



Faculty of Medicine, University of Ruhuna  
B.Sc. Medical Laboratory Science  
Year End Examination Year 3- 4<sup>th</sup> Batch, January 2016

Clinical Biochemistry (MLS 3102) –Theory

29<sup>th</sup> January 2016

9.00 am to 11.00 am

Two hours

Answer ALL FOUR questions.  
Answer each question in a separate booklet.

Question 1

**1.1** Compare and contrast the internal quality control and external quality assessment programmes in clinical biochemistry.

(30 marks)

**1.2** Explain the steps you would take to assure the quality of the pre and post-analytical phases of thyroid hormone analysis.

(40 marks)

**1.3** Discuss the factors you would consider in purchasing a general biochemistry analyzer to the laboratory.

(30 marks)

Question 2

**2.1** Explain briefly the biochemical changes observed in the following conditions.

**2.1.1** Acute renal failure

**2.1.2** Rickets

(40 marks)

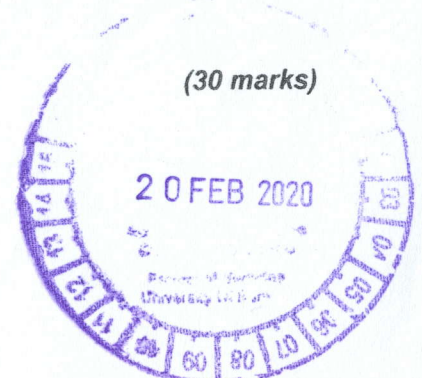
**2.2** Explain the pathological basis for the observed biochemical changes in the following patients.

**2.2.1** Detectable serum thyroglobulin in a patient who had undergone thyroidectomy

**2.2.2** Moderate elevation of serum alanine transaminase in a 25 year-old male

**2.2.3** Marked elevation of serum TSH in a newborn baby

(30 marks)



**2.3** Describe briefly the clinical significance of measuring

2.3.1 albumin/creatinine ratio

2.3.2 serum PSA

2.3.3 HbA1c

**(30 marks)**

**Question 3**

**3.1** Describe briefly the principle of measuring the following analytes in serum.

3.1.1 Alanine aminotransferase (ALT).

3.1.2 Total calcium

**(20 marks)**

**3.2**

3.2.1 Draw a labeled diagram of an electrophoretic system.

3.2.2 What is the principle behind the above technique?

3.2.3 Briefly describe the methods for visualizing separated molecules in electrophoresis.

**(30 marks)**

**3.3**

3.3.1 Define osmolality.

3.3.2 Name three "colligative properties" of solutions.

3.3.3 State the principle of osmometry based on one of the colligative properties mentioned above.

**(30 marks)**

**3.4**

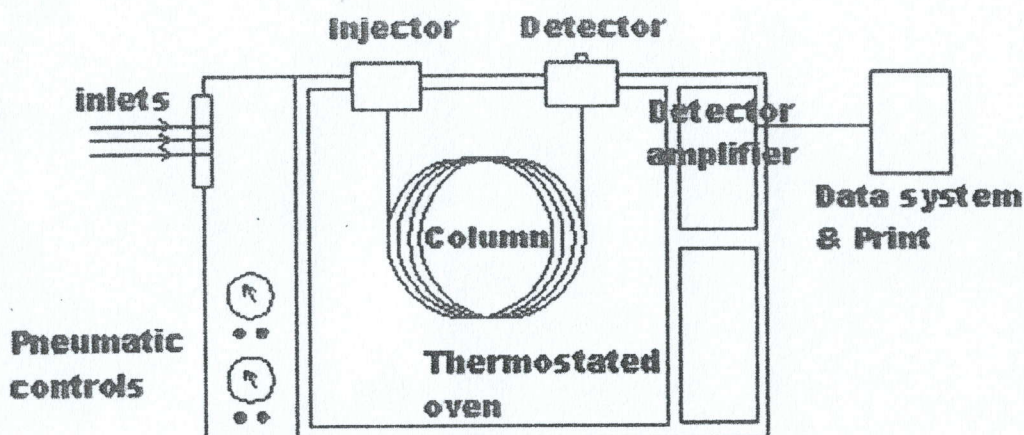
3.4.1 What is an electrochemical cell?

3.4.2 Draw a labeled schematic diagram of a potentiometric electrode system for measurement of pH.

**(20 marks)**



**Question 4**



9

**4.1** The schematic diagram shows one of the instruments used in chromatography.

**4.1.1** Name the instrument given in the diagram. (4 marks)

**4.1.2** Name three detectors used in this chromatographic technique. (9 marks)

**4.1.3** Give two mobile phases used in this chromatographic technique. (8 marks)

**4.1.4** Name the three distinct regions in a mass spectrometer. (9 marks)

(Total 30 marks)

**4.2** Briefly explain the following terms in chromatography.

**4.2.1** Efficiency

**4.2.2** Resolution

**4.2.3** Temperature programming in column oven

**4.2.4** Gradient elution in the mobile phase

(40 marks)

**4.3** The Van Deemter equation is given below.

$$H = A + B/\mu + C\mu$$

**4.3.1** Give the physical process predominately represented by each term given as A, B/μ and Cμ

**4.3.2** If the gas chromatographic separation is carried out with an open tubular column (capillary column), which of the above term of the Van Deemter equation would drop out? Explain your answer.

**4.3.3** Draw H vs U curves for both liquid chromatography (LC) and gas chromatography (GC) methods separately and indicate  $U_{opt}$  and  $H_{min}$ .

(30 marks)

