



(University of Choice)

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

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

**FOURTH YEAR SECOND TRIMESTER EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN MEDICAL LABORATORY SCIENCES**

COURSE CODE: BML 411

COURSE TITLE: MOLECULAR DIAGNOSTICS

DATE: 7TH DECEMBER 2020

TIME: 8.00 -10.00AM

INSTRUCTIONS TO CANDIDATES

This paper consists of three sections:

- i. Section A – Multiple Choice Questions
- ii. Section B – Short Answer Question
- iii. Section C – Long Answer Question.

Answer all questions

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)

Choose the most suitable choice, only one choice is correct

1. The structure of DNA is closely related to its biological function. Which of the following statements regarding the structure of DNA is correct?
 - a. All base pairs interact by forming three hydrogen bonds.
 - b. DNA is comprised of nucleotide subunits each containing a base, a ribose sugar and a phosphate group.
 - c. The double helix of DNA is stabilized by interactions between adjacent ribose sugars.
 - d. Each DNA sequence folds into a unique and complex three-dimensional structure.
2. Which of the following statements concerning RNA is correct?
 - a. A double helix is the predominant three-dimensional structure of most forms of RNA.
 - b. tRNA transfers the base sequence of DNA to the ribosome.
 - c. mRNA translates the base sequence of DNA for use in protein synthesis.
 - d. Hydrogen bonding within the same strand of RNA is necessary to maintain its three dimensional structure.
3. With respect to the importance of hydrogen bonding and DNA double helix stability, which of the following statements is false?
 - a. Favorable tautomeric form of nucleotide bases
 - b. Contributes to the thermodynamic stability
 - c. Decreases the entropy
 - d. Specificity of base pairing
4. In a DNA double helix the bases are held together by hydrogen bonds. These hydrogen bonds are _____
 - a. Covalent bonds
 - b. Non-covalent bonds
 - c. Ionic bonds
 - d. Van der Waals forces
5. DNA strands run _____ in relation to each other.
 - a. antiparallel
 - b. parallel
 - c. perpendicular
 - d. Crossectional
6. A nucleotide in DNA is composed of _____.
 - a. a deoxyribose sugar, a phosphate, and a nitrogen base
 - b. only a deoxyribose sugar and a nitrogen base
 - c. only a deoxyribose sugar and a phosphate
 - d. a ribose sugar, a phosphate, and a nitrogen base
7. Between the two strands of a DNA segment the nitrogen bases are held together by _____.
 - a. covalent bonds
 - b. hydrogen bonds
 - c. ionic bonds
 - d. metallic bonds
8. Which substance was used to break down the phospholipids from the cell membrane and nuclear membrane?
 - a. salt

- b. soap
 - c. alcohol
 - d. water
9. The substance that causes the DNA to precipitate is the ____
- a. salt
 - b. soap
 - c. alcohol
 - d. water
10. The substance used to separate the proteins from the DNA
- a. salt
 - b. soap
 - c. alcohol
 - d. water
11. What would the expected effect be on a PCR reaction if the primers used were slightly shorter and more variable than the intended oligonucleotide sequences?
- a. The PCR reaction would not commence
 - b. The PCR reaction would end after one cycle
 - c. The reaction would generate a single short PCR product
 - d. The reaction would yield a mixture of non-specific products
12. What is the aim of using Southwestern blotting:
- a. Detection of protein–protein interactions
 - b. Detection of DNA–protein interactions
 - c. Identification of tandemly repeated sequences in DNA
 - d. Identification of specific nuclear proteins
13. Primer used for the process of polymerase chain reaction are _____
- a. Single stranded DNA oligonucleotide
 - b. Double stranded DNA oligonucleotide
 - c. Single stranded RNA oligonucleotide
 - d. Double stranded RNA oligonucleotide
14. At what temperature do denaturation of DNA double helix takes place?
- a. 60°C
 - b. 54°C
 - c. 74°C
 - d. 94°C
15. Which of the following is a mismatch?
- a. Polymerase – Taq polymerase
 - b. Template – double stranded DNA
 - c. Primer – oligonucleotide
 - d. Synthesis – 5' to 3' direction
16. Nitrogen bases pair with bases that are ____.
- a. available
 - b. complimentary
 - c. identical
 - d. Similar

17. Which of the following is an equilibrium method that can be used to accurately determine DNA-protein dissociation constants?
- Site directed mutagenesis
 - Chromatin Immunoprecipitation
 - EMSA
 - Footprinting
18. Which laboratory mutagen is prone to mutation of DNA?
- N-methyl, N1-nitro, N-nitrosoguanidine
 - N-methyl, N2-nitro, N-nitrosoguanidine
 - N1-methyl, N1-nitro, N-nitrosoguanidine
 - N-methyl, N-nitro, N-nitrosoguanidine
19. Which base undergoes spontaneous damage under physiological conditions?
- Thymine
 - Cytosine
 - Uracil
 - Guanine
20. What is the product by mutation by oxidation of DNA?
- 2,7-dihydro-8-oxoguanine
 - 1,7-dihydro-7-oxoguanine
 - 7,8-dihydro-8-oxoguanine
 - 7,4-dihydro-8-oxoguanine

Section B: Short Answer Questions (40 marks)

- Explain the all stages of Membrane based method in DNA extraction (8marks).
- Describe the functions of DNA in cell physiology. (8marks).
- Using a labeled Diagram outline the structure of a nucleotide (8marks).
- Explain the commonly used DNA detection techniques (8marks).
- Describe the common application of Polymerase Chain Reaction (PCR) (8marks).

Section C: Long Answer Questions (60 marks).

- Discuss Any Ten (10) variants of PCR (20marks).
- Discuss nucleic acid hybridization methods and their application (20marks).
- Describe methods used diagnose site directed mutation in the targeted site (20marks).