FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA
Second Examination for Medical Degrees – June 2024
Biochemistry-Paper II

Answer **All Five** Questions.
Answer each question in a **separate** book.
Marks allocated to each part of a question are shown within parenthesis.
Handover each book separately.

June, 2024
(Three hours)

1.

1.1 A 35-year-old male presented to a physician with complaints of fatigue, mild abdominal discomfort, and unintentional weight gain over the past few months. He denied any significant alcohol consumption but had been on a diet high in processed foods and soft drinks.

Laboratory tests revealed elevated levels of triglycerides (TG), alanine aminotransferase (ALT) and aspartate aminotransferase (AST). An ultrasound scan of the abdomen showed evidence of hepatic steatosis.

His weight and height measurements were 70 kg and 130 cm respectively.

1.1.1 Calculate the BMI of the patient. (05 marks)

1.1.2 Based on the BMI what is the weight category of this patient? (05 marks)

1.1.3 What is the most probable clinical condition that this patient has developed? (05 marks)

1.1.4 Explain the biochemical basis for the development of the clinical condition mentioned in 1.1.3 (25 marks)

1.1.5 Explain five lifestyle modifications for the patient. (20 marks)

1.2 Explain the following.

1.2.1 The role of well-developed brown adipose tissue in preventing hypothermia of newborns. (20 marks)

1.2.2 Serum cardiac troponin I is the gold standard cardiac marker in the diagnosis of acute myocardial infarction. (20 marks)

2.

2.1 A 75-year-old male patient with type 2 diabetes mellitus who had been on a long pilgrimage had missed his treatment for diabetes. He developed fever after being treated for a swelling of the right foot for three days.

He was in a confused state on admission to hospital. His tongue was dry and had weak thready pulse. His blood glucose was 603.0 mg/dL. Urine was negative for ketone bodies.

2.1.1 Explain the biochemical basis for the elevated blood glucose level in this patient. (20 marks)

2.1.2 What is the most likely diagnosis of this patient? (05 marks)

2.1.3 Explain the biochemical basis for the two main treatment strategies that could be used on this patient. (15 marks)

2.2 A 4-year-old preschool child was brought to the clinic by the mother with a history of recurrent respiratory tract infections and growth retardation, weakness and lethargy. Examination revealed wasting, sagging skin and pallor. There was no oedema.

2.2.1 State the most likely nutritional condition that the child has developed. (05 marks)

2.2.2 Mention three anthropometric measurements/indices and two biochemical parameters useful in the nutritional assessment of this child with the probable findings. (10 marks)

2.2.3 Explain the biochemical basis for the wasting and sagging skin in this child. (20 marks)

2.2.4 Explain the basis for the development of recurrent infections in this child. (15 marks)

2.2.5 State two dietary recommendations giving examples. (10 marks)

3.

3.1 Explain the following.

3.1.1 The occurrence of paraproteinaemia and immune paresis in multiple myeloma. (25 marks)

3.1.2 Smoking speeds up the development of in α_1-antiproteinase deficiency. (25 marks)

3.2 Explain the biochemical basis of the following.

3.2.1 Serum creatinine concentration is increased in acute renal failure. (25 marks)

3.2.2 Involvement of G-proteins in the action of cholera toxin leading to diarrhoea, rapid loss of fluids and electrolytes. (25 marks)

4.

4.1 A 45-year-old female was presented to a physician with a history of 15 kg of weight gain in one-year, increased sleepiness, slow speech, dry skin, constipation and enlargement of the thyroid gland.

4.1.1 State the most probable endocrinological abnormality present in this patient (05 marks)

4.1.2 What could be the most common cause for the development of the condition mentioned in 4.1.1 in this patient? (05 marks)

4.1.3 Explain the pathophysiology related to the cause mentioned in 4.1.2. (15 marks)

4.2 A 34-year-old female with five children and a history of excessive menstrual bleeding was presented to a clinician with complaints of lethargy and shortness of breath on exertion.

4.2.1 What is the most probable micronutrient deficiency in this woman? (05 marks)

4.2.2 Explain the biochemical basis for the development of the above condition. (20 marks)

4.3

4.3.1 Explain the biochemical basis for the development of cataract in children with galactosaemia. (25 marks)

4.3.2 Explain the molecular basis of using gene therapy in treating hereditary diseases. (25 marks)

5.

5.1 Explain the biochemical basis of the following.

5.1.1 Occurrence of immunodeficiency due to deficiency of enzymes in purine degradation pathway. (25 marks)

5.1.2 Occurrence of neuropsychiatric impairment in classical phenylketonuria. (25 marks)

5.1.3 Development of haemolytic anaemia in sickle cell disease. (25 marks)

5.2 Explain the following.

5.2.1 Mechanism of action of 3'-azido-3'-deoxythymidine (AZT) as an antiviral agent. (25 marks)

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