

j) Describe the role of the following enzymes

- a. RNA polymerase I (1 mark)
- b. RNA polymerase II (1 mark)
- c. RNA polymerase III (1 mark)

SECTION B: ANSWER ANY OTHER TWO QUESTION

QUESTION TWO (20 MARKS)

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

QUESTION THREE (20 MARKS)

- a) Discuss at least 5 methods of plant genetic modifications other than genetic engineering (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
ATGGTGCATCTGACTCCTGAGGAGAAGTCTGCCGTTACTGCCCTGTGGGGCAAGGTGAA
CGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACCCTTGGACCC
AGAGGTTCTTTGAGTCCTTTGGGGATCTGTCCACTCCTGATGCTGTTATGGGCAACCCTA
AGGTGAAGGCTCATGGCAAGAAAGTGCTCGGTGCCTTTAGTGATGGCCTGGCTCACCTG
GACAACCTCAAGGGCACCTTTGCCACACTGAGTGAGCTGCACTGTGACAAGCTGCACG
TGGATCCTGAGAACTTCAGGCTCCTGGGCAACGTGCTGGTCTGTGTGCTGGCCCATCAC
TTTGGCAAAGAATTCACCCACCAAGTGCAGGCTGCCTATCAGAAAGTGGTGGCTGGTGT
GGCTAATGCCCTGGCCCACAAGTATCACTAATATCAGAAAGTGGTGGCTGGTGTGGCTA
ATGCCCTGGCCCACAA-3'

QUESTION FOUR (20 MARKS)

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

QUESTION FIVE (20 MARKS)

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