



**FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA, GALLE.**

Second Examination for Medical Degrees – March/April 2003

**BIOCHEMISTRY - PAPER II**

Wednesday 26<sup>th</sup> March, 2003

2.00 pm to 5.00 pm  
(3 hours)

Answer All Six Questions.

Marks allotted to each part of a question is shown within parenthesis.

1. A 20 year old insulin dependent diabetic female was admitted to casualty in a semi-conscious state. Her plasma values on admission (a) and eight hours after therapy with insulin, saline etc (b) are as follows.

Plasma analyte	(a)	(b)	Reference range (mmol/L)
Na <sup>+</sup>	127	134	(132-144)
K <sup>+</sup>	7.0	3.1	(3.2-4.8)
Urea	10.1	6.0	(3.0-8.0)
Creatinine	0.18	0.07	(0.06-0.12)
PO <sub>4</sub> <sup>3-</sup>	1.85	0.30	(0.6-1.3)
Glucose	41.0	7.2	(3.0-5.5)
Acetoacetate	2.6	2.28	(<0.2)
β-Hydroxybutyrate	12.0	1.2	(<0.25)

Explain in biochemical terms how the above changes in the plasma analytes have been brought about by treatment. (100 marks)

2. 2.1 Give biochemical explanations for the following.

2.1.1 Transamination reactions play a major role in amino acid metabolism. (25 marks)

2.1.2 Glucagon increases the intracellular cAMP concentration in the liver through G-proteins. (25 marks)

- 2.2 Explain how the following are beneficial in hyperammonaemia.

2.2.1 Partaking frequent small meals and restriction of protein intake.

2.2.2 Giving a glucose infusion. (50 marks)

3. Give the biochemical basis of the following.

- 3.1 Hypoglycaemia in

3.1.1 acute alcohol toxicity. (25 marks)

3.1.2 premature neonate. (25 marks)

3.1.3 carnitine palmitoyl transferase 1 deficiency. (25 marks)

- 3.2 Identification of a paraprotein band in serum electrophoresis is suggestive of a malignant process. (25 marks)

4. 4.1 4.1.1 List the allosteric effectors which affect the release of oxygen from oxyhaemoglobin. (10 marks)
- 4.1.2 Describe how these effectors facilitate the release of oxygen from haemoglobin. (30 marks)
- 4.2 Explain the consequences of oxygen toxicity in the red blood cell. (20 marks)
- 4.3 Explain the mechanisms that protect cells from oxidative destruction. (40 marks)
5. 5.1 Discuss the involvement of vitamins in gene expression with reference to two vitamins. (30 marks)
- 5.2 Explain the biochemical basis of deficiency manifestations related to vitamins stated in 5.1. (40 marks)
- 5.3 Explain why the deficiency of either iron or copper lead to microcytic anaemia. (30 marks)
6. 6.1 Explain why the energy requirement of a population is usually expressed as the mean value whereas the protein requirement is estimated as mean +2 SD. (10 marks)
- 6.2 A one year old child with normal rate of growth consumes 500ml breast milk per day.
- 6.2.1 Calculate the energy supplied by breast milk as a percentage of energy requirement. State all assumptions made. (40 marks)
- 6.3 "Following trauma, patients show severe nitrogen losses. When the energy intake is increased the nitrogen losses become less severe. However, they cannot achieve a zero nitrogen balance."
- Explain the above observation stating the underlying biochemical processes. (50 marks)