

- j) Describe the role of the following enzymes
- i. RNA polymerase I (1 mark)
 - ii. RNA polymerase II (1 mark)
 - iii. RNA polymerase III (1 mark)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTIONS TWO (20 MARKS)

- a) Discuss CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats)/CAS9 in Biotechnology. (5 marks)
- b) Using a diagram where possible discuss gene structure. (15 marks)

QUESTIONS THREE (20 MARKS)

- a) Design a colorimetric based biosensor utilizing the bacterial genome to monitor bacterial contaminations of waste water. (10 marks)
- b) Discuss by deducing the open reading frame, the tRNA sequence and the amino-acid sequence of the following gene sequence which has been extracted from the segment of the genome coding for hemoglobin: (10 marks)

5'GTGAACGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACTAC
ATGGTGCATCTGACTCCTGAGGAGAAGTCTGCCGTTACTGCCCTGTGGGGCAAGGTGA
ACGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACCCCTGGAC
CCAGAGGTTCTTTGAGTCCTTTGGGGATCTGTCCACTCCTGATGCTGTTATGGGCAACC
CTAAGGTGAAGGCTCATGGCAAGAAAGTGCTCGGTGCCTTTAGTGATGGCCTGGCTCA
CCTGGACAACCTCAAGGGCACCTTTGCCACACTGAGTGAGCTGCACTGTGACAAGCTG
CACGTGGATCCTGAGAACTTCAGGCTCCTGGGCAACGTGCTGGTCTGTGTGCTGGCCC
ATCACTTTGGCAAAGAATTCACCCACCAAGTGCAGGCTGCCTATCAGAAAGTGGTGGC
TGGTGTGGCTAATGCCCTGGCCCACAAGTATCACTAATATCAGAAAGTGGTGGCTGGT
GTGGCTAATGCCCTGGCCCACAA-3'

QUESTION FOUR (20 MARKS)

Discuss the production of a transgenic mice using genetically engineered embryonic stem (ES) cells.

QUESTIONS FIVE (20 MARKS)

Discuss a bacteria plasmid vector as a good vehicle for genetic modification of plants genome.