



UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

FIRST BPHARM PART I EXAMINATION – JULY/AUGUST 2026

PH 1123 BIOCHEMISTRY I – SEQ

TIME: TWO HOURS

INSTRUCTIONS

- There are **four** questions in part A, B and C in this SEQ paper.
- Answer all questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

PART A

1.

1.1. A researcher examined cells undergoing meiosis and observed homologous chromosomes paired together to form tetrads.

1.1.1. Mention the stage of meiosis at which homologous chromosomes are observed as tetrads. (10 marks)

1.1.2. List the major events that occur during this stage of meiosis. (20 marks)

1.1.3. State the significance of these events in producing genetically diverse offspring. (20 marks)

1.2. The transport of substances across the plasma membrane occurs through a variety of mechanisms.

1.2.1. State the physiological importance of diffusion in humans. (10 marks)

1.2.2. Differentiate between simple diffusion and facilitated diffusion. (20 marks)

1.2.3. Briefly explain the mechanism of action of the Na^+/K^+ ATPase system. (20 marks)

2. Vitamins are essential organic compounds required for the normal metabolic functions of the human body.

2.1. Define the term provitamin and provide two suitable examples. (15 marks)

2.2. State the major biological functions of vitamin D in the human body. (10 marks)

2.3. List two disorders associated with vitamin D deficiency. (10 marks)

2.4. State the physiological importance of folic acid (vitamin B₉). (15 marks)

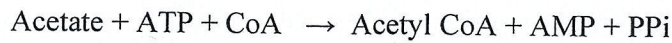
PART B

2.5. Endergonic and exergonic reactions form the basis of the reactions occurring in various organisms.

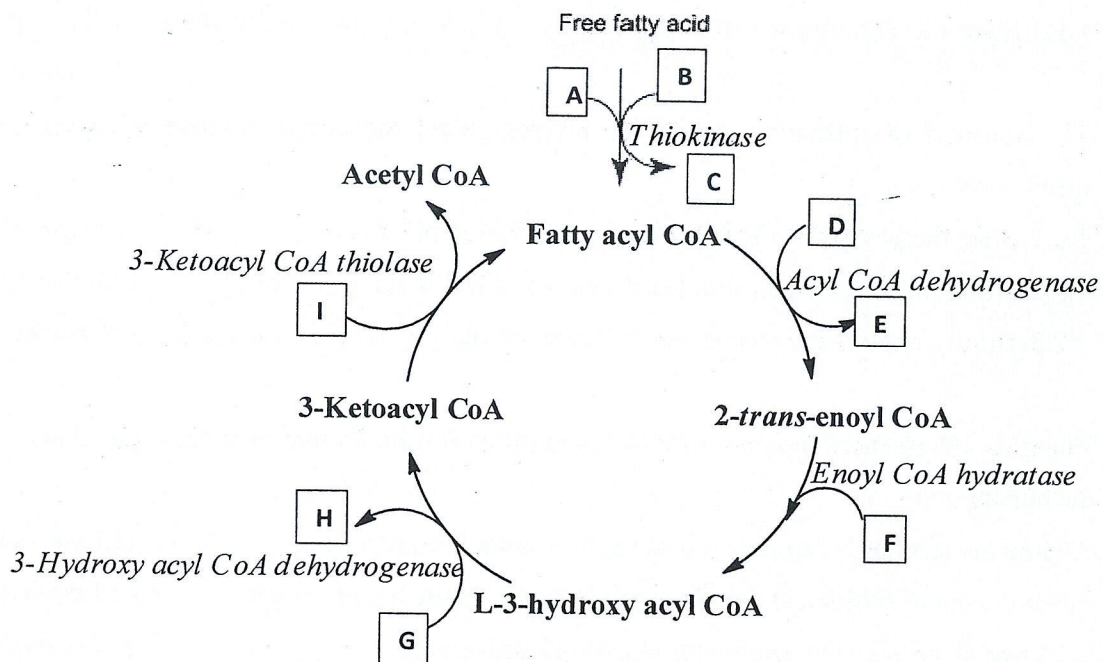
2.5.1. Differentiate between exergonic and endergonic reactions. (10 marks)

