



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCES
DEPARTMENT OF PHYSIOTHERAPY
BACHELOR OF SCIENCE IN PHYSIOTHERAPY (DIRECT ENTRY)
END OF SEMESTER APRIL, 2024 EXAMINATIONS

COURSE: PHT 128: BIOCHEMISTRY

DATE: 9TH APRIL 2024

Duration: 2 HOURS Start: 11.15PM Finish: 1.15PM

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. Use a physical calculator where applicable
5. pKa value of formic acid= 3.75

SECTION I: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Which of the following are the major functions of Carbohydrates?
 - A. Storage
 - B. Structural framework
 - C. Transport Materials
 - D. Both Storage and structural framework
2. -Which of these amino acids are essential for infants?
 - A. Methionine
 - B. Arginine and Histidine
 - C. Valine
 - D. Lysine and Leucine
3. LDH₁ and LDH₂ are elevated in -----
 - A. Myocardial infarction
 - B. Liver disease
 - C. Kidney disease
 - D. Brain disease
4. All of the following statements are true for orotic aciduria. Except
 - A. Orotic acid is excreted in urine.
 - B. Anaemia is a symptom of this disease.
 - C. Growth retardation is seen in affected people.
 - D. Self mutilation is another symptom of this disease.
5. The ratio that approximates the number of net molecule of ATP formed per mole of Glucose oxidized in presence of Oxygen to the net number formed in absence of Oxygen is:-
 - A. 4: 1
 - B. 10: 2
 - C. 12: 1
 - D. 18: 1

6. Which out of the following conditions is associated with hypouricemia?

- A. Lesch Nyhan syndrome
- B. Adenosine deaminase deficiency
- C. Over activity of PRPP synthetase
- D. Over activity of amido transferase:-

7. Compared to the resting state, vigorously contracting muscle shows:-

- A. An increased conversion of pyruvate to lactate
- B. Decreased oxidation of pyruvate of CO₂ and water
- C. A decreased NADH/NAD⁺ ratio
- D. Decreased concentration of AMP

8. Salvage pathway is used in the synthesis of _____

- A. Amino acid
- B. Carbohydrate
- C. Nucleotide
- D. Fatty acid

9. At a pH below the isoelectric point, an amino acid exists as:-

- A. Cation
- B. Anion
- C. Zwitterion
- D. Undissociated molecule

10. Serum amylase is increased in:-

- A. Acute parotitis
- B. Acute pancreatitis
- C. Pancreatic cancer
- D. All of these

11. Carnitine is synthesized from:-

- A. Lysine and methionine
- B. Glycine and arginine
- C. Aspartate and glutamate
- D. Proline and hydroxyproline

12. The most toxic compound is:-

- A. Tyrosine
- B. Phenylpyruvate
- C. Lysine
- D. Phenylalanine

13. Prostaglandins are synthesized in the body from:-

- A. Myristic acid
- B. Arachidonic acid
- C. Stearic acid
- D. Lignoceric acid.

14. Which of these is a hereditary disease caused due to an error in amino acid metabolism?

- A. Homocystinuria
- B. Albinism
- C. Phenylketonuria
- D. Branched-chain ketoaciduria

15. The following statement is FALSE regarding ketone bodies:-

- A. They may result from starvation
- B. They are formed in kidneys
- C. They include acetoacetic acid and acetone
- D. They may be excreted in urine.

16. A manifestation of vitamin A deficiency is:-

- A. Painful joints
- B. Night blindness
- C. Loss of hair
- D. Thickening of long bones

17. Which of these non-covalent bonds in biological systems is usually the weakest?

- A. Van der waals interactions
- B. Ion-dipole interaction
- C. Hydrogen bond
- D. Hydrophobic interaction

18. In a water molecule, hydrogens are partially ____, oxygens are partially ____

- A. Negative; positive
- B. Positive; positive
- C. Positive; negative
- D. Negative; negative

19. This statement about enzymes is true:

- A. Enzymes accelerate reactions by lowering the activation energy
- B. Enzymes are proteins whose three-dimensional form is key to their function
- C. Enzymes do not alter the overall change in free energy for a reaction
- D. All of these

20. Koshland proposed which model:

- A. Fluid mosaic model
- B. Induced fit model
- C. Lock and key model
- D. Reflective index model

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SECTION II: SHORT ASSAY QUESTIONS (30 MARKS)

1. Outline **THREE** uses of Nicotinamide Adenine Dinucleotide Phosphate reduced(NADPH), generated in Pentose shunt. (3 Marks)
2. Calculate the pH of 1 L solution containing 0.1 M formic acid and 0.1 M sodium formate before and after the addition of 1 mL of 5 M NaOH. How much would the pH change if the NaOH were added to 1L of pure water? (5 Marks)
3. Explain:
 - a. The fate of pyruvate in the cell (4½ Marks)
 - b. Phenylketonuria disorder (1½ Marks)
 - c. Mechanism of action of Allopurinol drug in minimizing uric acid excretion. (3 Marks)
4. Regarding fats
 - a. Explain why we require fats in our diet. (2 Marks)
 - b. Outline three (3) outstanding differences between biosynthesis and β oxidation of fatty acids. (3 Marks)
5. Outline Four (4) roles of metabolism. (4 Marks)
6. List **TWO** biomedical importance of amino acids. (2 Marks)
7. Highlight **FOUR** (4) key enzymes of gluconeogenesis (2 Marks)

SECTION C: LONG ASSAY QUESTIONS (20 MARKS)

INSTRUCTIONS: Answer ONLY ONE Question

1. (a) i. Derive Henderson-Hasselbalch equation. (4 Marks)
 - ii. What is the Henderson-Hasselbalch equation's application? (2 Marks)
 - iii. Explain **THREE** limitations of Henderson-Hasselbalch equation (6 Marks)(b) Describe **FOUR** characteristics of water. (8 Marks)
2. (a) Describe in details various characteristic properties of enzymes. (12 Marks)
 - (b) Describe the **TWO** proposed theories that justifies mechanisms of enzyme action. (8 Marks)