

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF DEGREE
OF MASTER OF SCIENCE IN MICRONIOLOGY AND BIOTECHNOLOGY
AND MASTER OF SCIENCE IN ANIMAL BREEDING AND GENOMICS**

MICB 835/GENE 841: BIOCHEMICAL AND MOLECULAR GENETICS

STREAMS: M.Sc

TIME: 3 HOURS

DAY/DATE: WEDNESDAY 14/07/2021

8.30 A.M. – 11.30 A.M.

INSTRUCTIONS:

Answer any THREE questions

Do not write anything on the question paper

QUESTION ONE (20 MARKS)

- (a) A single base and a single deletion approximately 15 base pairs apart in the DNA coding for an enzyme caused a change in the amino acid sequence from,

----lys-ser-pro-ser-leu-ans-ala-ala-lys-----

to the abnormal form,

---lys-val-his-his-leu-met-ala-ala-lys-----

From the available codon information (see attached genetic code), determine the segment of mRNA for both the original polypeptide and that resulting from the double mutant.

(7

marks)

- (i) State the base added? (0.5 marks)
- (ii) Sate the base deleted? (0.5 marks)

(b) The following polyribonucleotides were used in an in vitro system to synthesis polypeptides. Which amino acids would be expected to be incorporated into the polypeptide, of a length of four amino acids, in each case?

- (i) Poly G. (4 marks)
- (ii) Poly GU. (4 marks)
- (iii) Poly UA. (4 marks)

QUESTION TWO (20 MARKS)

Discuss four of the next generation sequencing technologies, comparing their performance with that of Sanger dideoxy sequencing. (20 marks)

QUESTION THREE (20 MARKS)

- (a) Describe the process of DNA transcription in prokaryote. (14 marks)
- (b) Discuss the two strategies of gene therapy. (6 marks)

QUESTION FOUR (20 MARKS)

- (a) Discuss two genome mapping strategies. (10 marks)
 - (b) A particular gene has three alleles (A1, A2 and A3). If the three polypeptides resulting from these alleles can randomly combine with each other in all combinations to form functional protein molecules, each consisting of the two polypeptides (dimer),
 - (i) How many different molecules could possibly be formed in a very large population of this diploid organism? (2 marks)
 - (ii) Using the symbols given for the three alleles, list the possible protein molecules. (3 marks)
 - (iii) Giving an explanation, write down the maximum number of different protein molecules that could be found in any one organism. (5 marks)
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