



**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

(MAIN CAMPUS)

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

FOURTH YEAR SECOND SEMESTER MAIN EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE, MEDICAL BIOTECHNOLOGY**

COURSE CODE: BMB 421

**COURSE TITLE: GENE EXPRESSION SYSTEMS AND
SEQUENCES**

DATE: 17TH APRIL 2023

TIME: 11.00AM – 1.00PM

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**). **Answer all questions. DO NOT WRITE ON THE QUESTION PAPER.**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over

Page 1 of 4

SECTION A: Multiple Choice Questions (20 Marks)

1. Polysomes do not contain:
 - a. Protein
 - b. DNA
 - c. m-RNA
 - d. t-RNA
2. Translocase is an enzyme required in the process of:
 - a. DNA replication
 - b. RNA synthesis
 - c. Initiation of protein synthesis
 - d. Elongation of peptides
3. Which of the following genes of the E. coli "Lac operon" codes for a constitutive protein?
 - a. The a gene
 - b. The i gene
 - c. The c gene
 - d. The z gene
4. The anticodon region is an important part of the structure of:
 - a. r-RNA
 - b. t-RNA
 - c. m-RNA
 - d. hn-RNA
5. Another name for reverse transcriptase is:
 - a. DNA dependent DNA polymerase
 - b. DNA dependent RNA polymerase
 - c. RNA dependent DNA polymerase
 - d. RNA dependent RNA polymerase
6. Degeneracy of the genetic code denotes the existence of:
 - a. Codons consisting of only two bases
 - b. Codons that include one or more unusual bases
 - c. Different protein synthesizing systems in which a given triplet codes for different amino acids
 - d. Multiple codons for a single amino acid
7. In contrast to eukaryotic m-RNA, prokaryotic m-RNA is characterised by:
 - a. Having 7 – methyl guanosine triphosphate at the 5' – end
 - b. Being polycistronic
 - c. Being only monocistronic
 - d. Being synthesised with introns
8. Which of the following is transcribed during repression
 - a. Structural gene

- b. Promoter gene
 - c. Regulator gene
 - d. Operator gene
9. Synthesis of RNA molecule is terminated by a signal which is recognized by:
- a. α – factor
 - b. β – factor
 - c. δ – factor
 - d. ρ – (rho) – factor
10. In *E. coli*, the chain initiating amino acid in protein synthesis is:
- a. N- formyl methionine
 - b. Methionine
 - c. Serine
 - d. Cysteine
11. binds to 30S subunit and inhibits binding of aminoacyl t-RNAs
- a. Tetracyclines
 - b. Puromycin
 - c. Erythromycin
 - d. Chloramphenicol
12. binds to 50S subunit and inhibits translocation
- a. Tetracyclines
 - b. Puromycin
 - c. Erythromycin
 - d. Chloramphenicol
13. How many high – energy phosphate bond equivalents are required for amino acid activation in protein synthesis?
- a. One
 - b. Two
 - c. Three
 - d. Four
14. Elongation of a peptide chain involves all the following, except:
- a. m- RNA
 - b. GTP
 - c. Formyl – met – t-RNA
 - d. Tu, Ts and G factors
15. In the biosynthesis of c-DNA, the joining enzyme ligase requires:
- a. GTP
 - b. ATP
 - c. CTP
 - d. UTP
16. Polypeptide chain formation occurs:

- a. From amino terminus to carboxy terminus
 - b. From amino terminus
 - c. From carboxy terminus
 - d. During starvation
17. Diphtheria toxin inhibits protein synthesis:
- a. By inactivating initiation factor
 - b. By inactivating elongation factor
 - c. By preventing peptide bond formation
 - d. By combining with ribosomes
18. While studying the structure of a small gene that was recently sequenced during the human genome project, an investigator notices that one strand of the DNA molecule contains 20 As, 25 Gs, 30 Cs, and 22 Ts. How many of each base is found in the complete double – stranded molecule?
- a. A = 44, G = 60, C = 50, T = 40
 - b. A = 45, G = 45, C = 52, T = 52
 - c. A = 50, G = 47, C = 50, T = 47
 - d. A = 42, G = 55, C = 55, T = 42
19. Which of the following is best described as being trans – acting?
- a. CAP site
 - b. Operator
 - c. Promoter
 - d. Repressor
20. Bacteria have
- a. 70S ribosomes
 - b. 60S ribosomes
 - c. 50S ribosomes
 - d. 80S ribosomes

SECTION B: Short Answer Questions (40 marks)

1. Briefly discuss the properties of chaperones involved in gene expression processes in both eukaryotes and prokaryotes (8 marks).
2. What is the difference between inducible and constitutive genes in prokaryotes (8 marks).
3. Briefly discuss two (2) post – transcriptional modifications of RNA (8 marks).
4. State six requirements needed in the process of translation (8 marks).
5. Briefly describe four (4) components of the operon (8 marks).

SECTION C: Long Answer Questions (60 marks)

1. Describe in detail four (4) stages involved in the process of transcription (20 marks).
2. Describe five (5) methods of gene regulation expression in eukaryotes (20 marks).
3. Demonstrate the laboratory protocol for chain termination method as applied in gene sequencing (20 marks).