



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE (MAJOR/MINOR)	
QUALIFICATION CODE: 07BOSH	LEVEL: 7
COURSE NAME: BIOCHEMISTRY: BIOCHEMICAL PRINCIPLES AND PRACTICE	COURSE CODE: BPP702S
SESSION: JANUARY 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR	ASSOC PROF 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 MATERIALS

None

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES
(Including this front page)

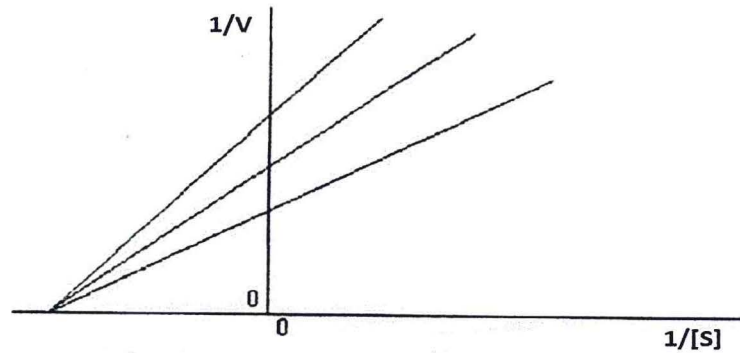
QUESTION 1

[14]

a) Briefly, discuss **FOUR (4)** factors that affect enzyme action

(8)

b) Consider the Lineweaver Burk plot shown below:



I. The enzyme carboxypeptidase-A catalyzes the hydrolysis of the peptide AGEs (Advanced glycation end products) in 10mM phosphate buffer at pH 7.0. This enzyme obeys Michaelis-Menten kinetics when $K_m = 3\text{mM}$, $V_0 = 150\text{mmol/min}$ and $[S] = 0.5\text{ mM}$.

Calculate the V_{max} of this enzyme.

(4)

II. What effect (increase, decrease, no Change) does the inhibitor carboxypeptidase-A have on V_{max} .

(1)

III. What effect (increase, decrease, no Change) does the inhibitor carboxypeptidase-A have on K_m .

(1)

QUESTION 2

[11]

a) Draw the dominant structural form of glycine in a highly acidic solution, pH = 1.5.

(2)

b) Sketch the pH titration curve of glycine in 2.1 and show clearly the following:

(3)

I. Isoelectric point

II. pK_1 ($-\text{COOH}$) and pK_2 ($-\text{NH}_3^+$)

III. Point only zwitterions exist

c) State **SIX (6)** main functions of the amino acid tryptophan

(6)

QUESTION 3

[14]

- a) Outline the **FOUR (4)** enzyme sites that regulate gluconeogenesis (4)
- b) Using structural formulas, write the balanced chemical equation for the reactions where GTP is produced in the Krebs cycle. (4)
- c) Briefly describe the anabolic role of the TCA cycle in fatty acid synthesis (6)

QUESTION 4

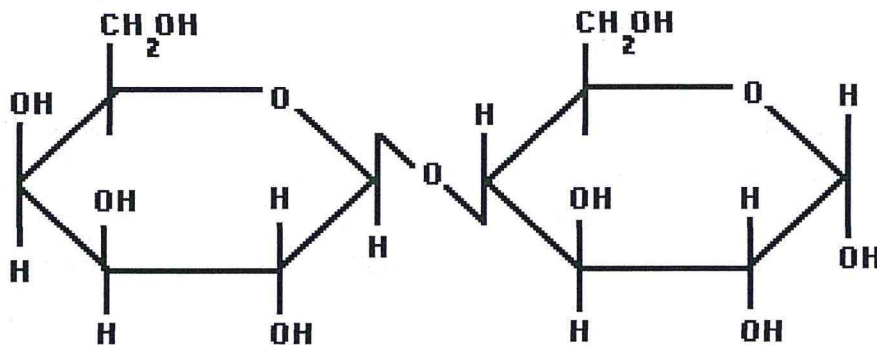
[17]

- a) Schematically describe the following patterns of metabolic regulation (8)
- b) State **FOUR (4)** functions performed by metabolism in living cells (4)
- c) Give the possible symptoms of deficiency of the following vitamins (5)
- I. Vitamin B2 (Riboflavin);
 - II. Vitamin B12;
 - III. Vitamin A (Retinol);
 - IV. Vitamin K (Phylloquinone);
 - V. Vitamin D;

QUESTION 5

[15]

- a) Draw the structures and name the two stereoisomer monosaccharides that form when the disaccharide below is hydrolyzed. (4)

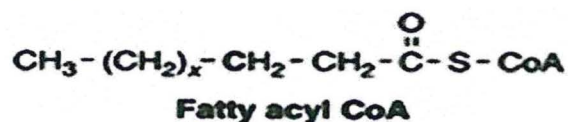


- b) Give a detailed description of how a DNA molecule is translated into a protein (5)
- c) Describe the following techniques used for the separation and purification of amino acids and proteins (6)
- I. Affinity Chromatography;
 - II. Size Exclusion Chromatography;
 - III. Gel Electrophoresis;

QUESTION 6

[17]

- a) Inositol triphosphate (IP3) and diacylglycerol (DAG) are all small molecules that can be found inside most cells, yet they are known to be important second messengers that can increase or decrease in response to a wide variety of signals. However, each signal often produces completely different responses. Describe how such responses are regulated following GPCR signalling. (5)
- b) Lipids are known to be insoluble in water, briefly elucidate on how dietary lipid are digested, absorbed and transported in the body. (4)
- c) With the aid of the fatty acyl CoA structure below, discuss the production of energy (ATP) through the process of β -oxidation (breakdown) of fatty acids. (8)



QUESTION 7

[12]

- a) Based on ADME properties, why is drug development a challenging task? (4)
- b) Describe the two pathways utilized by the body for the excretion of compounds once they have entered the bloodstream (4)
- c) Discuss how cholera toxin disrupts the regulation of intestinal secretion following GPCR signalling. (4)

THE END