MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya
Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,
Website: info@must.ac.ke Email: info@must.ac.ke

University Examinations 2024/2025

SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICAL MICROBIOLOGY

HMM 3214: STRUCTURE OF BIOMOLECULES

DATE: JANUARY 2025 **TIME: 3 HOURS**

INSTRUCTIONS:
Answer ***All*** *questions*
Ensure that all your answers are properly numbered
Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark
Part II: Short Answer Questions – Answer questions following each other on the answer booklet
Part III: Long Answer Questions – Answer each question on the answer booklet

SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. Which biomolecule primarily serves as a source of energy for the body?
   a) Lipids
   b) Proteins
   c) Nucleic acids
   d) Carbohydrates
2. The primary structural unit of a phospholipid is:
   a) Glycerol, two fatty acids, and a phosphate group
   b) One fatty acid and one nucleotide
   c) A chain of amino acids

d) A glucose molecule

3. Which of the following best describes a disaccharide?
   a) A carbohydrate composed of two monosaccharides
   b) A protein composed of two polypeptides
   c) A lipid made of two fatty acids
   d) A nucleic acid made of two nucleotides
4. Which organelle is responsible for the synthesis of ribosomal RNA (rRNA)?
   a) Nucleus
   b) Nucleolus
   c) Ribosome
   d) Golgi apparatus
5. The fluid mosaic model refers to the:
   a) Structure of DNA
   b) Arrangement of lipids and proteins in the plasma membrane
   c) Process of protein synthesis
   d) Function of enzymes in biochemical reactions
6. Which of the following is a characteristic of enzymes?
   a) They are consumed in chemical reactions.
   b) They are specific to substrates.
   c) They increase the activation energy of reactions.
   d) They are unchanging and do not vary in different environments.
7. The role of cholesterol in the plasma membrane is to:
   a) Provide energy
   b) Regulate fluidity
   c) Store genetic information
   d) Serve as a signaling molecule
8. What type of bond forms between amino acids in a protein?
   a) Ionic bond
   b) Hydrogen bond

c) Peptide bond

d) Covalent bond

9. The primary purpose of the endoplasmic reticulum (ER) is:

a) Energy production

b) Protein and lipid synthesis

c) DNA replication

d) Cellular respiration

10. Which type of transport does NOT require ATP?

a) Active transport

b) Facilitated diffusion

c) Endocytosis

d) Exocytosis

11. What is the main function of ribosomes?

a) Lipid synthesis

b) Protein synthesis

c) DNA replication

d) Energy production

12. Which of the following is a polysaccharide?

a) Glucose

b) Fructose

c) Glycogen

d) Sucrose

13. Which structure is responsible for detoxifying harmful substances in the cell?

a) Rough ER

b) Smooth ER

c) Golgi apparatus

d) Mitochondrion

14. What type of lipid is primarily responsible for forming cell membranes?

a) Steroids

b) Triglycerides

c) Phospholipids

d) Waxes

15. The role of the Golgi apparatus in the cell includes:

a) Synthesizing proteins

b) Modifying and packaging proteins

c) Producing ATP

d) Storing genetic information

16. What is the function of nucleotides in nucleic acids?

a) Energy storage

b) Providing structural support

c) Encoding genetic information

d) Serving as enzymes

17. Which of the following biomolecules is NOT soluble in water?

a) Carbohydrates

b) Proteins

c) Nucleic acids

d) Lipids

18. The primary structure of a protein refers to:

a) The sequence of amino acids

b) The three-dimensional shape

c) The folding pattern

d) The presence of functional groups

19. Which type of cell lacks a true nucleus?

a) Eukaryotic

b) Prokaryotic

c) Both

d) Neither

20. The chemical reaction that synthesizes macromolecules from monomers is called:

a) Hydrolysis

b) Dehydration synthesis

c) Oxidation

d) Reduction

SECTION B: SHORT ANSWER ALL QUESTIONS (40 MARKS)

1. Describe the structure and classification of proteins (5 Marks)
2. Explain the roles of lipids in biological systems (5 Marks)
3. Outline the process of cellular respiration and its connection to biomolecules (5 Marks)
4. Discuss the significance of the cytoskeleton in eukaryotic cells (5 Marks)
5. Explain the structure and function of DNA and RNA (5 Marks)
6. What are the primary functions of carbohydrates in cells (5 Marks)
7. Describe how biomolecules interact within the cellular environment (5 Marks)
8. Discuss the various types of transport mechanisms across bio membranes (5 Marks)

SECTION C: LONG ANSWER TWO QUESTIONS (40 MARKS)

1. a) Discuss the roles of different biomolecules in cellular metabolism (10 Marks)

b) Explain how enzymes function as biological catalysts (10 Marks)

2.a) Compare the structures and functions of the cell membrane in prokaryotic and eukaryotic cells (10 Marks)

b) Discuss the mechanisms of transport across the cell membrane, including examples of specific molecules (10 Marks)

3.a) Explain the importance of organelle localization of biomolecules in eukaryotic cells (10 Marks)

b) Discuss how the structure of nucleic acids relates to their function in protein synthesis (10 Marks)