# UNIVERSITY OF JAFFNA, SRI LANKA

## FIRST EXAMINATION FOR MEDICAL DEGREES (2ND) - JUNE 2023

## ACADEMIC YEAR 2020/2021

## BIOCHEMISTRY PAPER II

**13.06.2023** **Duration: 3 Hours (9.00 am to 12.00 noon)**

**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 blood glucose levels under the following conditions:
   - **1.1.1** Fasting **(10 Marks)**
   - **1.1.2** Prediabetes **(10 Marks)**
   - **1.1.3** Diabetes **(10 Marks)**

   **1.2** Diagrammatically show how insulin secretion by the pancreas is effected when the blood glucose level is elevated. **(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** Diagrammatically show how liver detoxifies ammonia. **(40 Marks)**

   **2.2** Cysteine is a non-essential amino acid for adults. Explain. **(30 Marks)**

   **2.3** Explain the steps in preparing a patient and performing Oral Glucose Tolerance Test (OGTT). **(30 Marks)**

3. 3.1 **3.1.1** List the hormones which increase lipolysis. **(20 Marks)**

**3.1.2** Diagrammatically show how these hormones elevate lipolysis. **(30 Marks)**

3.2 **3.2.1** List the conditions which would lead to ketosis. **(15 Marks)**

**3.2.2** Explain why the concentration of β-hydroxy butyric acid concentration is higher than that of acetoacetic acid in a ketosis patient. **(35 Marks)**

4. 4.1 Explain the biochemical basis of the occurrence of β-thalassemia. **(35 Marks)**

4.2 Explain the changes in serum and urine bilirubin levels in a patient with β-thalassemia. **(30 Marks)**

4.3 Explain the **tests** that would be useful to confirm the condition with urine and blood. **(35 Marks)**

5. 5.1 Body fluids have different buffer systems.

**5.1.1** List the different buffer systems in the blood. **(10 Marks)**

**5.1.2** Among the different buffer systems in blood, explain how the best buffer system acts. **(20 Marks)**

5.2 Explain how the structure of collagen is suited for its function. **(20 Marks)**

5.3 Explain how the structure of phospholipids is suited to form plasma membrane. **(20 Marks)**

5.4 **5.4.1** List different classes of immunoglobulin with their function. **(20 Marks)**

**5.4.2** What is self-tolerance in immune response? **(10 Marks)**

6. 6.1 Explain the biochemical basis of Lesch Nyhan Syndrome. **(35 Marks)**

6.2 Explain the biochemical basis of occurrence of pernicious anaemia. **(35 Marks)**

6.3 Explain how the vitamin $B_{12}$ deficiency can lead to folate trap. **(30 Marks)**

7. **7.1.** A 26-year-old male was diagnosed to have haemochromatosis.

**7.1.1** Give the conditions which can lead to haemochromatosis. **(20 Marks)**

**7.1.2** Give the biochemical basis of treating a patient with hemochromatosis with deferoxamine. **(10 Marks)**

**7.2** **7.2.1** Diagrammatically show and label the different parts of tRNA. **(20 Marks)**

**7.2.2** Explain how the structure of tRNA is suited for its function. **(20 Marks)**

**7.3** Explain the biochemical basis of human ABO blood grouping. **(30 Marks)**

8. A 35-year-old strict vegetarian woman from Nuwara Eliya district had the plasma $T_4$ level of 32 nmol/L (normal 65-130 nmol/L). She usually consumed upcountry vegetables like sweet potatoes, cabbage, cauliflower and radish. 'Proper intake' of iodized salt has improved her plasma $T_4$ level. A survey carried out in that area revealed that many of the people had low plasma $T_4$ level.

**8.1** Mention the probable endocrine condition of the woman? Explain with the reason why this woman and many others living in this area have low plasma $T_4$ level. **(20 Marks)**

**8.2** Give the 'Proper intake' method of iodized salt. **(15 Marks)**

**8.3** Explain the expected TSH level before the 'Proper intake' of iodized salt. **(20 Marks)**

**8.4** Explain with the help of a labelled diagram, how the intake of iodized salt improved her condition. **(35 Marks)**

**8.5** Explain how the $T_4$ is converted to $T_3$ in the target tissues. **(10 Marks)**

9. **9.1** Explain which Lactate Dehydrogenase Isoenzyme levels are altered in myocardial infarction, muscular dystrophy, and megaloblastic anaemia. **(30 Marks)**

**9.2** Explain how hydrocortisone acts as anti-inflammatory drug. **(30 Marks)**

**9.3** Write short notes on glycerol phosphate shuttle. **(20 Marks)**

**9.4** Explain how the ATP production is self-regulated in mitochondria. **(20 Marks)**

**10.** Dietary Approach to Stop Hypertension (DASH) eating plan is beneficial to hypertensive patients.

**10.1** How a DASH diet which contains 2000 kcal/day could be prepared for a Sri Lankan man with hypertension. **(45 Marks)**

**10.2** Explain the advantages of consuming DASH diet when compared with a normal diet for a person with hypertension? **(25 Marks)**

**10.3** Calculate the amount of protein that should be included in a healthy diet plate for an adult weighing 70 kg to maintain nitrogen equilibrium. **(15 Marks)**

**10.4** List the factors that should be considered while selecting proteins for a balanced diet? **(15 Marks)**