MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH YEAR SUPPLEMENTARY /SPECIAL EXAMINATION FOR

BACHELOR OF SCIENCE (AGRICTULTURAL EDUCATION AND EXTENSION)

BACHELOR OF SCIENCE (BIOLOGY)

SBT 420: BIOTECHNOLOGY

DATE: 15/3/2022 **TIME : 2:00 – 4:00PM**

INSTRUCTIONS

1. Anwer Question 1 (compulsory) and **any two** questions in Section B.

Instructions

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

SECTION A

QUESTION ONE (30 MARKS)

a) Distinguish between Guanine and Uracil (3 marks)

b) Describe the features of tRNA (3 marks)

c) Describe the use of transposon in mutations (3 marks)

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

3’ 5’
ATGAGTAACGCG
5’ TACTCATTGCGC 3’

e) Describe the nonpunctuating property of genetic code (3 marks)

f) Describe the traslocation of Eucaryotic mRNA during gene expressions (3 marks)

g) With the help of Cre-loxP genes describe mutation (3 marks)

h) Describe the functions of CAS9 enzyme in Biotechnology (3 marks)

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

j) Describe RNA polymerase III (3 marks)

SECTION B

QUESTION TWO

a) Discuss Somatic hybridization (10 marks)
b) Discuss the use of CRISPR /CAS9 in Biotechnology (10 marks)

QUESTION THREE.

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: (20 marks)

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

QUESTION FOUR
Discuss the steps in the genetic engineering of the Embryonic stem cells (20 marks)

QUESTION FIVE
Discuss the applications of *Agrobacterium tumefaciens* in agricultural engineering (20 marks)