



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

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN MEDICAL LABORATORY SCIENCES

COURSE CODE: BML 222

COURSE TITLE: MOLECULAR BIOLOGY AND GENETICS

DATE: 7TH DECEMBER 2020

TIME: 2.00 -4.00 PM

INSTRUCTIONS TO CANDIDATES

- Answer all questions in this paper

TIME: 2 Hours

SECTION A: 20 MARKS

- Which of the following is a DNA nucleotide?
 - Ribonucleoside 5' monophosphate
 - Deoxyadenosine 5' monophosphate
 - Ribo-oxyguanosine 5' monophosphate
 - Ribooxycytosine 5' monophosphate
- Which of the following statements is TRUE about a phosphate group?
 - It is always bonded to the 2' carbon atom of the sugar in a nucleotide
 - It is always bonded to the 3' carbon atom of the sugar in a nucleotide
 - It is always bonded to the 4' carbon atom of the sugar in a nucleotide
 - It is always bonded to the 5' carbon atom of the sugar in a nucleotide
- Which of the following is NOT a model of DNA replication?
 - Conservative replication
 - Duplicative replication
 - Dispersive replication
 - Semiconservative replication
- Which of the following DOES NOT describe polynucleotide strands?
 - A number of nucleotides join to form a polynucleotide strand
 - One end of the strand is known as 5'-end and another end of the strand is known as 3'-end
 - The two strands are anti-parallel
 - Phosphodiester bonds link bases on opposite strands
- Which of the following is not a requirement of DNA replication in the cell
 - Primers
 - DNA template
 - Enzymes
 - Substrates
- Identify the direction of replication
 - 3' to 5'
 - 3' to 3'
 - 5' to 3'
 - 5' to 5'
- Which of the following enzymes catalyzes base excision repairs?
 - Polymerases
 - Endonucleases
 - Glycosylases
 - Photolyase
- Which of the following is true about terminal inverted repeats of transposable elements?
 - They are sequences of 9 to 40bp in Length
 - The sequences are inverted but non complementary
 - They are located in the middle of transposable elements
 - They are 3 to 12 base pairs on both sides
- An RNA coding region is:
 - A sequence of DNA nucleotides that is copied into an RNA molecule
 - The sequence of nucleotides that signals where transcription is to end

- C. The sequence of nucleotides that signals where transcription is to start
 - D. DNA sequence that transcription apparatus recognize and binds
10. Which of the following is an assumption of Hardy-Weinberg Law?
- A. A population is small
 - B. Non-random mating
 - C. Population not affected by migration or natural selection
 - D. Population affected by mutation
11. Which of the following is NOT true about transposition through an RNA intermediate?
- A. The transposable elements excises from old site and inserts at a new site without increase in copy numbers
 - B. Transposable elements that transpose through RNA intermediates are called retrotransposons
 - C. A retrotransposon in DNA is first transcribed into an RNA sequence
 - D. The processed RNA undergoes reverse transcription
12. Which of the following is NOT a component of RNA transcription?
- A. RNA template
 - B. DNA template
 - C. Raw materials or substrates
 - D. Transcription apparatus
13. Which of the following is NOT a critical region of transcription unit?
- A. A promoter
 - B. An RNA coding sequence
 - C. Primers
 - D. Terminator
14. The sequences recognized by restriction enzymes are usually from
- A. 4 to 10 bp
 - B. 6 to 8 bp
 - C. 4 to 12 bp
 - D. 4 to 8 bp
15. Which of the following is true about type III restriction enzymes?
- A. They recognize specific sequences in the DNA and cut the DNA within the recognition sequence
 - B. They recognize specific sequences in the DNA and cut the DNA at random sites that may be some distance (1000 bp or more)
 - C. They recognize specific sequences in the DNA and cut the DNA at nearby sites, usually 25 bp away
 - D. None of the above
16. The class of RNA that carries the coding instructions is:
- A. Ribosomal RNA
 - B. Messenger RNA
 - C. Transfer RNA
 - D. Pre-messenger RNA
17. Which of the following is an RNA hybridization technique
- A. Western blot
 - B. Northern blot
 - C. Polymerase chain reaction
 - D. Restriction fragment length polymorphism

18. The promoter is:
- A sequence of DNA nucleotides that is copied into an RNA molecule
 - The sequence of nucleotides that signals where transcription is to end
 - The sequence of nucleotides that signals where transcription is to start
 - DNA sequence that transcription apparatus recognize and binds
19. During DNA synthesis nucleotides are added to the
- Phosphate group
 - 5' end
 - 3'OH end
 - Sugar
20. DNA fragments that are 500 bp, 1000 bp, and 2000 bp in length are separated by gel electrophoresis. Which fragment will migrate farthest in the gel?
- The 2000-bp fragment
 - The 1000-bp fragment
 - The 500-bp fragment
 - All will migrate equal distances

SECTION B: 40 Marks

- As a molecular biology and genetics student, outline the importance of genetics as a discipline of study [5 Marks]
- Describe the process of tRNA charging during translation [5 Marks]
- Explain how migration affect allele frequencies [5 Marks]
- Explain the principle of gel electrophoresis [5 Marks]
- What is genetic recombination [5 Marks]
- How can PCR be applied today in life [5 Marks]
- Outline the process of southern blotting [5 Marks]
- Short hair in rabbits (*S*) is dominant over long hair (*s*). The following crosses are carried out, producing the progeny shown. Give all possible genotypes of the parents [5 Marks]

Parents	Progeny
(a) short x short	4 short and 2 long

Section C: 60 Marks. Answer all questions

- Discuss the conclusions drawn from monohybrid crosses [20 Marks]
- Compare and contrast DNA replication in bacterial and eukaryotic cells [20 Marks]
- Describe the process of transcription in bacterial cells [20 Marks]