



(University of Choice)

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

**(MAIN CAMPUS)**

**UNIVERSITY EXAMINATIONS (MAIN PAPER)  
2023/2024 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER EXAMINATIONS**

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

**COURSE CODE: BMB 314**

**COURSE TITLE: FORENSIC GENETICS AND ITS  
APPLICATION**

**DATE: 8<sup>TH</sup> DECEMBER 2023**

**TIME: 2.00-4.00PM**

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**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

## SECTION A: Multiple Choice Questions (20 Marks)

1. What are the differences in the specific regions of DNA sequence called during DNA fingerprinting?
  - A. Non repetitive DNA
  - B. Repetitive DNA
  - C. Satellite DNA
  - D. Histone DNA
2. How can DNA be as useful tool in forensic application?
  - A. Showing the same degree of polymorphism with hair follicles
  - B. Showing different degrees of polymorphism with saliva
  - C. By not possessing any heritable information
  - D. By the presence of lysozymes in it
3. Which tissue samples are used for DNA fingerprinting?
  - A. Hair
  - B. Skin
  - C. Blood
  - D. All of the above
4. What is the meaning of the abbreviation PCR in forensic genetics?
  - A. Plain chain reaction
  - B. Polymerase chain reaction
  - C. Police custody remarks
  - D. Paternal choice reaction
5. Which force can stabilize a DNA double – helix?
  - A. Hydrophilic sugar – phosphate groups are found on the exterior of the helix where interaction with water occurs
  - B. Hydrophobic bases are present in the interior of the helix, each base – pair is stabilized by the same number of hydrogen bonds
  - C. Covalent base stacking base stacking interactions may take place between neighboring bases within the same strand in the helix
  - D. Non – covalent N- glycosidic bonds may form between nitrogenous bases in opposite strands in the helix
6. Which one of the following statements about forensic analysis of DNA is true?
  - A. A DNA profile using short tandem repeats is unique to an individual
  - B. Forensic analysis makes use of SNPs in coding sequences to distinguish between individuals
  - C. PCR is used for DNA profiling (DNA fingerprinting).
  - D. DNA fingerprinting cannot be used for paternity testing
7. What is the primary goal of forensic science?
  - A. To exonerate innocent people
  - B. To identify suspects and bring them to justice
  - C. To punish criminals
  - D. All of the above
8. The study of the decomposition of human body is known as:
  - A. Forensic chemistry
  - B. Forensic anthropology
  - C. Forensic pathology
  - D. Forensic entomology
9. Which one of the following is a type of forensic evidence?
  - A. Blood

- B. DNA
  - C. Fingerprints
  - D. All of the above
10. Basis of DNA fingerprinting is-----
- A. Satellite DNA
  - B. High degree of polymorphism
  - C. Beta galactosidase
  - D. Endonuclease
11. The VNTR belongs to a class of satellite DNA referred to as
- A. Minisatellite
  - B. Beta galactose
  - C. Microsatellite
  - D. All of the above
12. In DNA fingerprinting analysis is made of:
- A. Satellite DNA
  - B. Moderately repetitive sequences
  - C. Micro satellites
  - D. Variable number of tandem repeats
13. Basis of DNA fingerprinting is
- A. Double helix
  - B. Error in base sequence
  - C. Polymorphism in sequence
  - D. DNA replication
14. The probes for DNA fingerprinting are:-----
- A. Anand single standard labeled DNA
  - B. Unknown double standard labeled DNA
  - C. Known single standard labeled DNA
  - D. Known double standard unlabeled DNA
15. The DNA fingerprint pattern of a child is-----
- A. Exactly similar to that of both of the parents
  - B. 100% similar to the father's DNA print
  - C. 100% similar to the mother's DNA print
  - D. 50% bands similar to father and rest similar to the mother
16. The correct order of procedures in DNA profiling is-----
- A. DNA isolation – PCR amplification – electrophoresis – southern blotting – autoradiography – analysis of DNA print pattern
  - B. DNA isolation – restriction digestion – PCR amplification – electrophoresis – southern blotting – autoradiography – analysis of DNA print pattern
  - C. DNA isolation – PCR amplification – restriction digestion – electrophoresis – southern blotting – autoradiography – analysis of DNA print pattern
  - D. DNA isolation – restriction digestion – PCR amplification – southern blotting – electrophoresis – autoradiography – analysis of DNA print pattern
17. Minisatellites are-----
- A. 10 – 40 bp sized short sequences with the genes
  - B. Short coding repetitive regions on the eukaryotic genome
  - C. Short non coding repetitive sequences present throughout the chromosome
  - D. Are regions of chromosomes after secondary constriction
18. The technique used to establish individual's based on their DNA print patterns is called-----
- A. DNA fingerprinting

- B. DNA profiling
  - C. Molecular fingerprinting
  - D. All of these
19. Which one of the following is an example of documentary evidence?
- A. A bloody knife found at the crime scene
  - B. A police report detailing the investigation
  - C. A set of fingerprints lifted from a door handle
  - D. A DNA sample collected from the victim's body
20. Which one of the following is not a method for collecting DNA evidence?
- A. Blood sample
  - B. Saliva swab
  - C. Urine sample
  - D. Hair sample

**SECTION B: Short Answer Questions (40 Marks)**

1. Discuss five (5) major processes that the biological samples submitted in forensic genetic laboratories are subjected to (5 marks).
2. Discuss how forensic genetic laboratory results are interpreted (5 marks).
3. List five (5) items that the crime investigators may collect from a crime scene which may contain DNA material (5 marks).
4. Explain three (3) main steps contained in the DNA extraction methods (5 marks).
5. After DNA extraction in a forensic laboratory, electrophoresis may be performed: -
  - i. Explain the role of the buffer during electrophoresis (2 marks).
  - ii. Enumerate three qualities of an ideal buffer (3 marks).
6. State the two most common buffers used for nucleic acids separation (5marks).
7. Explain the role of detergents used in the process of DNA extraction (5 marks).
8. Enumerate five (5) reagents used while processing samples in a forensic genetics laboratories (5 marks).

**SECTION C: Long Answer Questions (60 Marks)**

1. Explain the precautions to be taken when extracting DNA for forensic analysis (20 marks).
2. During forensic laboratory investigations of rape case, vaginal swab was collected from the victim. Explain the laboratory protocol for differential lysis between sperm and epithelial cells from the collected sample (20 marks).
3. Explain the process of DNA extraction from hair collected from the scene of crime (20 marks)