UNIVERSITY OF JAFFNA, SRI LANKA
FIRST EXAMINATION FOR MEDICAL DEGREES - APRIL 2025
ACADEMIC YEAR 2022/2023

BIOCHEMISTRY PAPER II
(45TH BATCH)

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** Diagrammatically show the modes of action of glucagon and epinephrine on glycogenolysis of hepatocytes. **(40 Marks)**

   1.2 List the hormones which influence the skeletal muscle glycogenolysis. **(15 Marks)**

   1.3 Compare and contrast the liver and skeletal muscle glycogenolysis. **(25 Marks)**

   1.4 Give the principle of a method that is commonly used to detect glucose in urine. **(20 Marks)**

2. **2.1** A 45 year old driver met with an accident and was admitted to the hospital. Analysis of his blood alcohol revealed 82 mmol/L (legal limit for motor car drivers is 17.4mmol/L), 2.8 mmol/ L glucose (normal blood glucose is 3.3-8.4 mmol/L) and 2.8 mmol/L lactate (normal blood lactate 3.3-8.4 mmol/L).

   2.1.1 Explain, how ethanol is metabolized in a chronic alcoholic. **(30 Marks)**

   2.1.2 Give the biochemical basis of occurrence of hypoglycaemia in this driver. **(30 Marks)**

   2.2 Write short notes on

   2.2.1 Von Gierke's Disease **(20 Marks)**

   2.2.2 Lesch Nyhan Syndrome **(20 Marks)**

3. **3.1** A 40-year-old female was presented with intolerance to fatty foods, pain in the right side of the abdomen, yellowish sclera, and passage of clay-coloured stools. Laboratory investigations were as follows:

		Patient	**Normal Range**
Serum	Total bilirubin (μmol/L)	30.0	1.71-20.5
	Direct bilirubin (μmol/L)	20.0	<5.1
	ALP (IU/L)	800	44-147
	ALT (IU/L)	20	4-36
Urine	Colour	Deep Yellow	
	Bilirubin	++	
	Urobilinogen	Absent	
Stool	Stercobilinogen	Absent	

3.1.1 Name the probable cause for the above observations. **(05 Marks)**

3.1.2 Diagrammatically show the steps involved in the metabolism of bilirubin in liver and its excretion. **(20 Marks)**

3.1.3 Explain the biochemical basis of the above laboratory findings. **(35 Marks)**

3.1.4 Give reasons for the fat intolerance. **(10 Marks)**

3.2 **3.2.1** List the enzymes which are secreted by the pancreas. **(10 Marks)**

3.2.2 Feeding triacylglycerols rich in medium chain fatty acid is useful to the patient with pancreatic insufficiency. Explain. **(20 Marks)**

4. **4.1** List the

4.1.1 organ which is sensitive to elevated blood ammonia level. **(10 Marks)**

4.1.2 organs which are mainly involved with ammonia detoxification. **(15 Marks)**

4.1.3 enzymes and pathways which help in the detoxification of ammonia. **(15 Marks)**

4.2 Show the reaction steps with the appropriate cofactors and enzymes which lead to ammonia production. Explain the biochemical importance of the reactions. **(35 Marks)**

4.3 List the ingredients of Oral Rehydration Solution and explain the basis of their use in a diarrhoea patient. **(25 Marks)**

5. **5.1** A 56-year-old lady presented to Endocrine Out Patient Clinic complaining neck swelling, tremor, loss of body weight and nervousness, and sleep disturbances. There was a strong family history of thyroid diseases. On physical examination, she was diagnosed to have goitre and fine tremor. Blood analysis revealed the following results.

Parameter	**Patient**	**Normal**
FT_4 (ng/dL)	6.60	0.7 – 1.8
TSH (mIU/L)	0.005	0.10 -5.00
Thyroid-Stimulating Immunoglobulins (IU/L)	9.25	< 0.55

5.1.1 What could be the probable clinical condition of this lady? **(05 Marks)**

5.1.2 Explain the observed thyroid profile: **(25 Marks)**

5.1.3 List the functions of thyroid hormones in the body. **(20 Marks)**

5.1.4 Explain how the thyroid hormone is transported in the blood **(10 Marks)**

5.2 **5.2.1** Explain hemochromatosis. **(15 Marks)**

5.2.2 List the biochemical tests to be carried out for the diagnosis of hemochromatosis. **(10 Marks)**

5.3 Explain how hydrogen ions are buffered by urinary buffer system. **(15 Marks)**

6. **6.1** Explain how thrombosis is brought about by the autocrine action of thromboxane. **(35 Marks)**

6.2 **6.2.1** What are isoenzymes and how do they differ from each other. **(25 Marks)**

6.2.2 Diagrammatically show the serum electrophoretic pattern of lactate dehydrogenase levels in a liver disease patient. **(20 Marks)**

6.3 Coconut oil solidifies easier than gingili oil. Explain. **(20 Marks)**

7. **7.1** List the advantages of having lower Km value of heart muscles lipoprotein lipase than that in adipocytes. **(20 Marks)**

7.2 Diagrammatically show two pathways that are forming ketone bodies. **(30 Marks)**

7.3 Energy charge increase in hepatocytes leads to ketogenesis. Explain. **(30 Marks)**

7.4 List the organs that cannot utilise the ketone bodies. **(10 Marks)**

7.5 Name a test that is used to detect the ketone bodies in the urine. **(10 Marks)**

8. **8.1** Explain the structure of myoglobin. **(20 Marks)**

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

8.3 **8.3.1** List the different forms of vitamin A. **(15 Marks)**

8.3.2 Explain how the absorbed vitamin A is transported and stored. **(20 Marks)**

8.3.3 Explain the biochemical basis of developing night blindness in vitamin A deficiency. **(25 Marks)**

9. **9.1** Define

9.1.1 Glycaemic index **(10 Marks)**

9.1.2 Glycaemic load **(10 Marks)**

9.2 List the conditions in which low and high glycaemic indices containing diets to be recommended. **(30 Marks)**

9.3 Give the additional protein requirements and justify the amounts mentioned for a

9.3.1 pregnant woman. **(15 Marks)**

9.3.2 lactating mother. **(15 Marks)**

9.4 Give the biochemical basis of the action of thermogenin. **(20 Marks)**

10. **10.1** **10.1.1** List the different classes of immunoglobulins. **(10 Marks)**

10.1.2 Explain how the different classes of immunoglobulins differ in their physical and biological properties. **(20 Marks)**

10.1.3 Enumerate the functions of the different classes of immunoglobulins. **(20 Marks)**

10.2 Explain the following with examples.

10.2.1 Acceptable mutation **(10 Marks)**

10.2.2 Partially acceptable mutation **(10 Marks)**

10.2.3 Unacceptable mutation **(10 Marks)**

10.3 Explain the properties of glycosaminoglycan with two examples. **(20 Marks)**