



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FOURTH SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN BIOLOGY

SBT 418: MICROBIAL GENETICS

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

QUESTION ONE (30 MARKS)

- a) Briefly describe the replica plate method of testing for successful mutants (3 marks)
- b) Explain the antiparallel nature of a DNA double helix (3 marks)
- c) Illustrate the synthesis of cDNA from a mRNA template (3 marks)
- d) Describe three types of point mutations (3 marks)
- e) Explain three ways of making a bacterial cell competent for transformation (3 marks)
- f) Briefly explain the role of the F factor plasmid in bacteria (3 marks)
- g) One cannot reliably predict the sequence of nucleotides on mRNA or DNA by observing the amino acid sequence of proteins. Justify (3 marks)
- h) Illustrate phosphodiester linkage in DNA (3 marks)
- i) Briefly discuss the structural differences between DNA and RNA (3 marks)
- j) Study the following segment of DNA: Show the direction of replication of the new strands and explain what causes lagging and leading strands to show different patterns of replication (3 marks)

$$\begin{array}{c} 5' \text{A T C G G C T A C G T T C A C } 3' \\ 3' \text{T A G C C G A T G C A A G T G } 5' \end{array}$$
- k) The following sequence represents triplets on DNA: Give the mRNA codons and tRNA anticodons that correspond with this sequence (3 marks)

TAC CAG ATA CAC TCC CCT GCG ACT

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

Discuss the process of gene expression

QUESTION THREE (20 MARKS)

Discuss the semi-conservative DNA replication

QUESTION FOUR (20 MARKS)

Discuss the regulation of prokaryotic gene expression

QUESTION FIVE

- a) Discuss the concept of biofilm formation (10 marks)
- b) Discuss the transfer of genetic material through transduction. (10 marks)