AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF NURSING & MIDWIFERY SCIENCES

END OF APRIL SEMESTER 2026 EXAMINATIONS

COURSE CODE AND TITLE: COURSE CODE AND TITLE: BSN 114 – Medical Biochemistry I

DATE: 7TH APRIL 2026

Duration: 2 HOURS **START:9AM STOP: 11AM**

INSTRUCTIONS

1. This exam is out of 70 marks
2. This Examination comprises THREE Sections. Section I: Multiple Choice Questions (20 marks) Section II: Short Answer Questions (30 marks) and Section III: Long Answer Questions (20 marks)
3. Answer ALL Questions.
4. Do Not write anything on the question paper -use the back of your booklet for rough work if need be.

SECTION I: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. A patient has blood pH 7.30 and elevated $PaCO_2$. Which primary disturbance is present?

A. Metabolic acidosis

B. Respiratory acidosis

C. Metabolic alkalosis

D. Respiratory alkalosis

2. Identify the pair that most effectively maintains pH near the physiological range:

A. Strong acid–strong base

B. pH far from pKa

C. Weak acid–conjugate base with pKa near pH

D. Neutral salt solutions

3. During prolonged vomiting, which biochemical change is most likely?

A. Decreased bicarbonate

B. Metabolic alkalosis

C. Respiratory acidosis

D. Increased hydrogen ion retention

4. Transporter primarily responsible for glucose uptake into intestinal epithelial cells?

A. GLUT2

B. SGLT1

C. GLUT4

D. Na^+/K^+ ATPase

5. Enzyme deficiency that leads to lactose intolerance symptoms: -

A. Sucrase

B. Lactase

C. Amylase

D. Maltase

6. If plasma bicarbonate increases while CO_2 remains constant, blood pH will:

A. Decrease

B. Remain unchanged

C. Increase

D. Become neutral

7. The bicarbonate buffer system depends directly on regulation by:

A. Kidneys only

B. Lungs only

C. Lungs and kidneys

D. Pancreas

8. The tissue that relies heavily on anaerobic metabolism during intense exercise?

A. Liver

B. Skeletal muscle

C. Kidney cortex

D. Adipose tissue

9. The TCA cycle primarily functions to:

A. Produce glucose

B. Generate reducing equivalents

C. Synthesize proteins

D. Store ATP

10. The molecule that directly donates electrons to the electron transport chain?

A. ATP

B. NADH

C. Glucose

D. Pyruvate

11. Insulin secretion is stimulated primarily by:

A. Low blood glucose

B. High blood glucose

C. High fatty acids

D. Low amino acids

12. The hormone that opposes insulin action in glucose metabolism?

A. ADH

B. Glucagon

C. Thyroxine

D. Aldosterone

13. Oxidative phosphorylation occurs in the:

A. Cytosol

B. Mitochondrial matrix

C. Inner mitochondrial membrane

D. Outer mitochondrial membrane

14. An increase in osmolarity of plasma will stimulate release of:

A. Insulin

B. ADH

C. Cortisol

D. Growth hormone

15. The condition that would most likely produce respiratory alkalosis?

A. Hypoventilation

B. Severe diarrhea

C. Hyperventilation

D. Renal failure

16. The immediate precursor to ATP formation in oxidative phosphorylation?

A. ADP

B. AMP

C. NAD^+

D. FAD

17. In the fed state, excess glucose is primarily converted into:

A. Ketone bodies

B. Glycogen

C. Urea

D. Lactate

18. The organ that plays the central role in maintaining blood glucose during fasting?

A. Brain

B. Heart

C. Liver

D. Skin

19. A decrease in hydrogen ion concentration will:

A. Lower pH

B. Increase pH

C. Not change pH

D. Cause neutrality

20. mechanism that contributes to renal compensation in acidosis?

A. Bicarbonate excretion

B. Hydrogen ion secretion

C. CO_2 retention

D. Reduced ammonium production

SECTION II: SHORT ANSWER QUESTIONS (30 MARKS)

1. Define a buffer and explain its mechanism of action. (5 marks)

2. Describe TWO physiological buffer systems. (5 marks)

3. Outline stages of carbohydrate digestion. (5 marks)

4. Explain the role of insulin in glucose regulation. (5 marks)

5. Differentiate respiratory and metabolic acidosis. (5 marks)

6. Describe glucose absorption in the small intestine. (5 marks)

SECTION III: LONG ANSWER QUESTIONS (20 MARKS)

1. Acid–base balance is essential for normal physiological function.

    a) Explain the bicarbonate buffer system in maintaining blood pH. (5 marks)

    b) Describe respiratory regulation of acid–base balance. (5 marks)

2. Bioenergetics is central to cellular metabolism.

    a) Explain the role of the TCA cycle in energy production. (5 marks)

    b) Describe ATP production via oxidative phosphorylation. (5 marks)