



FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA  
Second Examination for Medical Degrees – October 2023  
Biochemistry-Paper II

Answer **All Five** Questions.  
Answer each question in a **separate** book.  
Marks allocated to each part of a question are shown within parenthesis.  
Handover each book separately.

17<sup>th</sup> October 2023  
2.00 p.m. - 5.00 p.m.  
(Three hours)

- 1.
- 1.1 An 18-year-old male with type 1 diabetes mellitus was admitted to the hospital in a confused state. He was diagnosed as having an acute severe chest infection. His random blood glucose concentration was 570 mg/dL. His serum sodium concentration was elevated and urine was positive for ketone bodies.
- 1.1.1 State the most likely condition that this patient has developed. (10 marks)
- 1.1.2 Explain the biochemical basis for the following observations
- a. Random blood glucose concentration of 570 mg/dL (15 marks)
  - b. Elevated serum sodium (10 marks)
  - c. Ketone bodies in urine (15 marks)
- 1.2 Explain the basis for the following.
- 1.2.1 Skin hypopigmentation in classical phenylketonuria. (25 marks)
- 1.2.2 Lactate dehydrogenase is a tumour marker. (25 marks)
2. Explain the biochemical basis for the following.
- 2.1 Administration of lactulose in hyperammonaemia. (25 marks)
- 2.2 Occurrence of anaemia in  $\beta$  thalassaemia major. (25 marks)
- 2.3 Development of hypoglycaemia in acute alcohol intoxication. (25 marks)
- 2.4 High requirement of protein in a patient with an acute tissue injury. (25 marks)

## 3

- 3.1 A 46-year-old apparently healthy male who is a chronic alcohol user was presented to a physician with a complaint of abdominal discomfort. An ultrasound scan of the abdomen revealed fatty liver. Serum lipid levels were analyzed after a 12-hour fast and the results are given below.

Appearance of the serum sample- Turbid

Serum	Test result	Reference range
Total cholesterol	290 mg/dL	< 200 mg/dL
Triglycerides	420 mg/dL	150 mg/dL

- 3.1.1 Name the investigation that is used to assess the serum lipoproteins. (05 marks)
- 3.1.2 What are the two types of lipoproteins most likely to be elevated in this patient? (10 marks)
- 3.1.3 Explain the biochemical basis for the development of fatty liver in this patient. (30 marks)
- 3.1.4 State three lifestyle modifications that can be recommended to this patient. (15 marks)
- 3.2 A 40-year-old woman consumes a diet with adequate calories and 30 g of protein per day. Her height and weight are 1.3 m and 70 kg respectively.

Safe level of intake of proteins for an adult = 0.75 g/kg/day

Digestibility of a mixed diet = 85%

- 3.2.1 Calculate the body mass index of this woman. (10 marks)
- 3.2.2 Comment on her nutritional status based on the calculated value in 3.2.1. (05 marks)
- 3.2.3 Calculate her daily protein requirement and comment on the present intake. (15 marks)
- 3.2.4 State two dietary modifications that could be recommended to this woman. (10 marks)

- 4.
- 4.1 4.1.1 State the difference between *de novo* and salvage nucleotide synthesis. (10 marks)
- 4.1.2 Explain how hyperuricaemia occurs due to deficiency of enzymes in the purine salvage pathway. (20 marks)
- 4.2 Explain briefly the role of tandem repeats in paternity testing. (20 marks)
- 4.3 Explain the biochemical basis for the following.
- 4.3.1 Estimation of C-reactive protein in a patient with acute inflammation. (25 marks)
- 4.3.2 Urine protein electrophoresis is used to diagnose multiple myeloma. (25 marks)
5. Explain the following.
- 5.1 Role of hepcidin in body iron homeostasis. (25 marks)
- 5.2 Adequate intake of fluoride is beneficial while excess is harmful for bones and teeth. (25 marks)
- 5.3 Thiamine deficiency impairs carbohydrate metabolism leading to clinical consequences. (25marks)
- 5.4 Molecular mechanisms that are involved in the action of insulin signalling pathway. (25 marks)

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