FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA

Second Examination for Medical Degrees-June 2020

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.

23rd June 2020

2.00 p.m- 5.00 p.m

(Three hours)

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1. 1.1 A 21 year-old male patient with type 1 diabetes mellitus for five years of duration is admitted to the Emergency Treatment Unit with altered consciousness. He has fever and a bad wound in the right foot. His blood and urine samples are collected before administering normal saline, insulin and KCl intravenously.
Following are his investigation findings.

Analyte	Test result	Reference range
Blood glucose (mmol/L)	25.0	< 5.5
Sodium (mmol/L)	156.0	132.0 - 144.0
Potassium (mmol/L)	5.1	3.2 - 4.8
HCO_3^- (mmol/L)	17.0	23.0 - 33.0
Creatinine (mmol/L)	0.12	0.06 - 1.20
Dipstick test for urine ketone bodies	Positive	

1.1.1 State the probable diagnosis. (10 marks)

1.1.2 Explain the biochemical basis for each of the test results given above. (40 marks)

1.1.3 Explain the biochemical basis of each treatment given in the management of the patient. (20 marks)

1.1.4 Explain the biochemical basis of the investigation that can be performed to assess the glycaemic control over the past three months in this patient. (30 marks)

2. Explain the biochemical basis of the following.

2.1 Development of cataract in galactosaemia. (25 marks)

2.2 The earliest manifestation of vitamin A deficiency is delayed adaptation to dim light. (25 marks)

2.3 Development of megaloblastic anaemia in a patient with vitamin B_{12} deficiency. (25 marks)

2.4 Presence of hyperbilirubinaemia in a patient with gallstones. (25 marks)

3. 3.1 A 56 year-old woman who is to be discharged from hospital after being treated for an acute myocardial infarction has asprin and fish oil in her drug regime.

3.1.1 Explain the rationale behind the use of

3.1.1.1 aspirin (35 marks)

3.1.1.2 fish oil (20 marks)

3.1.2 State five possible risk factors for the development of atherosclerosis and coronary artery disease. (15 marks)

3.2 Explain briefly the biochemical basis.
Deficiencies of the enzymes involved in the purine catabolism pathway lead to immunodeficiency. (30 marks)

4. Explain the following.

4.1 Consumption of food rich in fructose contributes to hypertriglyceridaemia. (25 marks)

4.2 Administration of glucose infusion in ammonia toxicity. (25 marks)

4.3 Role of plasma haptoglobin as an acute phase protein. (25 marks)

4.4 The role of hepcidin in the regulation of body iron homeostasis. (25 marks)

5.1 A 42 year-old woman with type 2 diabetes mellitus, who underwent a health check-up, was found to have an increased risk of heart disease, with hypercholesterolaemia and hypertension. She is referred to a dietician for necessary dietary advice. Her weight and height measurements are 80 kg and 1.5 m respectively. She consumes a mixed diet.

Safe level of protein intake for an individual = 0.75 g/kg/day

Digestibility of proteins in a mixed diet = 80%

5.1.1 Calculate the BMI of the above individual. Comment on the value. (15 marks)

5.1.2 Calculate the safe level of dietary protein intake for the above patient. (20 marks)

5.1.3 Explain the main considerations in planning a diet for the above patient. (40 marks)

5.2 An advanced molecular diagnostic technique is employed in the diagnosis of patients infected with COVID-19 virus.

5.2.1 State the molecular diagnostic technique used for the above purpose. (5 marks)

5.2.2 Explain the molecular basis of the technique mentioned in 5.2.1 and its significance as a diagnostic tool. (20 marks)

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