



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	LEVEL: 7
COURSE CODE: BPP702S	COURSE NAME: BIOCHEMISTRY: BIOCHEMICAL PRINCIPLES AND PRACTICE
SESSION: JANUARY 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY QUESTION PAPER	
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MODERATOR:	DR. PETRINA KAPEWANGOLO

INSTRUCTIONS	
<ol style="list-style-type: none">1. Answer ALL the questions.2. Write clearly and neatly.3. Number the answers clearly.4. All written work MUST be done in BLUE or BLACK ink.	

PERMISSIBLE MATERIAL

Scientific Calculator

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES
(Including this front page)

QUESTION 1**[12]**

a) Define the following terms (5)

I. Ampholyte

II. Oxidoreductases

III. Competitive inhibitors

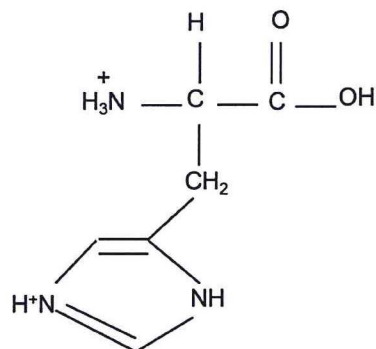
IV. Isoelectric Point

V. Non-competitive inhibitors

b) Calculate the pKa of lactic acid, given that when the concentration of free lactic acid is 0.01M and the concentration of lactate is 0.087M, the pH is 4.80 (3)

c) A buffer is made by adding 0.300 mol of $\text{HC}_2\text{H}_3\text{O}_2$ and 0.300 mol of $\text{NaC}_2\text{H}_3\text{O}_2$ to 1.0 L of water. The pH of the buffer is 4.74. Calculate the pH of this solution if 0.020 mol of NaOH is added ($K_a = 1.8 \times 10^{-5}$) (4)**QUESTION 2****[12]**

Histidine is one of 20 amino acids found in proteins. Shown here is the fully protonated structure of histidine molecule and the pKa values for the acidic groups are 1.82, 6.00 and 9.17



a) What is the pI value of this amino acid? Show clearly how you arrive at the answer (5)

b) What is the zwitterionic structure of histidine? (1)

c) The histidine group plays an important role in buffering blood (the pH of blood is 7.4). Which conjugate acid-base pair is responsible for maintaining the pH of blood? (2)

- d) Draw the structure which will be dominant at pH 12 (1)
- e) Draw the structures of dipeptides that can be formed from the reaction between the amino acids histidine and glycine (3)

QUESTION 3 [10]

- a) Discuss the mode of action of small interfering RNAs (siRNAs) (4)
- b) What are the special features found at the 5' end and the 3' end of mature eukaryotic mRNA? (2)
- c) The nucleotide sequence listed below represents the non-template DNA strand of a gene (2)
5' CGATGTCTTCAACTACGTAG 3'

Give;

- I. the nucleotide sequence of the template strand
- II. the nucleotide sequence of the mRNA formed (assuming no introns are present)

Be sure to include which ends are 5', 3'.

- d) Briefly explain the concept of RNA splicing (2)

QUESTION 4 [15]

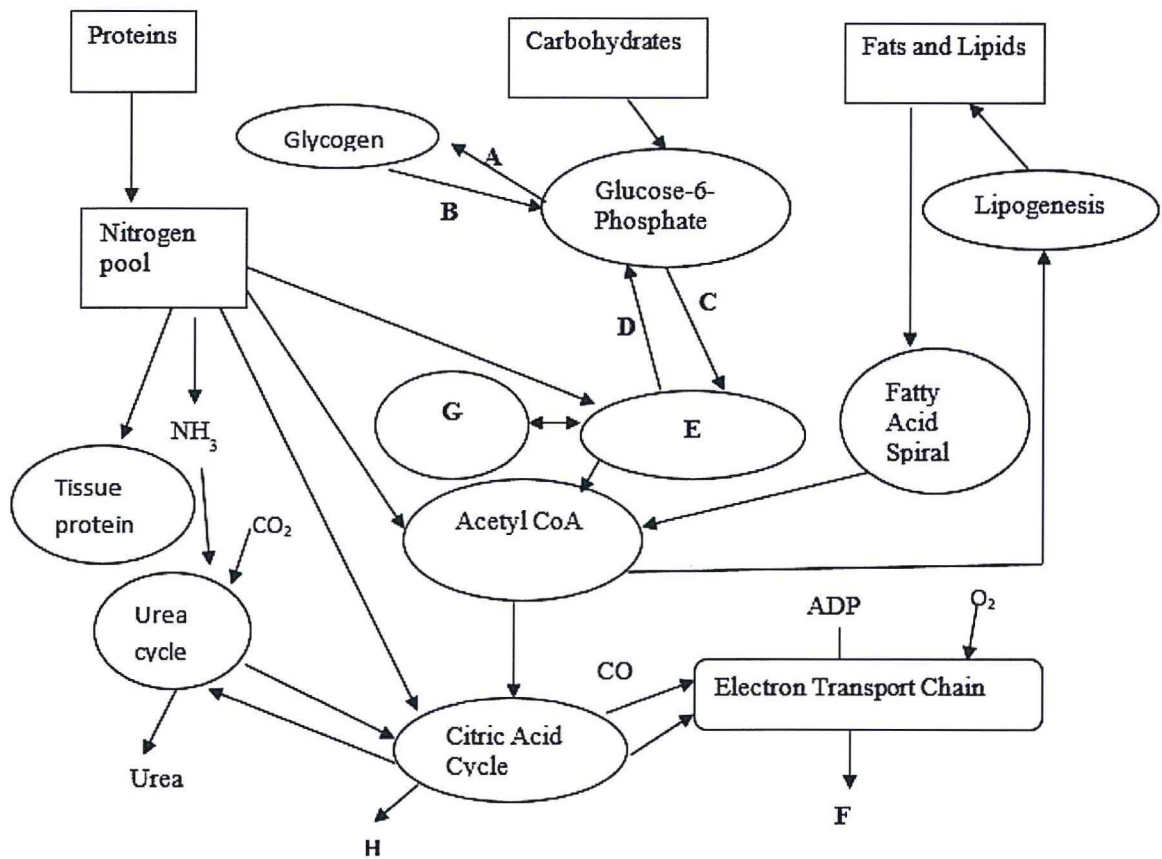
- a) State **FOUR (4)** factors that affect enzyme action? (4)
- a) The glycolysis pathway is regulated by **THREE (3)** enzymes namely; (3)
- b) Using structural formulas, write the balanced chemical equation for the **TWO (2)** reactions where CO₂ is produced in the Krebs cycle (8)

QUESTION 5

[18]

a) Briefly explain the Electron Transport Chain/Oxidative Phosphorylation process (10)

b) The diagram below is a summary of some of the major metabolic processes in an organism



I. Name the processes A, B, C and D (4)

II. Name compound E (1)

III. Metabolic processes C and D are not mere reverse of each other. Discuss briefly this statement (3)

QUESTION 6

[18]

- a) Briefly discuss **THREE (3)** types of membrane proteins. (6)
- b) Discuss **THREE (3)** characteristics of the genetic code (6)
- c) Briefly discuss the following mutations: (6)
 - I. Nonsense Mutation
 - II. Frame shift Mutation
 - III. Missense Mutation

QUESTION 7

[15]

- a) Based on ADME properties, why is drug development a challenging task? (5)
- b) Give **FIVE (5)** reasons as to why the knowledge of mechanism of action of drugs is important (10)

END