UNIVERSITY OF JAFFNA, SRI LANKA

FIRST EXAMINATION FOR MEDICAL DEGREES - APRIL 2025

ACADEMIC YEAR 2022/2023

BIOCHEMISTRY PAPER II

(43RD AND 44TH BATCHES)

22.04.2025

Time: 3 Hours

Answer all 10 questions.

Marks allotted to each part are indicated in brackets.

Answer Each Question on Separate Answer Books.

1. **1.1** Give the reference ranges of fasting blood glucose levels under the following conditions:

   1.1.1 Normal **(10 Marks)**

   1.1.2 Prediabetes **(10 Marks)**

   1.1.3 Diabetes **(10 Marks)**

   1.2 Diagrammatically show how the elevated blood glucose level leads the pancreas to secrete insulin. **(35 Marks)**

   1.3 List the tissues which are not sensitive to

   1.3.1 Insulin **(20 Marks)**

   1.3.2 Glucagon **(15 Marks)**

2. **2.1** Explain why glutamate dehydrogenase is important for the synthesis of

   2.1.1 non-essential amino acids. **(30 Marks)**

   2.1.2 urea. **(20 Marks)**

   2.2 Explain how the proteins are catabolised by the ubiquitin/proteasome system. **(25 Marks)**

   2.3 Explain how the anaemic conditions caused by the deficiencies of iron and vitamin B_6 can be differentiated. **(25 Marks)**

3. An eight-year-old boy developed respiratory distress. He was breathing deeply and a fruity smell in the breath was noted. Laboratory examinations demonstrated the blood glucose level of 40 mM (normal 3.5 to 6.0 mM), elevated serum ketone bodies with a pH of 7.0 (normal 7.4 to 7.45). The patient had increased Blood Urea Nitrogen (BUN) level and responded to intravenous rehydration and calculated insulin therapy.

3.1 What could be the probable defect in this boy? **(10 Marks)**

3.2 List the causes for the defect mentioned in Section 3.1. **(15 Marks)**

3.3 Give the biochemical explanations for the changes in blood

3.3.1 glucose **(35 Marks)**

3.3.2 ketone bodies **(20 Marks)**

3.3.3 pH **(20 Marks)**

4. **4.1** Explain how the exogenous fat is absorbed and that enters the blood stream is distributed to the peripheral tissues? **(45 Marks)**

4.2 **4.2.1** List the probable causes of serum triacylglycerol level elevation. **(15 Marks)**

4.2.2 Give the biochemical basis of the use of fibrates to treat a person with elevated triacylglycerol level. **(20 Marks)**

4.3 Explain the biochemical basis, why it is recommended to avoid fructose and sucrose to reduce the serum triacylglycerol level. **(20 Marks)**

5. **5.1** **5.1.1** List the different types of immunoglobulins. **(10 Marks)**

5.1.2 Explain how the structure of immunoglobulin is suited for its function. **(25 Marks)**

5.1.3 Explain the biochemical basis of autoimmune diseases taking myasthenia gravis as an example. **(25 Marks)**

5.2 List the importance of cholesterol to the body. **(20 Marks)**

5.3 List the components that are required and their role in DNA transcription. **(20 Marks)**

6. **6.1** Explain the serum calcium homeostasis in a normal adult. **(40 Marks)**

6.2 Copper is essential for wound healing. Explain the biochemical basis.

(20 Marks)

6.3 Explain the biochemical basis of blood groups typing. **(20 Marks)**

6.4 Explain the biochemical basis of lactose intolerance and its complications.

(20 Marks)

7. **7.1** A 17-year-old boy was admitted to a hospital and diagnosed to have sickle cell disease, and the following report was obtained.

	Patient	**Normal Range**
Haemoglobin (gdL^{-1})	7.5	12-15
Packed Cell Volume (%)	23.4	41-53
Serum Bilirubin ($mgdL^{-1}$)	2.3	0.2-1.0

7.1.1 Explain the molecular and the biochemical basis of sickle cell anaemia.

(40 Marks)

7.1.2 Explain the biochemical basis of the laboratory findings. **(20 Marks)**

7.1.3 Name the biochemical tests which could be carried out to differentiate the types of bilirubin in serum and give the principle of the method.

(20 Marks)

7.2 Diagrammatically show the serum electrophoresis pattern of lactate dehydrogenase of a patient with haemolytic anaemia. **(20 Marks)**

8. **8.1** **8.1.1** List the main classes of plasma proteins and give their functions.

(35 Marks)

8.1.2 Give the serum electrophoretic pattern of a patient with nephrotic syndrome comparing with that of a normal person. **(20 Marks)**

8.2 Diagrammatically show how the glucose is absorbed into the enterocytes.

(25 Marks)

8.3 Explain the biochemical basis of treating the cancer patients with methotrexate.

(20 Marks)

9. **9.1** A 45-year-old woman underwent partial gastrectomy and developed **a mixed type** of anaemia and later developed neuropsychiatric symptoms. Explain the biochemical basis of the above conditions. **(60 Marks)**

9.2 ATP production in the miltochondria is self-regulated. Explain. **(20 Marks)**

9.3 Eating cold water fish is beneficial to avoid atherosclerosis. Explain. **(20 Marks)**

10. A 40-year-old male bank officer with a body weight of 125kg and a height of 160cm while maintaining his nitrogen equilibrium was diagnosed to have hypertension. He had tried different diets suggested by the dietician and regular exercise but could not reach the ideal body weight expected for his height. Suddenly he had a retrosternal chest pain and was admitted to the hospital. He was diagnosed to have angina pectoris. The coronary artery disease was treated by a Coronary Artery Bypass Graft. On discharge he was advised to take a single dose of aspirin at night and advised to reduce his weight.

10.1 Calculate the Body Mass Index of this bank officer. **(10 Marks)**

10.2 What would be the expected ideal weight for his height? **(10 Marks)**

10.3 How a DASH diet which contains 2000 kcal/day could be prepared for a Sri Lankan man with hypertension. **(35 Marks)**

10.4 Explain the advantages of consuming DASH diet when compared with a normal diet for a person with hypertension? **(20 Marks)**

10.5 Explain the changes in nitrogen balance before, immediately after the coronary artery bypass graft and two weeks after his discharge from the hospital.

(25 Marks)