



FACULTY OF MEDICINE, UNIVERSITY OF RUHUNA
SECOND EXAMINATION FOR MEDICAL DEGREES

PHYSIOLOGY PAPER II

Time: Three hours

Answer all five questions

Answer each question in a separate book

Use diagrams where necessary

August 2022

1. A 40-year-old mother of five children presents with dyspnoea on exertion for the last few months. She has no dyspnoea at rest. Examination reveals pallor and a systolic murmur. Blood investigations confirm anaemia. Echocardiography shows normal heart valves. ECG showed only sinus arrhythmia which was considered normal.
- 1.1
- 1.1.1 Define anaemia. (15 marks)
- 1.1.2 List **three (3)** compensatory mechanisms seen in chronic anaemia. (15 marks)
- 1.1.3 Explain the physiological basis for the systolic murmur in this patient. (20 marks)
- 1.1.4 Explain why she is not dyspnoeic at rest but dyspnoeic on exertion. (25 marks)
- 1.2 Explain the physiological basis of sinus arrhythmia in a healthy person. (25 marks)
2. A 60-year-old known patient with emphysema presents with worsening shortness of breath for three days duration. On admission, his SpO₂ is 85%. He is cyanosed and has a barrel-shaped chest. There are diffuse ronchi on examination. Arterial blood gas (ABG) analysis shows the following results.
- | | | |
|-------------------------------|---------|-----------------|
| pH | 7.32 | (7.35 – 7.45) |
| PO ₂ | 55 mmHg | (80 – 100 mmHg) |
| PCO ₂ | 50 mmHg | (35 – 45 mmHg) |
| HCO ₃ ⁻ | 32 mmHg | (22 – 26 mmHg) |
- 2.1
- 2.1.1 What do you understand by 'SpO₂ 85%'? (10 marks)
- 2.1.2 Which noninvasive investigation would have detected SpO₂? (10 marks)
- 2.1.3 Define cyanosis. (10 marks)
- 2.1.4 State **one (1)** abnormality you would expect to see in his full blood count that make him more susceptible to cyanosis. (05 marks)
- 2.1.5 State reasons for the barrel-shaped chest. (10 marks)
- 2.2 This patient is treated with 100% oxygen, steroids and bronchodilators. However, after 24 hours of treatment he showed a reduced respiratory rate and had a deteriorating level of consciousness. ABG shows the following results.
- | | | |
|-------------------------------|---------|-----------------|
| pH | 7.2 | (7.35 – 7.45) |
| PO ₂ | 50 mmHg | (80 – 100 mmHg) |
| PCO ₂ | 70 mmHg | (35 – 45 mmHg) |
| HCO ₃ ⁻ | 32 mmHg | (22 – 26 mmHg) |
- 2.2.1 Explain the reason for his deterioration with 100% oxygen. (20 marks)
- 2.2.2 What is his acid-base disturbance? (10 marks)
- 2.2.3 List **two (2)** changes that would occur in his renal tubules to resist the acid-base disturbance mentioned in 2.2.2. (10 marks)
- 2.3 Describe briefly the limiting pH of urine. (15 marks)

- 3.**
- Explain the physiological basis for the following
- 3.1 Patients with xerostomia are prone to develop dental caries. (25 marks)
 - 3.2 Steatorrhea is seen in chronic pancreatitis. (25 marks)
 - 3.3 Constipation is seen in Hirschsprung disease. (25 marks)
 - 3.4 One-year-old child defecates soon after each meal. (25 marks)

- 4.**
- 4.1
- 4.1.1 What are the **three (3)** main hormones involved in the regulation of serum calcium? (10 marks)
 - 4.1.2 List **three (03)** actions of two of the hormones you mentioned in 4.1.1. (20 marks)
- 4.2
- 4.2.1 List **three (3)** main hormones secreted by the adrenal medulla. (10 marks)
 - 4.2.2 Explain briefly how excessive secretion of the adrenal medullary hormones leads to hypertension. (30 marks)
 - 4.2.3 Excess secretion of one adrenal cortical hormone can lead to diabetes. Explain the mechanism of developing diabetes mellitus with excessive of adrenal cortical hormone. (30 marks)

- 5.**
- 5.1 When a person enters a dark room from brightly lighted environment his vision becomes poor and after some time his vision improves. Explain the physiological basis for this. (30 marks)
 - 5.2 Explain briefly the differences between visceral pain and superficial pain. (30 marks)
 - 5.3 Explain briefly how to differentiate lower motor neuron lesions from upper motor neuron lesions. (25 marks)
 - 5.4 List the **three (3)** sensory inputs that provide information for maintaining posture and balance. (15 marks)
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