical structure of a DNA. [3 marks]
(b) Explain the importance of determining the polarity of DNA for a molecular biologist. [3 marks]
2. Describe the role of the following features of a gene
(i) Promoter [2 marks]
(ii) Introns [2 marks]
3. (a) Explain the flow of information from the DNA to the characteristics of an organism. [3 marks]
(b) Describe the desirable features of a plasmid [3 marks]
4. (a) Using the DNA sequence below determine the sequence of RNA that would be formed after transcription. [2 marks]
5' GGCTAGCGATCAGGCTAGACATCCTAAGGTGGCCTTGAAGAC 3'
(b) Below is a sequence of DNA obtained from a gene. With explanation, determine the most probable position of the sequence within the gene. [2 marks]
GCCTGCTAGTAATGCTTTTAAAAAA

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5. The figure below shows the genetic code. Use it to answer the questions that follow

- (i) Determine the protein sequence that would be formed after translation of the following RNA sequence

5'GCAUCACCGCAGUCGAUCGAUCGA 3' [2 marks]

- (ii) Using the RNA sequence below and genetic code show how a frameshift mutation affects the product of a gene [2 marks]

5' GCAUCACCGCAGUCGAUCGAUCGA 3'

- (iii) Use any 2 examples from the genetic code above to show that it is degenerate.

[2 marks]

6. (a) State the differences between insertion sequence and composite transposons.

[2 marks]

- (b) Using an appropriate diagram illustrate a typical program for amplification of DNA in a thermocycler during PCR.

[2 marks]

SECTION B

7. (a) Discuss the methods through which genetic recombination happens in bacteria

[10 marks]

- (b) Discuss the enzymes involved in DNA replication.

[10 marks]

8. (a) Describe the types of genetic mutations.

[10 marks]

- (b) Describe post translational modifications of proteins

[10 marks]

9. (a) Describe the general steps of extraction of DNA from cells.

[10 marks]

- (b) Describe the recombinant gene cloning process.

[10 marks]