(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

UNIVERSITY MAIN EXAMINATIONS 2020/2021 ACADEMIC YEAR

FIRST YEAR, SECOND TRIMESTER EXAMINATION FOR THE DEGREE OF BACHEOR OF SCIENCE IN CLINICAL MEDICINE, SURGERY & COMMUNITY HEALTH, PHYSIOTHERAPY & MEDICAL EDUCATION

COURSE CODE: **HCM 120/BIO 112**

COURSE TITLE: **MEDICAL BIOCHEMISTRY II**

DATE: THURSDAY 22ND APRIL 2021 **TIME: 9.00-12.00 NOON**

INSTRUCTIONS TO CANDIDATES

Answer All Questions

Section A: Multiple Choice Questions (MCQs)	20 Marks.
Section B: Short Answer Questions (SAQs)	40 Marks.
Section C: Long Answer Question (LAQs)	40Marks

Time: 3 hours

Section A: Multiple Choice Questions (MCQs) (20 MARKS)

1. **Which of the following types of drug metabolizing enzymes are inducible:**
   A. Both microsomal and non-microsomal enzymes
   B. Non-microsomal enzymes
   C. Microsomal enzymes
   D. Mitochondrial enzymes

2. **The following drug metabolizing reaction is entirely non-microsomal:**
   A. Glucuronide conjugation
   B. Acetylation
   C. Oxidation
   D. Reduction

3. **Microsomal enzyme induction can result in:**
   A. Physical dependence
   B. Psychological dependence
   C. Tolerance
   D. Idiosyncrasy

4. **The addition of glucuronic acid to a drug:**
   A. Decreases its water solubility
   B. Is an example of a Phase 1 reaction
   C. Usually leads to inactivation of the drug
   D. Involves cytochrome P450

5. **The following are properties of a typical SARS-CoV-2 virus structure except:**
   A. Single stranded RNA
   B. Positive sense strand
   C. Enveloped
   D. Icosahedral

6. **Positive stranded RNA viruses have which of the following characteristics:**
   A. They have to transcribe their genome RNA to a mirror image copy as a mRNA
   B. Their genome RNA can be translated directly as mRNA
   C. Their RNA genome is segmented
   D. Their genome is circular

7. **How does the papilloma family of viruses cause cancer:**
   A. Integrates viral genome into cellular DNA
   B. Has an oncogene able to initiate cancer
   C. Acts as a cofactor for a cellular oncogenes
   D. Replicate in dividing cells and encodes three oncogenic proteins E5, E6 and E7

8. **Proto-oncogene in normal cells:**
   A. Initiates apoptosis
   B. Suppresses progression through the cell cycle in response to DNA damage
   C. Codes for proteins involved in the stimulus of cell division
   D. Totally blocks cellular transcription

9. **Which of the following characteristics is TRUE of prions:**
   A. They can be inactivated by boiling at 100^0c
   B. They contain a capsid
   C. They can be reliably inactivated by an autoclave
   D. They are a rogue form of protein, PrP

10. The following are cellular structures enclosed within the cell envelope **except:**
    A. Mesosomes
    B. Polyamines
    C. Glycocalyx
    D. Cytoplasmic granules

11. **The following are purely enzymatic bacterial pathogenic determinants except:**
    A. Proteinase
    B. Phospholipase C
    C. Hyaluronidase
    D. Dnase

12. **A gene showing codominance:**
    A. Has one allele dominant to the other
    B. Has alleles that are recessive to each other
    C. Has alleles tightly linked on the same chromosome
    D. Has both alleles independently expressed in the heterozygote

13. **The allele associated with sickle cell anemia apparently reached a high frequency in some human populations due to:**
    A. A high mutation rate at that specific gene
    B. Superior fitness of heterozygotes in areas where malaria was present
    C. Random mating
    D. Migration of individuals with the allele into other populations

14. **The phenomenon of *"Independent Assortment"* refers to:**
    A. Independent location of genes from each other in an interphase cell
    B. Expression at the same stage of development
    C. Unlinked transmission of genes in crosses resulting from being located on different chromosomes, or far apart on the same chromosome
    D. Association of a protein and a DNA sequence implying related function

15. **What are the assumptions of Hardy Weinberg Equilibrium :**
    A. Small population size, random mating, no selection, no migration, no mutation
    B. Large population size, like individuals mate, no selection, no migration, no mutation
    C. Large population size, random mating, no selection, no migration, no mutation
    D. Large population size, random mating, no selection, migrants enter from other populations, no mutation

16. **Which component of transcribed RNA in eukaryotes is present in the initial transcript but is removed before translation occurs:**
    A. Codons coding for the protein to be produced
    B. Intron
    C. Ribosome binding site
    D. 3' Poly A tail and 5' cap

17. **Transcriptional activator proteins:**
    A. Bind regions near a eukaryotic gene and allow an RNA polymerase to transcribe a gene
    B. Bind to ribosomes to activate the production of specific proteins
    C. Are essential to function of transfer RNAs during translation
    D. Transcribe a messenger off a DNA template

18. **The "sticky ends" generated by restriction enzymes allow:**
    A. Replication of transfer RNA within the bacterial cell
    B. Easy identification of plasmids which carry an insert
    C. Pieces of DNA from different sources to hybridize to each other and to be joined together
    D. Insertion of centromeres into ribosomes lacking them

19. **The enzyme used in polymerase chain reaction (PCR) is:**
    A. RNA polymerase
    B. Taq polymerase
    C. Ribonuclease
    D. Endonuclease

20. **RFLP analysis is a technique that:**
    A. Is used to amplify genes for producing useful products
    B. Is used to detect genetic variation at the protein level
    C. Measures the transfer frequency of genes during conjugation
    D. Uses hybridization to detect specific DNA restriction fragments in genomic DNA

Section B: Short Answer Questions (SAQs) **(40 MARKS)**

1. Elucidate the mechanisms involved in gene expression and its regulatory control (10 marks)
2. Briefly discuss the Biological/Biochemical effect of Type I and II Interferons (10 marks)
3. Briefly categorize the types and causal agents of DNA mutations (10 marks)
4. Briefly expound on the discrete structural characteristics exhibited by both Gram-positive and Gram-negative bacteria (10 marks)

Section C: Long Answer Questions (LAQs) **(40 MARKS)**

1. a) Outline the enzymes involved in Phase I and Phase II drug biotransformation reactions, while indicating the reactions catalyzed (10 marks)

   b) Briefly explain the consequences/outcomes of Drug Biotransformation (10 marks)

2. a) Using suitable examples, perform Virus Classification based on Recommendations by the International Committee on Nomenclature of Viruses (ICNV) (10 marks)

   b) Describe the typical Viral Structural components including specific functions of each (10 marks)