

UNIVERSITY OF JAFFNA, SRI LANKA  
FACULTY OF MEDICINE



FIRST EXAMINATION FOR MEDICAL DEGREES - MARCH 2021

**BIOCHEMISTRY PAPER II**  
**(OLD CURRICULUM)**

16. 03.2021

Time: 3 Hours

Answer all 10 questions.

Marks allotted to each part are indicated in brackets.

Answer Each Question on Separate Answer Book.

1. An eight year old boy developed respiratory distress. He was breathing deeply and had fruity breath. Laboratory examination demonstrated a blood glucose level of 40 mM (normal 3.5 to 6.0 mM), elevated serum ketones and a pH of 7.0. The boy showed positive response to intravenous rehydration and insulin.
  - 1.1 What could be the probable defect in this boy? (10 Marks)
  - 1.2 Give the biochemical basis for the
    - 1.2.1 elevated blood glucose level (40 Marks)
    - 1.2.2 elevated serum ketone body level and deep breath with fruity smell. (35 Marks)
    - 1.2.3 decreased pH (15 Marks)

2. Answer the following questions based on the patient mentioned in **Question 1**.
- 2.1 Explain how intravenous rehydration with insulin helped to correct acidosis.  
(40 Marks)
- 2.2 Which fraction/s of the plasma lipoprotein/s would have elevated in the patient.  
(10 Marks)
- 2.3 Diagrammatically show the metabolism/s of the lipoprotein/s which are mentioned in **Section 2.2**.  
(20 Marks)
- 2.4 Diagrammatically show the electrophoretic patterns of the plasma lipoproteins of the patient.  
(30 Marks)
3. 3.1 A mother complained that her child was mentally retarded for his chronological age and was extremely irritable. The blood phenylalanine level was elevated and the urine contained phenyl pyruvate.
- 3.1.1 Suggest the probable defect in the child.  
(10 Marks)
- 3.1.2 Explain the metabolic defect and the excretion of abnormal derivatives of phenylalanine in the urine?  
(30 Marks)
- 3.2 The blood ammonia level is elevated in hepatic diseases. Explain. (30 Marks)
- 3.3 A 48 year old male admitted to the hospital was diagnosed to have angina pectoris (a coronary artery disease, with a large atherosclerotic plaque obstructing the left anterior descending coronary artery). The obstruction was relieved and the patient received daily aspirin therapy. Following discharge he was advised to take a single aspirin a day. Explain the basis of this aspirin therapy. (30 Marks)
4. 4.1 Explain why at physiological pH, haemoglobin buffer system is better than bicarbonate buffer system.  
(30 Marks)
- 4.2 Give the biochemical basis of the haemolytic effect of some snake envenomation.  
(20 Marks)
- 4.3 Give the biochemical basis for the non-elastic nature of collagen fibres.  
(25 Marks)
- 4.4 Give the serum electrophoretic pattern of a nephrotic syndrome patient.  
(25 Marks)

5. 5.1 A 30-year-old female from hilly area of Sri Lanka had the plasma  $T_4$  level of 40 nmol/l (normal 65- 130 nmol/l). Intake of iodized salt had improved the plasma  $T_4$  level.

5.1.1 What could be the probable condition in the female mentioned above?

(10 Marks)

5.1.2 Explain with the help of a labelled diagram, how the intake of iodized salt improved her condition.

(50 Marks)

5.1.3 Explain how the  $T_4$  is converted to  $T_3$  in the target tissues. (20 Marks)

5.2 What is meant by TIBC? Explain the alteration in the TIBC level of a pregnant woman.

(20 Marks)

6. 6.1 A patient treated with sulphanilamide had serum total bilirubin level of 4 mg  $dL^{-1}$  and his urine urobilinogen level was increased.

6.1.1 Which fraction of the bilirubin would have elevated in the patient?

(10 Marks)

6.1.2 Explain the above findings.

(35 Marks)

6.1.3 What biochemical test would you perform in serum to confirm the above findings and give the principle of the test.

(15 Marks)

6.2 Give the biochemical basis for the elevation in serum alkaline phosphatase level in bone diseases.

(20 Marks)

6.3 Explain with a diagram how the respiratory chain is affected by dinitrophenol.

(20 Marks)

7. 7.1 Graphically show the effect of blood glucose concentration on the activities of hexokinase and glucokinase by indicating  $K_m$  and  $V_{max}$ . (15 Marks)

7.2 Explain the roles of the  $K_m$  values of glucokinase and hexokinase in glucose homeostasis. (35 Marks)

7.3 Schematically show the metabolism of vitamin D and explain its role in calcium homeostasis. (50 Marks)

8. 8.1 Show how dietary fat is digested and absorbed? (15 Marks)
- 8.2 Show how insulin increases protein synthesis at molecular level? (35 Marks)
- 8.3 Explain the formation of polyclonal antibodies during an infection? (50 Marks)
9. 9.1 Heparin and warfarin are used in the treatment of thrombotic conditions. Explain. (50 Marks)
- 9.2 Show the important pathways of purine synthesis in brain cells. (20 Marks)
- 9.3 Explain the importance of breast milk in growth, development and immunity of an infant. (30 Marks)
10. 10.1 Give the health benefits of the following
- 10.1. Probiotics in curd (10 Marks)
- 10.2 Resistant starch in rice (10 Marks)
- 10.3 Whole grain meals (10 Marks)
- 10.4 DASH diet (10 Marks)
- 10.2 10.2.1 What are the components of Total Energy Expenditure (TEE) of a man? (20 Marks)
- 10.2.1 Explain the physiological factors affecting each of the components of TEE. (40 Marks)