



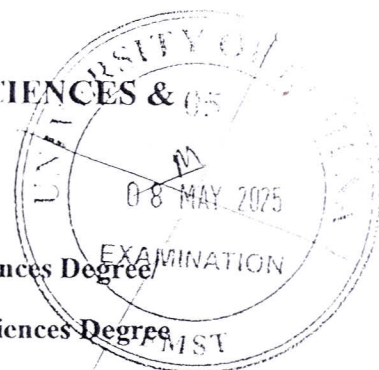
UNIVERSITY OF RUITUNA
FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2023/2024

Bachelor of Science Honours in Fisheries and Marine Sciences Degree

Bachelor of Science Honours in Marine and Freshwater Sciences Degree

Level IV Semester I Examination – April/May 2025



CHM 4112: Biochemistry

Time: 01 hour and 30 minutes

Instructions:

- Answer all questions in part I in the paper itself and submit.

In each of the questions 1-15 in part I, pick one of the alternatives from (a), (b), (c), (d), and (e) which is correct or most appropriate and underline your selection.

- Use the answer writing book to answer the questions in part II.

Part II

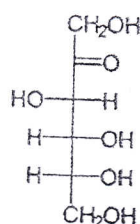
01. Answer all parts.

a. Briefly explain following terms.

- Epimers
- Oligosaccharides
- Catabolism

(15 marks)

b. Consider the structure of D-fructose.



- Draw two Haworth projections of the pyranose ring forms for the two anomers of fructose
- Draw the chair conformations of each pyranose ring structure above.
- List out five functions of carbohydrates in the living body.
- Even though Fructose does not have an aldehyde group, it gives positive results with Fehling's Tests. Explain the reason for this observation

(45 marks)

c. Carbohydrate metabolism is one of the major ways of producing energy in the body. Give short answers to the following questions regarding carbohydrate metabolism.

- List out the main steps of glycolysis.
- What is the role of phosphoglucosomerase enzyme in glycolysis? With appropriate structures, draw a suitable mechanism for the process.
- Mention the products of glycolysis with their net amounts.
- Briefly explain the fate of the end product of glycolysis in aerobic and anaerobic conditions.

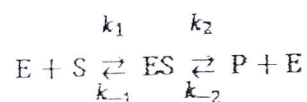
(40 marks)

02. Answer all parts.

a. Give short answers to the following questions.

- i. What does it mean by feedback inhibition?
- ii. Briefly explain the allosteric regulation of enzymes in the metabolic process.
- iii. List three methods, other than allosteric regulation, used in biological systems to regulate the catalytic activity of enzymes. (30 marks)

b. Kinetics of the enzymes can be studied using the following reaction.



E: free enzyme; S: Substrate; ES: Enzyme-Substrate complex; P: Products

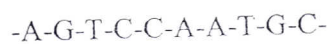
i. Using suitable assumptions, derive the following equation regarding Michael-Menten kinetics.

$$V_0 = \frac{V_{\max}[S]}{[S] + [K_m]}$$

- ii. Plot the Lineweaver-Burk plot with deriving a suitable equation, and label the graph properly.
- iii. Using an appropriate equation, show the order of enzymatic reaction changes from 1st order to zeroth order when the substrate concentration is increased. (40 marks)

c. Replication of DNA occurs with the aid of enzymes.

i. Draw the complementary RNA fragment for the given DNA fragment below.



ii. Briefly explain the major steps of DNA replication. (30 marks)

03. Answer all parts.

a. Answer the following questions

- i. Define the term Zwitterion of amino acids.
- ii. Draw a dipeptide to show the peptide bond and mark the peptide plane.
- iii. Explain why the peptide plane of the protein is a rigid planar structure. (30 marks)

