



**FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA  
 SECOND EXAMINATION FOR MEDICAL DEGREES  
 PHYSIOLOGY PAPER II – Structured Essay**

**Answer all five questions  
 Answer in the given space  
 Use diagrams where necessary  
 No additional papers will be given**

**Index Number:.....**

**Time: Three hours  
 April 2026**

1.

1.1. Partial pressure of oxygen in the inspired air decreases from 160 mmHg to 100 mmHg when it reaches alveoli. Explain the physiological basis for this. (20 Marks)

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1.2.

1.2.1. Draw the oxygen haemoglobin dissociation curve of a healthy person at rest at sea level. (15 Marks)

1.2.2. In the same graph mark PO<sub>2</sub> at  
 A. P<sub>50</sub> (with value)  
 B. veins (with value)  
 C. aorta (with value) (15 Marks)

1.3 Briefly describe the changes that occur in the pulmonary circulation during exercise. (15 Marks)

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1.4 Explain the mechanisms that facilitate increased unloading of oxygen from haemoglobin at tissue level during exercise. (20 Marks)

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1.5 List the modes of carbon dioxide transport in blood. (15 Marks)

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2.1 The large intestine has several important functions. Bacteria in the large intestine play a vital physiological role in human health.

2.1.1 Briefly describe the absorptive and secretory functions of the large intestine. (10 Marks)

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2.1.2 Briefly describe the intestinal movement seen only in the large intestine. (10 Marks)

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2.1.3 Briefly describe the role of gut bacteria in the process of digestion. (10 Marks)

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2.1.4 State two common causes for alteration of gut bacterial flora in the large intestine. (10 Marks)

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2.2 Diuresis would result from excess water intake as well as from diuretics.

2.2.1 List four different classes of diuretics based on their mechanism of action. (10 Marks)

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2.2.2 Describe the mechanism of action of the diuretic that acts on the Loop of Henle. (20 Marks)

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2.2.3 List two side effects of the diuretic mentioned in 2.2.2. (10 Marks)

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2.2.4 Describe the physiological mechanism of diuresis following ingestion of large volume of water. (20 Marks)

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3. A 28-year-old woman presents with progressive weight gain and fatigue. She also complains of menstrual irregularities. Examination reveals thin extremities with central obesity, a rounded face, and fat accumulation over the upper back of the chest. The abdominal skin shows prominent reddish-purple striae. Her blood pressure is 160/100 mmHg. Capillary blood glucose level is 350 mg/dL. Cushing syndrome is suspected.

3.1 State the underlying hormonal abnormality of this patient? (10 Marks)

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3.2 Explain the physiological basis of following clinical features seen in her.

3.2.1 Blood pressure reading of 160/100 mmHg (15 Marks)

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3.2.2 Thin extremities (10 Marks)

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3.2.3 Blood glucose level of 350 mg/dL (15 Marks)

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3.3 What is the test done to confirm Cushing syndrome? (5 Marks)

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3.4 Explain the physiological basis of performing the above mentioned test to confirm the diagnosis instead of the random hormone level. (15 Marks)

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After treating the condition, her menstrual cycles became regular.

3.5 Describe the hormonal changes that occur during the follicular phase of menstrual cycle.(20 Marks)

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3.6 List 2 methods of detecting ovulation. (10 Marks)

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4. A 20-year-old woman presents with vomiting and diarrhoea for 3 days. Her urine output is low. On admission, she has cold peripheries, oxygen saturation 94%, pulse rate 110 bpm, blood pressure 80/50 mmHg. She is immediately started on fluid resuscitation.

4.1. Calculate her mean arterial pressure (MAP). (10 Marks)

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4.2 Using flow charts explain the reasons for the following clinical features in this patient.

4.2.1 Low blood pressure. (10 Marks)

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4.2.2 Tachycardia (15 Marks)

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4.2.3 Reduced urine output (15 Marks)

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4.2.4 Cold peripheries

(10 Marks)

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4.3 Draw a graph to illustrate the Frank–Starling curves of this patient before the onset of the illness (A) and on admission (B). (15 Marks)

4.4 This patient’s arterial blood gas (ABG) shows a saturation of 99%. State a possible reason for the discrepancy in saturation compared to pulse oximeter reading mentioned above? (10 Marks)

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After her acute condition settles, she is started on oral rehydration solution (ORS).

4.5 List three constituents of ORS along with their functions. (15 Marks)

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5 A 65-year-old man with a history of chronic smoking presents to the emergency department with sudden onset speech difficulty and right sided upper limb weakness. He is suspected of having cerebral infarction.

5.1 Outline the areas of the brain involved in speech along with the function of each area.

(20 Marks)

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5.2 What is the most likely area of the brain affected in this patient?

(10 Marks)

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After one month he presents to the clinic. His speech dysfunction is improving but upper limb shows features of an upper motor neuron lesion.

5.3 List two features of upper motor neuron lesions.

(10 Marks)

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5.4 Briefly explain the neurophysiological basis of an upper motor neuron sign you have mentioned above.

(20 Marks)

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He is investigated in detail to identify the risk factors for the condition and found to have polycythaemia.

5.5 List three haematological investigation findings that favour polycythaemia. (10 Marks)

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5.6 Outline the association between smoking and polycythaemia using a flow chart. (20 Marks)

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5.7 Explain briefly how polycythaemia increases the risk of developing the cerebral infarction. (10 Marks)

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