CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

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

AGRI 421: INTRODUCTION TO MOLECULAR GENETICS

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

DAY/DATE: FRIDAY 8/12/2017 **8.30 A.M - 10.30 A.M.**

INSTRUCTIONS:

- **Answer ALL Questions in Section I and any TWO in Section II**
- **Do not write anything on the question paper**

SECTION I [30 MARKS]

1. Explain the following terms. [6 Marks]
   (i) DNA cloning
   (ii) Gene targeting
   (iii)Transition mutation

2. (a) Explain six characteristics of A-DNA structure. [6 Marks]

   (b) Describe briefly second generation sequencing methods, giving their advantages and disadvantages against the Sanger dideoxyl sequencing method. [5 Marks]

3. Explain the functions of the following enzymes/protein in DNA replication. [7 Marks]
   (a) DNA polymerase I
   (b) DNA polymerase II
   (c) DNA polymerase III
   (d) Ligases
   (e) SSB proteins
   (f) DNA gyrase
   (g) Primases

4. The transcribed polynucleotide strand and the DNA duplex has the following sequence:
   3'-TACCGATCCGAGCT-5'

   Construct (a) the RNA molecule which would be transcribed from this polynucleotide strand and (b) the complementary DNA polynucleotide strand. [6 Marks]

SECTION II [40 MARKS]

5. (i) Illustrate the *lac-operon* in *E.coli.* [10 Marks]
   (ii) Discuss mechanisms of terminating translation. [10 Marks]

6. Describe gene editing. [10 Marks]

7. List the enzymes that would be produced constitutively by each of the following genotypes. [10 Marks]

   (i) $I^-0^+Z^+Y\text{-}A^+//F`I^+O`Z^-Y\text{-}A^-$

   (ii) $I^+O^+Z^-Y^+A^+//F`I^-O^+Z^+Y\text{-}A^+$

   (iii)$I^-O`Z^-Y^-A^-//F`I^-O`Z^+Y\text{-}A^-$

8. (a) Discuss the point mutations that occur in DNA sequenced encoding proteins. [10 Marks]

   (b) Briefly outline the following methods of termination of transcription in eukaryotes. Indicate the important features of these mechanisms.
   (i) Rho-dependent
   (ii)
   (iii) [5 Marks]
   (iv)Rho-independent [5 Marks]

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