



FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA
Second Examination for Medical Degrees – May 2023
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.

24th May 2023
2.00 p.m - 5.00 p.m
(Three hours)

1.

1.1 A 56-year-old male patient presented to the emergency treatment unit with acute severe constricting central chest pain which started three hours ago. His electrocardiogram revealed presence of an acute myocardial infarction.

1.1.1 Write **four** risk factors for coronary artery disease. (10 marks)

1.1.2 State the best cardiac biomarker that can be used in the diagnosis of this patient. (10 marks)

1.1.3 Explain the biochemical basis for the use of the biomarker stated in 1.1.2. (25 marks)

1.2 A 46-year-old female with a history of gallstones admitted to the emergency treatment unit with an episode of severe right-sided colicky abdominal pain. Examination revealed presence of jaundice. Her urine was positive for bilirubin.

1.2.1 State the blood investigation and the expected results to diagnose the type of hyperbilirubinaemia in this patient. (15 marks)

1.2.2 What is the type of hyperbilirubinaemia expected to be present in this patient? (05 marks)

1.2.3 Explain the biochemical basis for the development of jaundice in this patient. (25 marks)

1.2.4 State **two** enzyme markers that can be used to determine the presence of cholestasis in this patient. (10 marks)

2. Biochemical investigation results of a 45-year-old newly diagnosed patient with type 2 diabetes mellitus in fasting state are given below. Her height and weight were 1.5 m and 75.0 kg, respectively.

| Investigation | Test results (mg/dL) | Reference value (mg/dL) |
|-------------------------|----------------------|-------------------------|
| Plasma glucose | 360.0 | < 100.0 |
| Serum total cholesterol | 315.0 | < 200.0 |
| Serum triglyceride | 278.0 | < 150.0 |

2.1 Explain the biochemical basis for the following test results of this patient.

2.1.1 Plasma glucose (25 marks)

2.1.2 Serum total cholesterol and triglyceride (35 marks)

2.2 Calculate the body mass index (BMI) of this patient and comment on the value. (10 marks)

2.3 Explain **five** main dietary considerations in planning a diet for this patient. (30 marks)

- 3.
- 3.1 Explain the biochemical basis for the following.
- 3.1.1 Serum creatinine concentration is increased in acute renal failure. (25 marks)
- 3.1.2 Profound watery diarrhoea occurs in cholera infection. (25 marks)
- 3.1.3 Soy milk is given in the management of lactose intolerance. (25 marks)
- 3.2 Explain the role of hexose monophosphate pathway in the phagocytic function. (25 marks)
4. Explain the significance of the following in recombinant DNA technology.
- 4.1 4.1.1 Restriction enzymes (10 marks)
- 4.1.2 Taq DNA polymerase (10 marks)
- 4.1.3 Plasmids (10 marks)
- 4.2 4.2.1 State the difference between complementary (cDNA) and genomic DNA libraries. (05 marks)
- 4.2.2 Explain the molecular basis of the following. (15 marks)
- Construction of a cDNA library is more beneficial than constructing a genomic DNA library during the production of recombinant human insulin.
- 4.3 Explain the biochemical basis of the following.
- 4.3.1 Smoking speeds up the development of emphysema in patients with α_1 -antitrypsin deficiency. (25 marks)
- 4.3.2 Excessive consumption of red meat and some alcoholic beverages precipitate gout. (25 marks)
5. A 26-year-old female having the clinical features of anaemia presented to a physician with a normal serum ferritin report. The history suggestive of anaemia due to nutritional deficiency.
- 5.1 State **two** most likely vitamin deficiencies that can cause anaemia in this patient. (10 marks)
- 5.2 5.2.1 Which **one of the vitamins** mentioned in 5.1 is prescribed to every pregnant woman during the first trimester of pregnancy? (05 marks)
- 5.2.2 State the clinical condition that can be prevented in the baby by prescribing the vitamin mentioned in 5.2.1. (05 marks)
- 5.2.3 Explain how the deficiency of vitamin mentioned in 5.2.1 causes anaemia. (20 marks)
- 5.3 State **four** dietary recommendations with justifications for a patient with iron deficiency anaemia. (20 marks)
- 5.4 Explain the role of haemoglobin F (HbF) in the delivery of oxygen to the foetus. (25 marks)
- 5.5 Explain the biochemical basis for the use of carbimazole in the treatment of hyperthyroidism. (15 marks)
