



Faculty of Medicine, University of Ruhuna
Medical Laboratory Science Degree Programme
Year-End Examination-Year 3
6th Batch, July 2017

Clinical Biochemistry (MLS 3102) –Theory

25th July 2017

9.00 a.m. - 11.00 a.m.

Duration: **Two hours**

Answer all four questions.

Index number:.....

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Question 1

1.1 A 32 year-old male admitted due to a road traffic accident develops symptoms of acute kidney injury after 24 hours.

- 1.1.1 List the biochemical investigations that may be requested for this patient and comment on the requirements for sample collection. (20 marks)
- 1.1.2 State the biochemical changes that you would expect in the above investigations. (10 marks)
- 1.1.3 List the three categories of acute kidney injury and predict the category to which the above patient may belong. (10 marks)

1.2 Briefly state the pathological basis of the following clinical conditions;

- 1.2.1 Glycosuria in diabetes mellitus
- 1.2.2 Oedema in nephrotic syndrome
- 1.2.3 Polyuria in diabetes insipidus (30 marks)

1.3

- 1.3.1 List the properties of a substance that can be used for renal clearance test and briefly discuss how clearance tests can be used to assess kidney function (10 marks)
- 1.3.2 Describe the sample collection requirements for 24 hour urine creatinine clearance test and discuss the pre-analytical factors that might affect the test results (15 marks)
- 1.3.3 "A normal plasma creatinine concentration does not necessarily imply normal renal function". Comment on the above statement. (05 marks)

Question 2

- 2.1 Briefly describe what is proficiency testing. (20 marks)
- 2.2 Describe how you would reduce the cost of quality management in the biochemistry section of your laboratory. (20 marks)
- 2.3 Describe the factors that you would consider when purchasing a new biochemistry analyser for your laboratory. (30 marks)
- 2.4 Explain how you would control the analytical quality of fasting plasma glucose test using patient data, individual and multiple patient test results. (30 marks)

Question 3

- 3.1 What is the difference between osmolality and osmolarity? (10 marks)
- 3.2 Freezing point depression is the most common laboratory method for the determination of osmolality in biological fluids.
- 3.2.1 Describe the principle behind freezing point depression osmometer using the standard freezing curve. (50 marks)
- 3.2.2 The freezing point of a patient sample received to the Clinical Pathology laboratory was $-0.53\text{ }^{\circ}\text{C}$. Calculate the osmolality of the above patient (1 mole of dissolved molecules per kg depresses the freezing point of water by $1.86\text{ }^{\circ}\text{C}$). (20 marks)
- 3.3 Discuss the variation of the osmolal gap in following conditions.
- 3.3.1 Alcoholism
- 3.3.2 Dehydration

(20 marks)

Question 4

4.1 Classify chromatographic techniques according to the method of separation and explain how separation is achieved in **two** of the mentioned methods. (30 marks)

4.2 Draw a schematic diagram of a gas chromatographic system and label the components. (15 marks)

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4.3 Briefly comment on the following

4.3.1 Temperature programming in Gas Chromatography.

4.3.2 Isocratic elution in Liquid Chromatography.

4.3.3 Features of an ideal detector. (15 marks)

4.4 Separation and identification of growth hormone variants were performed using a reverse phase Liquid Chromatography-Mass Spectrometry system.

4.4.1 Explain what is reverse phase chromatography and why it is preferred for separation of biomolecules. (10 marks)

4.4.2 List factors that would affect band broadening in the above separation. (10 marks)

4.4.3. Explain how to minimize band broadening using the Van Deemter equation. (20 marks)

