



UNIVERSITY EXAMINATIONS 2023/2024

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN
NURSING

NND/NUU 3113: MEDICAL BIOCHEMISTRY 1

DATE: DECEMBER 2023

TIME:3 HOURS

INSTRUCTIONS: Answer all questions in the booklet provided

Ensure that all your answers are properly numbered

Section One: Multiple Choice Questions (MCQs): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark.

Section Two: Short Answer Questions – Answer questions following each other on the answer booklet

Section Three: Long Answer Questions – Answer the questions on the answer booklet

All questions are compulsory

PART I: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. The DNA region containing the TATA box and extending to the transcription start site (TSS) is often termed the
 - a) Polymerase home
 - b) Initiator
 - c) Start selector
 - d) Promoter
2. If a tRNA has the sequence 5'-CAU-3' t, what codon would it recognize
 - a) 3'-UAC-5'
 - b) 3 t-AUG-5 t

- c) 5'-ATG-3'
 - d) 5'-AUC-3'
3. What is the directionality of polynucleotide synthesis?
- a) C-terminal to N-terminal direction
 - b) N-terminal to C-terminal direction
 - c) 3' to 5' direction
 - d) 5' to 3' direction
4. Which of the forces or interactions listed below play the predominant role in driving RNA secondary structure formation?
- a) Ionic bonds
 - b) Hydrogen bonds.
 - c) Hydrophobic interaction
 - d) van der Waals interactions
5. The discontinuous DNA replication that occurs during replication is catalyzed via the production of small DNA segments termed
- a) Okazaki fragments
 - b) Toshihiro pieces
 - c) Crick strands
 - d) Watson fragments
6. The backbone of a DNA molecule consists of which of the following?
- a) Alternating sugars and nitrogenous bases
 - b) Nitrogenous bases alone
 - c) Phosphate groups alone
 - d) Alternating phosphate and sugar groups
7. If the ΔG of a reaction is zero:
- a) The reaction is endergonic.
 - b) The reaction is exergonic.
 - c) The reaction proceeds only if free energy can be gained.
 - d) The system is at equilibrium and no net change occurs

8. A patient with an enteropathy (intestinal disease) produced large amounts of ammonia (NH_3) from bacterial overgrowth in the intestine. The NH_3 was absorbed through the intestine into the portal vein and entered the circulation.

Which of the following is a likely consequence of his NH_3 absorption?

- a) A decrease of blood pH
 - b) An increase in pH
 - c) A decreased concentration of bicarbonate in the blood
 - d) Increased expiration of CO_2
9. An antibiotic is developed that is a close structural analog of a substrate of an enzyme that participates in cell wall synthesis in bacteria. This binding of the antibiotic reduces overall enzyme activity, but such activity can be restored if more substrate is added. The binding of the antibiotic to the enzyme is not via a covalent bond, nor does the enzyme alter the structure of the antibiotic. Which one of the following would best describe this antibiotic?
- a) It is an irreversible inhibitor.
 - b) It is a competitive inhibitor.
 - c) It is a noncompetitive inhibitor.
 - d) It is an uncompetitive inhibitor
10. The mutation creation in DNA of a stop caused codon a stop in DNA codon often TAG leads to be to created a deleterious on the coding condition. Strand If a between the TATA box and the transcription initiation site, what would be the most likely outcome?
- a) No effect
 - b) Loss of transcription
 - c) Loss of translation
 - d) A shorter protein
11. Classic hemophilia A results in an inability to directly activate which one of the following factors?
- a) Factor 11
 - b) Factor IX
 - c) Factor X
 - d) Protein S

12. Protein kinases are enzymes that phosphorylate amino acid side chains of proteins in ATP-dependent reactions. A protein kinase can be classified as
- a) Oxidoreductase
 - b) Hydrolase
 - c) Isomerase
 - d) Transferase
13. You examine a 10-month-old infant who has numerous scaly and ulcerative skin lesions, premalignant changes, and areas of hyperpigmentation on sun-exposed skin. This is most likely caused by a defect in
- a) Postreplication mismatch repair
 - b) Repair of DNA double-strand breaks
 - c) Base excision repair
 - d) Nucleotide excision repair
14. The most important type of DNA damage in the child described in Question 13 is
- a) DNA double-strand breaks
 - b) Thymine dimers
 - c) Replication errors
 - d) Insertions and deletions
15. The general mechanism is that an enzyme acts by:
- a) Reducing the activation energy
 - b) Increasing activation energy
 - c) Decreasing pH value
 - d) Increasing the pH value
16. An enzyme that joins the ends of two strands of nucleic acid is:
- a) Polymerase
 - b) ligase
 - c) synthetase
 - d) Helicase

17. Phosphorylation of proteins is an important component of signal transduction. Protein kinases phosphorylate proteins only at certain hydroxyl groups on amino acid side chains. Which of the following groups of amino acids contain side-chain hydroxyl groups and could be a potential substrate for a protein kinase?
- a) Aspartate, glutamate, and serine
 - b) Serine, threonine, and tyrosine
 - c) Threonine, phenylalanine, and arginine
 - d) Lysine, arginine, and proline
18. The following is used as a diagnostic marker for liver function
- a) Alkaline phosphatase
 - b) Urea
 - c) Creatinine
 - d) Amylase
19. An inactivating mutation in which one of the following proenzymes would be expected to lead to thrombosis (uncontrolled blood clotting)?
- a) Factor XIII
 - b) Prothrombin
 - c) Protein C
 - d) Factor VIII
20. Lipid soluble vitamins include the following except vitamin
- a) D
 - b) C
 - c) A
 - d) E

PART II: SHORT ANSWER QUESTIONS (40 MARKS)

1. Differentiate between the following (6 marks)
- a) Aldoses and Ketoses
 - b) Saturated and unsaturated fatty acids
 - c) Micronutrient and Macronutrient
2. Explain the causes of abnormalities in blood analytes (6 marks)
3. Draw the chemical structure of a dipeptide (6 marks)

4. Explain the process of transcription (6 marks)
5. Describe the levels of protein structure (6 marks)
6. Describe the composition of cell membranes (6 marks)
7. Outline the monomers that make each of the following biomolecules (4 marks)
 - a) Carbohydrates
 - b) Lipids
 - c) Nucleic acids
 - d) Proteins

PART III: LONG ANSWER QUESTIONS (40 MARKS)

- a) Njeri is diagnosed with a genetic disease X that is caused by a point mutation. Describe the types of point mutations and their effect on amino acid sequence. (10 marks)
- b) An 84-year-old male presents with respiratory acidosis at Meru Teaching and Referral Hospital.
 - a. Explain the likely causes of the condition? (10 marks)
 - b. Describe the process that maintains the normal body pH (10 marks)
- c) Enzymes are used in diagnostic laboratories to perform different tests. Explain factors that may affect the activity of these enzymes? (10 marks)