AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF NURSING & MIDWIFERY SCIENCES
BACHELOR OF SCIENCE IN NURSING
END OF MAY - JULY EXAMINATIONS 2026

BSM 213: Medical Biochemistry

DATE: 6TH AUGUST 2026

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. A nurse is reviewing arterial blood gas results. Which equation is used to estimate blood pH based on bicarbonate and carbonic acid concentrations?
   A. Michaelis-Menten equation
   B. Henderson-Hasselbalch equation
   C. Gibbs free energy equation
   D. Beer-Lambert law

2. Why is the bicarbonate buffering system important in critically ill patients?
   A. It promotes blood clotting
   B. It maintains acid-base balance
   C. It increases glucose absorption
   D. It stimulates red blood cell production

3. Which property of water allows it to dissolve electrolytes and medications in the body?
   A. Nonpolarity
   B. High viscosity
   C. Polarity and hydrogen bonding
   D. Low boiling point

4. A lactose-intolerant patient has difficulty digesting which sugar?
   A. Sucrose
   B. Lactose
   C. Fructose
   D. Maltose

5. Which type of sugar contains a ketone functional group?
   A. Ketose
   B. Aldose
   C. Pentose
   D. Hexose

6. Which carbohydrate serves as the major storage form of glucose in human muscles and liver?
   A. Starch
   B. Cellulose
   C. Glycogen
   D. Lactose

7. Which of the following is NOT a major function of proteins in the human body?
   A. Enzyme activity
   B. Immune defense
   C. Oxygen transport
   D. Storage of hereditary information

8. Which level of protein structure is disrupted in sickle cell disease?
   A. Primary structure
   B. Secondary structure
   C. Tertiary structure
   D. Quaternary structure

9. Why are phospholipids important in human cell membranes?
   A. They provide genetic information
   B. They form a selective barrier
   C. They store oxygen
   D. They transport hemoglobin

10. Which lipid is important in maintaining membrane structure and fluidity in human cells?
   A. Cholesterol
   B. Triglycerides
   C. Waxes
   D. Glycogen

11. A diet high in unsaturated fats has what effect on cell membranes?
   A. Decreases membrane fluidity
   B. Increases membrane rigidity
   C. Increases membrane fluidity
   D. Stops membrane transport

12. Which cellular process allows white blood cells to engulf bacteria?
   A. Osmosis
   B. Diffusion
   C. Endocytosis
   D. Filtration

13. A negative value for free energy change (ΔG) indicates that a reaction is:
   A. Nonspontaneous
   B. Spontaneous
   C. At equilibrium
   D. Reversible only

14. Which cardiac enzyme is commonly elevated after myocardial infarction?
   A. CK-MB
   B. Amylase
   C. Lipase
   D. ALT

15. In competitive enzyme inhibition, the inhibitor:
   A. Binds permanently to the enzyme
   B. Competes with the substrate for the active site
   C. Destroys the substrate
   D. Increases enzyme activity

16. What is the primary purpose of glycolysis in patient metabolism?
    A. Production of ATP from glucose
    B. Formation of antibodies
    C. Storage of fats
    D. Synthesis of proteins

17. Which enzyme is considered the key regulatory enzyme in glycolysis?
    A. Hexokinase
    B. Phosphofructokinase-1
    C. Lactate dehydrogenase
    D. Pyruvate carboxylase

18. The transport of long-chain fatty acids into mitochondria requires:
    A. Albumin
    B. Hemoglobin
    C. Carnitine
    D. Insulin

19. A patient with a urea cycle disorder is most likely to develop:
    A. Hyperglycemia
    B. Hyperammonemia
    C. Hypokalemia
    D. Hypercalcemia

20. During prolonged fasting, which organ plays the greatest role in maintaining blood glucose levels?
    A. Brain
    B. Liver
    C. Heart
    D. Pancreas

SECTION II: SHORT ASSAY QUESTIONS (30 MARKS)

1. Explain how two hormones with opposing functions (e.g., insulin and glucagon) work together to maintain metabolic homeostasis. (5Marks)

2. Discuss the clinical significance of serum proteins and enzymes in diagnosing diseases such as liver disease and myocardial infarction. (5Marks)

3. Compare DNA and RNA in terms of structure, function, and importance in human health. (5Marks)

4. Explain the biochemical defect in Pompe disease and discuss its effects on muscle and cardiac function in affected patients. (5 Marks)

5. Describe the pathway of cholesterol synthesis and discuss its relevance in cardiovascular disease. (5Marks)

6. 6. Explain the synthesis and utilization of ketone bodies and their significance in diabetic ketoacidosis. (5Marks)

SECTION C: LONG ASSAY QUESTIONS (20 MARKS)

INSTRUCTIONS : Answer **ONLY ONE** Question

1. Discuss the regulation of oxidative phosphorylation in human cells and explain how inhibitors can interfere with the electron transport chain and ATP production. (20Marks)

2. Describe in detail the hormonal regulation of glycogen synthesis, with emphasis on the roles of insulin, glucagon, and epinephrine. (20 marks)