(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE MEDICAL BIOTECHNOLOGY
MAIN EXAM

COURSE CODE: **BMB 421**

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

DATE: **29TH MAY 2019** **TIME:** **3.00 -5.00 PM**

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**).

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

SECTION A: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Which of the following statements is not correct?
A) Bacteria possess only one type of RNA polymerase
B) Attenuation is a regulatory process used by bacteria to control the initiation of transcription
C) Repressor binds to operator
D) Bacterial genes are polycistronic

2. 2. Which of the following bacterial operon is not controlled by attenuation?
A) Arabinose
B) Tryptophan
C) Leucine
D) Histidine

3. Which of the following is the most appropriate definition of an operator?
A) A non-coding, regulatory DNA sequence that is bound by RNA polymerase
B) A non-coding, regulatory DNA sequence that is bound by a repressor protein
C) A DNA-binding protein that regulates gene expression
D) A cluster of genes that are regulated by a single promoter

4. To which class of transcription factor do nuclear receptors belong?
A) Zinc finger proteins
B) Leucine zipper proteins
C) Helix-turn-helix proteins
D) Helix-loop-helix proteins

5. Which of the following statements about lac operon in e.coli is true?
A) Promoter is the binding site for the lac repressor
B) Operon is only switched on in the absence of lactose in the growth medium
C) β-galactosidase is only produced in large quantities when the lac repressor is bound to the operator
D) Lac operon mRNA is a polycistronic mRNA

6. Which of the following statements regarding the regulation of trp operon expression by attenuation is correct?
A) Rapid translation of the leader peptide prevents completion of mRNA transcript
B) Rapid translation of the leader peptide allows completion of mRNA transcript
C) The leader peptide sequence encodes enzymes required for tryptophan synthesis
D) The leader peptide sequence contains no tryptophan residues

7. Which of the following increases gene expression as much as 200-fold?
A) TATA box
B) Insulator
C) Enhancer
D) CAAT box

8. The mechanism by which CBP activates transcription is
A) CBP has DNA methyl transferase activity
B) CBP has histone acetyl transferase activity
C) CBP interacts with the basal transcription complex
D) CBP interacts with the basal transcription complex and has histone acetyl transferase activity

9. RNAi stands for
A) RNA inducer
B) RNA interference
C) RNA intron
D) RNA insertion

10. Which of the following about mRNA stability is not correct?
A) Regulation of mRNA stability is a way of regulating gene expression
B) Prokaryotic mRNAs have a half-life of only a few minutes
C) Histone mRNAs have especially long poly-A tails and are stable
D) It is thought that poly-A tails stabilize eukaryotic mRNAs

11. DNA sequencing refers to the
A) Technique used to determine sugar sequence in a DNA molecule
B) Technique used to determine phosphate sequence in a DNA molecule
C) Technique used to determine base sequence in a DNA molecule
D) All of these

12. Which of the following is a chemical nucleotide sequencing method?
A) Sanger
B) Maxam-Gilbert
C) Edmans method
D) Automated sequencing method

13. The enzyme used in Maxam-Gilbert method for ^{32}P labelling of the DNA at 5' end is
A) Polynucleotide kinase
B) Alkaline phosphatase
C) Exonuclease
D) Terminal nucleotidyl transferase

14. How many different types of chemical treatments are required in Maxam-Gilbert method?
A) 1
B) 2
C) 3
D) 4

15. Guanine specific cleavage in Maxam-Gilbert method is done by using
A) Formic acid
B) Hydrazine
C) Dimethyl sulphate
D) Piperidine

16. The principle of Sanger's method relies on
A) Use of chemicals for base specific cleavage
B) Use of dNTPs for chain termination
C) Use of ddNTPs for chain termination
D) Use of ^{32}P chain termination

17. The samples in Sanger's method after reaction are separated using
A) AGE
B) PAGE
C) PFGE
D) 2-D gel electrophoresis

18. Which of the following sequencing methods uses PCR for generating sequencing templates?
A) Sanger's
B) Sanger's methods and LMPCR
C) LMPCR
D) LMPCR and automated DNA sequencing

19. Automated DNA sequencing is an improvement of Sanger's method where
A) ddNTPs are used for chain termination
B) PCR is used for making sequencing templates
C) Fluorescently labelled dNTPs are used for chain termination
D) Fluorescently labelled ddNTPs are used for chain termination

20. Which of the following is not a DNA sequencing method?
A) LMPCR
B) Edmans method
C) Sanger's method
D) Maxam-Gilbert method

SECTION B: SHORT ANSWER QUESTIONS (40 MARKS)

1. Eukaryotic RNA polymerases have different roles in transcription explain. [8 Marks]
2. a) List any four eukaryotic promoter elements. [4 Marks]
   b) Differentiate between splicing and alternative splicing. [4 Marks]
3. Differentiate between prokaryotic and eukaryotic gene expression. [8 Marks]
4. Describe characteristics of the genetic code. [8 Marks]
5. a) List requirements for translation. [4 Marks]
   b) Which factors control gene expression? [4 Marks]

SECTION C: LONG ANSWER QUESTIONS (40 MARKS)

1. Discuss eukaryotic gene expression. [20 Marks]
2. a) Describe Maxam-Gilbert sequencing technique. [10 Marks]
   b) Describe pyro-sequencing. [10 Marks]