

UNIVERSITY OF JAFFNA, SRI LANKA
FACULTY OF MEDICINE



FIRST EXAMINATION FOR MEDICAL DEGREES (2ND) - NOVEMBER 2020

BIOCHEMISTRY PAPER II

24. 11.2020

Time: 3 Hours

Answer all 10 questions.

Marks allotted to each part are indicated in brackets.

Answer Each Question on Separate Answer Book.

1. Explain the biochemical basis of the following:
 - 1.1 Monitoring the glycosylated haemoglobin (HbA_{1C}) in diabetes mellitus patients. (30 Marks)
 - 1.2 Development of cataract in diabetes mellitus. (40 Marks)
 - 1.3 Hexose Monophosphate Pathway plays an important role in the antioxidant defence in red blood cells. (30 Marks)

2. Explain the biochemical basis of the followings:
 - 2.1 Administration of frequent small meals in glucose – 6 phosphatase deficiency. (25 Marks)
 - 2.2 Occurrence of hypoglycaemia and hyperammonemia in a chronic alcoholic admitted to hospital in an unconscious state. (35 Marks)
 - 2.3 Administration of lactulose and neomycin in the management of hepatic encephalopathy. (20 Marks)
 - 2.4 Poor skin pigmentation in classical phenylketonuria. (20 Marks)

3. A 45 year old male, a heavy smoker was admitted to the emergency unit with a sudden onset of constricting central chest pain which was not relieved with routine analgesics. He has hypertension and hypercholesterolemia and been on statin treatment. The results of his laboratory investigations on admission are given below.

Serum analyte	Test Results	Reference Range
Plasma total cholesterol (mg dL ⁻¹)	260	<200
Plasma triglyceride (mg dL ⁻¹)	300	<150
Cardiac troponin (ng mL ⁻¹)	6.21	<1.0
Total Creatine Kinase (IU L ⁻¹)	800	60 - 400

- 3.1. State the probable diagnosis with justification. **(20 Marks)**
- 3.2 Which isoenzyme of creatine kinase would have been elevated in this patient? **(10 Marks)**
- 3.3 Correlate the elevated total cholesterol and triacylglycerol levels of the patient for the currently diagnosed problem. **(35 Marks)**
- 3.4 Give the biochemical basis of treating this patient with statin. **(15 Marks)**
- 3.5 Replacing coconut oil with gingili oil is beneficial to this patient. Give the biochemical basis. **(20 Marks)**
4. 4.1 Give the biochemical basis of supplementing calcium and 1, 25 dihydroxy cholecalciferol to a patient whose, parathyroid gland has been accidentally removed during thyroidectomy. **(25 Marks)**
- 4.2 Discuss the biochemical significance of estimating serum thyroid stimulating hormone (TSH) concentration. **(25 Marks)**
- 4.3 Discuss the biochemical importance of lysyl oxidase. **(25 Marks)**
- 4.4 Explain why urinary hydroxyl proline excretion is increased markedly during growth. **(25 Marks)**

5. 5.1 A 45 year old woman with the Body Mass Index (BMI) of 30 kgm^{-2} was admitted to the emergency unit with colicky pain in right hypochondrial region. Clinical examination revealed jaundice. Her investigation results are given below.

Investigation	Results	Reference range
Serum total bilirubin (mg dL^{-1})	13.0	0.3 – 1.0
Serum direct bilirubin (mg dL^{-1})	9.0	0.1 – 0.4
Serum alkaline phosphatase (U L^{-1})	743.0	40.0 – 125.0
Serum alanine transaminase (U L^{-1})	36.0	10.0 – 40.0
Serum Albumin (g dL^{-1})	4.0	3.5 – 5.0
Hay's Test	Positive	
Fouchet's test	Positive	

5.1.1 State the probable diagnosis. (10 Marks)

5.1.2 Explain the biochemical basis of the following findings.

5.1.2.1 Serum total bilirubin and direct bilirubin levels.

(25 Marks)

5.1.2.2 Serum alkaline phosphatase, alanine transaminase and albumin levels.

(20 Marks)

5.1.2.3 Hays Test and Fouchet's Test.

(15 Marks)

5.2 'Brown adipose tissue is involved in thermogenesis.' Explain. (30 Marks)

6. 6.1 Explain the biochemical basis of the maintenance of alveolar stability by surfactants. (20 Marks)

6.2 Haemoglobin is an effective buffer system in the blood. (25 Marks)

6.3 Explain the role of cell membrane in cellular homeostasis. (30 Marks)

6.4 Give the structure and functions of hyaluronic acid. (25 Marks)

7. 7.1 Graphically show the effect of blood glucose concentration on the activities of hexokinase and glucokinase by indicating K_m and V_{max} . (20 Marks)
- 7.2 Diagrammatically show the mechanism of glucose reabsorption in proximal tubular cells in kidney. (20 Marks)
- 7.3 Show how the specific alteration in DNA caused by benzopyrene in cigarette smoke is repaired in human cells? (30 Marks)
- 7.4 Show how insulin activates mRNA? (30 Marks)
8. 8.1 8.1.1 Diagrammatically show how monoclonal antibodies are produced against spike protein epitopes of SARS -2 virus. (30 Marks)
- 8.1.2 Compare the serum protein electrophoretic pattern of a normal person with that of a multiple myeloma patient. (30 Marks)
- 8.2 8.2.1 Explain gout. (20 Marks)
- 8.2.2 Give dietary advice to a gout patient. (20 Marks)
9. 9.1 Patients with cirrhosis of liver develop night blindness. Explain. (50 Marks)
- 9.2 9.2.1 Discuss the biochemical uniqueness of human milk. (25 Marks)
- 9.2.2 Discuss the nutritional importance of green leaves. (25 Marks)
10. 10.1 Calculate the "Safe level of protein intake" by a healthy adult weighing 65kg to maintain nitrogen equilibrium. (60 Marks)
- 10.2 Give dietary advice for a 38 year old prediabetic sedentary man with BMI of 22.5 kgm^{-2} . (40 Marks)