MACHAKOS UNIVERSITY

University Examinations 2022/2023 academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (PUBLIC HEALTH)

HPH 310: BIOTECHNOLOGY AND HEALTH

DATE: **TIME:**

INSTRUCTIONS

1. Answer Question 1 (compulsory) and any two questions in Section B.
2. Use clean well labelled diagrams wherever appropriate.

SECTION A (COMPULSORY)

a) With illustration describe the role of BamHI and HindIII in cloning (3 marks)

b) Describe the Noncomposite transposons (3 marks)

c) Outline 3 features of plasmid vectors which make them better in monitoring recombinant DNA (3 marks)

d) Discuss the following terminologies highlighting their significance
   i. Histones
   ii. Methyl guanosine
   iii. Okazaki fragments

e) Distinguish between Adenine and Cytosine (3 marks)

f) Describe three types of RNA. (3 marks)

g) Deduce the amino acid sequence of the DNA sequence shown below (3 marks)

h) Describe two factors which could lead to unstable mRNA and its nontranslocations to the eucaryotic cytoplasm during gene expressions (3 marks)

i) Outline the use of Cre-loxP genes in biotechnology (3 marks)

j) Describe the key stages in genetic engineering (3 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS

QUESTIONS TWO (20 MAKS)

a) Discuss CRISPR/CAS9 technology and its use in fighting diseases (10 marks)

a) Using a diagram where possible discuss the gene structure (10 marks)

QUESTIONS THREE (20 MARKS)

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:

5'GTGAACGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACTAC
ATGGTGCATCTGACTCCTGAGGAGAAGTCTGCCGTTACTGCCCTGTGGGGCAAGGTGAA
CGTGGATGAAGTTGGTGGTGAGGCCCTGGGCAGGCTGCTGGTGGTCTACCCTTGGACCC
AGAGGTTCTTTGAGTCCTTTGGGGATCTGTCCACTCCTGATGCTGTTATGGGCAACCCTA
AGGTGAAGGCTCATGGCAAGAAAGTGCTCGGTGCCTTTAGTGATGGCCTGGCTCACCTG
GACAACCTCAAGGGCACCTTTGCCACACTGAGTGAGCTGCACTGTGACAAGCTGCACG
TGGATCCTGAGAACTTCAGGCTCCTGGGCAACGTGCTGGTCTGTGTGCTGGCCCATCAC
TTTGGCAAAGAATTCACCCCACCAGTGCAGGCTGCCTATCAGAAAGTGGTGGCTGGTGT
GGCTAATGCCCTGGCCCACAAGTATCACTAATATCAGAAAGTGGTGGCTGGTGTGGCTA
ATGCCCTGGCCCACAA-3'

QUESTION FOUR (20 MARKS)
Discuss the production of vaccines using embryonic stem (ES) cells.

QUESTION FIVE (20 MARKS)
Discuss in a stepwise process the construction of cDNA libraries using EcoR1 linkers.