



**AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF NURSING & MIDWIFERY SCIENCES
BACHELOR OF SCIENCE IN NURSING
End of May - July Trimester Examinations 2025**

**BSN 213: Medical Biochemistry
Preservice**

DATE: Wednesday 6th August 2025

Duration: 2 HOURS

Start: 9:00 AM

Finish: 11:00 AM

INSTRUCTIONS

- 1. This exam is out of 70 Marks**
- 2. This Examination comprises THREE Sections. Section I: Multiple Choice Questions
Section II: Short Answer Questions and Section III: Long Answer Questions**
- 3. Answer ALL Questions.**
- 4. Do not write on the question paper. Use the back of the answer booklet for any rough work**

SECTION I: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. The statement that best describes the role of the Henderson-Hasselbalch equation in medical biochemistry is: -
 - A. It explains how enzymes lower activation energy in biochemical reactions.
 - B. It is used to calculate the osmotic pressure of body fluids.
 - C. It allows the estimation of pH in a buffer solution based on the ratio of conjugate base to weak acid.
 - D. It predicts the amount of water reabsorbed by the kidneys during dehydration.

2. The buffering system in blood, particularly the bicarbonate buffer, is clinically important because: -
 - A. It enhances the oxygen-carrying capacity of hemoglobin.
 - B. It prevents enzymatic digestion of blood cells.
 - C. It helps maintain a stable blood pH, which is essential for enzyme activity and cellular function.
 - D. It facilitates the active transport of nutrients across the intestinal wall.

3. The characteristics of water that makes it an excellent solvent for biochemical reactions in living organisms is:-
 - A. It has a low specific heat capacity.
 - B. It is non-polar and easily crosses cell membranes.
 - C. It forms hydrogen bonds due to its polarity.
 - D. It dissociates completely into ions in solution.

4. A disaccharide composed of glucose and galactose is: -
 - A. Sucrose
 - B. Maltose
 - C. Lactose
 - D. Cellulose

5. Ketose sugar is: -
 - A. A sugar with an aldehyde group
 - B. A sugar with a carboxyl group
 - C. A sugar with a ketone group
 - D. A sugar with an amino group

6. The carbohydrates that serves as the primary storage form of glucose in animals is: -
 - A. Starch
 - B. Cellulose
 - C. Glycogen
 - D. Fructose

7. Identify the option that is not a primary function of proteins in the human body
- A. Enzymatic catalysis
 - B. Genetic information storage
 - C. Immune defense
 - D. Transport of molecules
8. The level of protein structure characterized by hydrogen bonding between backbone atoms forming α -helices and β -sheets is: -
- A. Primary
 - B. Secondary
 - C. Tertiary
 - D. None
9. The key feature that allows phospholipids to form biological membranes is: -
- A. Their neutral pH
 - B. Their ability to store energy
 - C. Their amphipathic nature (hydrophilic head and hydrophobic tails)
 - D. Their cholesterol backbone
10. The type of lipid that plays a major role in cell membrane fluidity and structure is: -
- A. Triglycerides
 - B. Phospholipids
 - C. Fatty acids
 - D. Waxes
11. The factor that increases the fluidity of a biological membrane is: -
- A. High cholesterol content at high temperatures
 - B. Presence of saturated fatty acids
 - C. Low temperature environment
 - D. Presence of unsaturated fatty acids
12. The process primarily responsible for the transport of large molecules such as proteins into the cell is: -
- A. Simple diffusion
 - B. Active transport
 - C. Endocytosis
 - D. Osmosis
13. The statements true regarding free energy change (ΔG) in biochemical reactions is: -
- A. A positive ΔG indicates a spontaneous reaction
 - B. A negative ΔG means energy is required for the reaction to proceed
 - C. A reaction with a ΔG of zero is at equilibrium
 - D. Reactions with a negative ΔG cannot occur in cells

14. The enzyme commonly measured in the blood to assess potential myocardial infarction (heart attack): -

- A. Lactate dehydrogenase
- B. Creatine kinase-MB (CK-MB)
- C. Amylase
- D. Alkaline phosphatase

15. In competitive inhibition, the inhibitor: -

- A. Binds to a site other than the active site
- B. Permanently inactivates the enzyme
- C. Competes with the substrate for the active site
- D. Increases the enzyme's maximum velocity (V_{max})

16. The primary purpose of glycolysis in cellular metabolism is: -

- A. To produce urea for nitrogen disposal
- B. To generate acetyl-CoA for protein synthesis
- C. To convert glucose into pyruvate and produce ATP
- D. To store excess glucose as glycogen

17. The enzyme that serves as the main regulatory point of glycolysis and is highly regulated by ATP levels is; -

- A. Enolase
- B. Aldolase
- C. Phosphofruktokinase-1 (PFK-1)
- D. Glyceraldehyde-3-phosphate dehydrogenase

18. The transport of long-chain fatty acids into the mitochondrial matrix for β -oxidation requires which of the following:-

- A. Coenzyme A alone
- B. ATP synthase
- C. Carnitine shuttle system
- D. Cytochrome c

19. A defect in any of the urea cycle enzymes typically results in which clinical condition: -

- A. Hyperglycemia
- B. Hyperuricemia
- C. Hyperammonemia
- D. Hypokalemia

20. During fasting, which organ primarily maintains blood glucose levels through gluconeogenesis and glycogenolysis: -

- A. Brain
- B. Adipose tissue
- C. Liver
- D. Skeletal muscle

SECTION II: SHORT ASSAY QUESTIONS (30 MARKS)

1. Explain the importance of biochemical reference values in clinical interpretation and describe how factors such as age, sex, and physiological state may affect these values. (5 Marks)
2. Describes the clinical significance of serum proteins and enzymes, providing examples of how changes in their levels can indicate specific disease conditions. (5 Marks)
3. Compare the structure of DNA and RNA under the following headings: sugar component, nitrogenous bases, strandedness, and stability. (5Marks)
4. Give the carbon structure of the following fatty acids:
 - i) 18:2 Δ (9, 12) (2Marks)
 - ii) 20:4 Δ (5, 8, 11 ,14) (3 Marks)
5. Discuss the metabolic pathway of cholesterol synthesis (5Marks)
6. Describe the synthesis and utilization of ketone bodies, and discuss how their production is regulated under fasting conditions. (5Marks)

SECTION C: LONG ASSAY QUESTIONS (20 MARKS)

INSTRUCTIONS : Answer ONLY ONE Question

1. (a) Describe the biochemical pathway of glycogenolysis, including the enzymes involved and the regulation of this process. (15Marks)
(b) Explain how hormonal control ensures energy availability during fasting or exercise. (5Marks)
2. Explain the regulation of oxidative phosphorylation and describe how inhibitors affect the electron transport chain and ATP production. Include examples of known inhibitors and their sites of action. (20Marks)