CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

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

AGRI 421: INTRODUCTION TO MOLECULAR GENETICS

STREAMS: B.Sc (AGRIC) Y4S1 **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 5/12/2018 **2.30 AP.M - 4.30 P.M.**

INSTRUCTIONS:

- **Answer ALL Questions in Section I and any TWO Questions in Section II**

SECTION I: [30 MARKS] - ANSWER ALL QUESTIONS

1. State the functions of the following enzymes in DNA replication: [4 Marks]
   (a) DNA polymerase I
   (b) DNA polymerase III
   (c) DNA Ligase
   (d) DNA gyrase

2. Double-stranded DNA from a particular species is 24% guanine. What are the proportions of the other nitrogenous bases in this DNA? [2 Marks]

3. A single base addition and a single base deletion approximately 15 base pairs apart in the DNA coding for enzyme caused a change in the amino acid sequence from,
   …lys-ser-pro-ser-lue-asn-ala-ala-lys…..

   to the abnormal form,
   …lys-val-his-his-leu-met-ala-ala-lys…..

   (a) 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. [8 Marks]
   (b) Which base was added? [½ Marks]

   (c) Which base was deleted? [½ Marks]

4. The following polyribonucleotides were used in an in vitro system to synthesize polypeptides. Which amino acids would be expected to be incorporated into the polypeptide, of a length of five amino acids, in each case?
   (i) Poly G [5 Marks]
   (ii) Poly GU [5 Marks]
   (iii) Poly AU [5 Marks]

SECTION II: [40 MARKS] - ANSWER ANY TWO QUESTIONS.

5. (a) Compare and contrast eukaryotic and prokaryotic promoters. [10 Marks]

   (b) Briefly describe Rho-independent termination method of transcription in eukaryotes. Indicate the important features of this mechanism. [10 Marks]

6. (a) Illustrate the *lac-operon* in *E.Coli.* [10 Marks]
   (b) Discuss the mechanisms of terminating translation. [10 Marks]

7. (a) Describe gene editing. [10 Marks]
   (b) Briefly discuss four of the next generation sequencing technologies. [8 Marks]

   (c) State the advantage and disadvantage of next generation sequencing over Sanger dideoxyl sequencing method. [2 Marks]

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