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**MASINDE MULIROUNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER EXAMINATIONS

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

COURSE CODE: BMB 324

COURSE TITLE: HUMAN POPULATION GENETICS

DATE: 26/04/2022

TIME: 12.00 -2.00 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

SECTION A: MULTIPLE CHOICE QUESTIONS (20 MKS)

Instructions to the candidate

- The section has twenty (20) multiple choice questions (MCQs)
 - Each question has a stem and four (4) completion options, of which only one is correct
 - Write your answers on the provided university examination booklet.
1. A local geographic population of reproducing individuals that has physical continuity over time and space is:
 - A. Deme
 - B. Genotype frequencies
 - C. Gene pool
 - D. Population of inference
 2. The population of DNA molecules that are collectively shared by the individuals in the deme:
 - A. Polymorphisms
 - B. Genotype frequencies
 - C. Gene pool
 - D. Population of inference
 3. The multiple allelic states are called:
 - A. Polymorphisms
 - B. Genotype frequencies
 - C. Gene pool
 - D. Deme
 4. In population genetics, demes are characterized by _____
 - A. Polymorphisms
 - B. Genotype frequencies
 - C. Gene pool
 - D. Population of inference
 5. A polymorphic nucleotide is known as
 - A. Deletion
 - B. SNP
 - C. Evolution nucleotide
 - D. Multigene families
 6. A complete set of chromosomes is
 - A. Nuclear genome
 - B. Mitochondrial genome
 - C. Genome
 - D. Genes
 7. In humans the nuclear genome consists of _____ set of chromosomes:
 - A. 22
 - B. 46
 - C. 92
 - D. 23
 8. The mitochondrial genome consists of _____ chromosomes
 - A. One
 - B. Two
 - C. Four
 - D. Six
 9. The units of functional information encoded in the DNA sequence
 - A. Nuclear genome
 - B. Mitochondrial genome
 - C. Genome

- DNA Genes
10. The amino-acid coding portions of the DNA sequence
 - A. Introns
 - B. Exome
 - C. Exons
 - D. mRNA
 11. The amino-acid coding subset of the genome
 - A. Introns
 - B. Exome
 - C. Exons
 - D. mRNA
 12. The extrinsic sequences that do not code for amino acids.
 - A. Introns
 - B. Exome
 - C. Exons
 - D. mRNA
 13. The protein-coding gene but which are non-functional for protein production.
 - A. Pseudogenes
 - B. RNA coding genes
 - C. Noncoding RNA
 - D. mRNA
 14. There are _____ for which the functional product is some type of RNA
 - A. Pseudogenes
 - B. RNA coding genes
 - C. Noncoding RNA
 - D. mRNA
 15. The most abundant transposable elements in the human genome are:
 - A. LINE-1
 - B. Microsatellites
 - C. Satellites
 - D. Alu elements
 16. Tandem repeated sequences of fewer than 10 and as short as 2 nucleotides:
 - A. LINE-1
 - B. Microsatellites
 - C. Satellite DNA
 - D. Minisatellites
 17. _____ is the largest tandem arrays
 - A. LINE-1
 - B. Microsatellites
 - C. Satellite DNA
 - D. Minisatellites
 18. ____ tandem repeats in which the repeated element varies from 10 (or 7 or 12) nucleotides in length up to 100 nucleotides:
 - A. LINE-1
 - B. Microsatellites
 - C. Satellite DNA
 - D. Minisatellites

19. _____ are the sites of spindle microtubule attachment:
- A. Centromere
 - B. Telomeres
 - C. GC islands
 - D. Nucleosome
20. _____ cap the ends of eukaryotic chromosomes and consist of DNA and protein
- A. Centromere
 - B. Telomeres
 - C. GC islands
 - D. Nucleosome

SECTION B 40 MARKS

1. Highlight the causes of genetic variation [5 Marks]
2. Explain the bottleneck effect in population genetics [5 Marks]
3. Describe how non-random mating affect populations [5 Marks]
4. Explain the founder effect [5 Marks]
5. Elaborate on activators and repressors of transcription [5 Marks]
6. Define: response elements; Promoters; Enhancers; Silencers and Insulators [5 Marks]
7. Describe rearrangements that occur when breaks occur in chromosomes [5 Marks]
8. Explain the cause of non-allelic homologous recombination (NAHR) [5 Marks]

SECTION C: LONG ANSWER QUESTIONS (60 MKS)

Instructions

- This section has THREE long answer questions (LAQs), totalling a maximum of SIXTY (60) marks
 - Answer all questions
 - Write your answers on the provided university examination booklet
1. Distinguish between genetic drift and natural selection [20 Marks]
 2. Discuss gene flow and mutations [20 Marks]
 3. Elucidate malaria resistance as an evidence of positive selection in humans [20 marks]