**UNIVERSITY OF JAFFNA, SRI LANKA**

**FACULTY OF ALLIED HEALTH SCIENCES**

**THIRD YEAR FIRST SEMESTER EXAMINATION IN BScHons (MLS)-2021**

**MLSCB 3126 CLINICAL BIOCHEMISTRY II**

**PAPER II**

**Date: 23.06.2023** **Time: 2 Hours**

**ANSWER ALL THE QUESTIONS IN SEPARATE ANSWER BOOKS**

1.

1.1 A 65-year-old man was admitted to Intensive Care Unit (ICU). His Arterial blood gas analysis and serum electrolytes results were as follows:

| Parameter | Results | Reference interval |
|---|---|---|
| pH | 7.55 | 7.35- 7.45 |
| $pCO_2$ (mmHg) | 43 | 35- 45 |
| $HCO_3^-$ (mmol/L) | 33 | 22- 26 |
| $Na^+$ (mmol/L) | 130 | 135- 147 |
| $K^+$ (mmol/L) | 3.2 | 3.5- 5.1 |
| $Cl^-$ (mmol/L) | 95 | 98- 106 |

1.1.1 Calculate the an-ion gap in this patient. (10 Marks)

1.1.2 Briefly describe the working principle of a blood gas analyzer for measuring the partial pressure of $CO_2$ ($pCO_2$). (30 Marks)

1.1.3 List **five (05)** possible preanalytical problems that can interfere with blood gas analysis. (25 Marks)

1.1.4 Mention **two (02)** possible causes for metabolic alkalosis in this patient. (10 Marks)

1.2 Later, upon continuous monitoring, the serum potassium value of the patient was within the range of 6.5-7.5 mmol/L.

1.2.1 Briefly explain **five (05)** possible causes (preanalytical and analytical errors) that can lead to these abnormal values in serum potassium levels. (25 Marks)

2.

2.1 A 12-year-old boy presented with short stature to the paediatric clinic. After analyzing his clinical history, growth hormone deficiency was suspected.

2.1.1 List **two (02)** causes for growth hormone deficiency. (05 Marks)

2.1.2 Mention **one (01)** baseline investigation that can be carried out in this patient. (05 Marks)

2.2

2.2.1 Name **one (01)** dynamic function test that can be carried out in adult patients simultaneously for suspected growth hormone and cortisol deficiency. (05 Marks)

2.2.2 Mention the contraindications, precautions to be taken, and patient preparation for the test mentioned in **2.2.1.** (30 Marks)

2.3

2.3.1 Briefly explain **two (02)** analytical problems that can be encountered in analyzing serum prolactin by two-site immunometric assays (Mention causes other than haemolysis, icterus and lipaemia). (40 Marks)

2.3.2 How will you minimize the analytical problems mentioned in **2.3.1**? (15 Marks)

3.

3.1 A 30-year-old man presented with hyperpigmentation in his skin and was suspected to have adrenal insufficiency.

3.1.1 List **two (02)** causes for adrenal insufficiency. (10 Marks)

3.1.2 Name **one (01)** hormonal test other than pituitary hormone and **one (01)** dynamic function test with their expected changes that can be done to confirm the diagnosis. (20 Marks)

3.1.3 Name **one (01)** drug that can give a positive interference with the hormone assay mentioned in 3.1.2. (05 marks)

3.1.4 What is the basic principle behind the dynamic function test mentioned in **3.1.2**? (10 Marks)

3.1.5 List **five (05)** other clinical biochemistry tests with expected changes, that may help in the diagnosis of this patient. (30 Marks)

3.2

3.2.1 Name **three (03)** medications for which measurement of drug concentration in the blood is recommended to monitor their effects. (09 marks)

3.2.2 Discuss the blood sample collection for measurement of drug levels. (16 marks)

4.

4.1 A 10-year-old girl was admitted to the Paediatric unit with fever, headache and vomiting of 2 days, duration and meningitis was suspected.

4.1.1 List **two (02)** important investigations that can be done in a clinical laboratory immediately after the admission and indicate the expected findings. (10 marks)

4.1.2 Name the procedure that can be done in this patient to collect cerebrospinal fluid (CSF) samples. (05 marks)

4.1.3 What are the routine tests that can be performed on the cerebrospinal fluid sample in the clinical laboratory (Please include all subsections of the clinical laboratory investigations). (10 marks)

4.2

4.2.1 How xanthochromia occurs and how the CSF is processed to see the findings? (Include the appearance of CSF as well) (10 marks)

4.2.2 List **two (02)** counting chambers that can be used for cell counting in cerebrospinal fluid. (05 marks)

4.2.3 List **two (02)** causes for CSF protein elevation. (10 marks)

4.3

4.3.1 What are the characteristic features of an ideal tumor marker? (20 Marks)

4.3.2 Write a brief note on the advantages of using liquid biopsies for the detection of tumors. (30 Marks)

5. A 75-year-old man presented with polyuria and constipation for 2 months duration. His serum corrected calcium was 3.25 mmol/L (The reference interval of corrected calcium is 2.25 – 2.55 mmol/L).

5.1 Name **two (02)** possible causes for the calcium value in this patient. (10 Marks)

5.2 Mention **two (02)** hormones involved in maintaining calcium homeostasis. (10 Marks)

5.3 List the precautions, patient preparation, sample type, collection tube and transport of sample for **one (01)** hormone test mentioned in **5.2.** (15 Marks)

5.4 Mention the definitive method and the reference method for the measurement of serum total calcium. (10 Marks)

5.5 Briefly explain the preparations and precautions to be taken for the collection and analysis of serum total calcium measurement. (40 Marks)

5.6 Name the additional serum analyte value you need for calculating the corrected calcium value and mention the equation of corrected calcium. (15 Marks)

6. "Quality assurance is vital in clinical laboratories to ensure the reliability of test results."

6.1 Name the different types of pipettes used to reconstitute lyophilized quality control material and mention **two (02)** important features that need to be followed for the maintenance of the pipettes. (20 Marks)

6.2 List the storage conditions and duration of storage for the quality control materials for common clinical biochemistry analytes mentioned below:

6.2.1 Lyophilized unopened internal quality control

6.2.2 Aliquoted, reconstituted internal quality control

6.2.3 Liquid, unopened Urine internal quality control

6.2.4 Liquid, opened Urine internal quality control (20 Marks)

6.3 Briefly explain each step involved in the process of proficiency testing. (40 Marks)

6.4 List the benefits of proficiency testing in a laboratory, (20 Marks)