2.5.2. How do cells drive endergonic reactions? (05 marks)

2.5.3. The standard free energy of hydrolysis of acetyl CoA is $-31.4 \text{ kJ mol}^{-1}$ and the standard free energy of hydrolysis of ATP to AMP and pyrophosphate is $-45.6 \text{ kJ mol}^{-1}$. Calculate the standard free energy change (ΔG^0) of the following reaction. (15 marks)

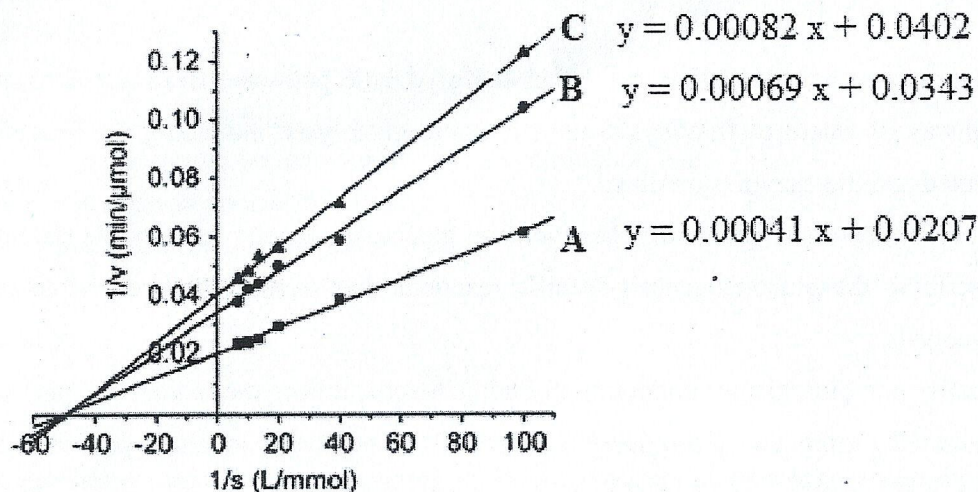


2.6. In fatty acid catabolism, activation of fatty acid and the four enzymatic steps of the fatty acid β -oxidation cycle are shown below. Identify the coenzymes and substrates (if any) in each step indicated by A-I. (20 marks)



3.

3.1. Three Lineweaver–Burk plots obtained for trypsin in the absence and presence of two inhibitors, SKTI and rSKTI (wild-type inhibitor), are shown in the graph below and labeled as A, B, and C (not in any particular order).



3.1.1. Identify the type of enzyme inhibition exhibited by the inhibitors. (10 marks)

3.1.2. Write the Lineweaver–Burk equation. (10 marks)

3.1.3. Using the graph, determine the apparent values of K_m and V_{max} for each case. (25 marks)

3.1.4. If the V_{max} value for SKTI is greater than that for rSKTI, identify which lines correspond to:

- trypsin without inhibitor,
- trypsin + SKTI,
- trypsin + rSKTI.

Justify your answer using the characteristics of the Lineweaver–Burk plot.

(20 marks)

3.2. Oxidation of fatty acids is a major energy source in many organisms.

3.2.1. Write the (chemical) equation for the final step of β -oxidation in the catabolism of any fatty acid with an even number of carbon atoms. (10 marks)

3.2.2. Calculate the number of acetyl-CoA and ATP molecules produced from the complete oxidation of myristic acid, $\text{CH}_3(\text{CH}_2)_{12}\text{COOH}$. (25 marks)

PART C

4.

- 4.1. Fructose can be metabolized and enter the glycolytic pathway. Illustrate the metabolic pathway of fructose (fructolysis) until it enters glycolysis, indicating the intermediates formed and the enzymes involved. (40 marks)
- 4.2. Gluconeogenesis is not simply the reverse of glycolysis. Briefly explain this statement by describing the gluconeogenesis-specific reactions that replace the irreversible steps of glycolysis. (20 marks)
- 4.3. Identify one biologically important product generated during the oxidative phase and one generated during the non-oxidative phase of the pentose phosphate pathway. Briefly explain the role of each product in cellular metabolism. (20 marks)
- 4.4. Humans are unable to synthesize ascorbic acid. Briefly explain the biochemical basis for this inability. (20 marks)

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