Question Paper

Exam Date & Time: 14-Jan-2022 10:20 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST PROFESSIONAL YEAR MBBS DEGREE EXAMINATION - JANUARY 2023
SUBJECT: PHYSIOLOGY - PAPER I
(CBME BATCH – REGULAR/REPEATERS)

Marks: 80 Duration: 160 mins.

Answer all the questions.

1) A 55-year-old man with a history of a chronic lung disease presents to his physician with worsening shortness of breath. He is noted to have an expanded anterior-posterior diameter of the chest with expiratory wheezes and breathing through pursed lips. A chest x-ray reveals hyperinflated lung fields bilaterally. The physician recommends spirometry to differentiate obstructive lung disease from restrictive lung diseases. Pulmonary emphysema is suspected.

1A) Draw spirogram illustrations to explain how spirometry can be used to differentiate obstructive lung disease from restrictive lung disease. (3)

1B) Explain the factors affecting gas exchange across the respiratory membrane. Explain which factor might be altered in this patient. (3+1 = 4)

1C) Using a graph, explain how the lung compliance of this patient would be different from a healthy person. (3)

2) An elderly patient was admitted to the cardiology ward for complete cardiac evaluation. He was subjected to various cardiac function tests. The laboratory data is given below:
Oxygen consumed per minute = 240 ml/min
Arterial oxygen content = 20 ml/100 ml
Oxygen content of pulmonary arterial blood = 14 ml/100 ml
Heart rate = 80 beats/minute
End diastolic volume = 100 ml

2A) Calculate the cardiac output of this patient. (3)

2B) Define end diastolic volume and comment on its value in this patient. (2)

2C) Describe the regulation of cardiac output. (5)

3) **Short questions:**

3A) Give the basis for the following:

i) Surfactant maintains stability of different sized alveoli. (2)

ii) Blockade of a pulmonary artery branch by a clot increases alveolar PO2 and decreases alveolar PCO2 values within the affected alveoli. (2)

3B) Draw the Hexaxial reference system that represents all the limb lead axis. Represent the mean electrical axis of the heart. (3+1 = 4)

3C) Give the basis for:

i) Aorta is called Windkessel vessel (2)

ii) Arterioles are called resistance vessels. (2)

3D) A 60-year old male was brought to the emergency after complaining of severe rectal bleeding. His blood pressure was 70/40mmHg, heart rate 120/min, pulse was thready. Skin was cold, clammy and pale, respiratory rate 28/min. Give the physiological basis for the clinical features seen in the case scenario. (4)

3E) Explain how GFR is kept constant despite changes in mean arterial pressure within a certain range. (4)

3F) Define renal clearance. Explain how renal blood flow can be estimated using renal clearance of specific substances. (1+3 = 4)

3G) Explain the mechanism that maintains the hyperosmolarity of renal medullary interstitium. (4)

3H) A 29-year-old woman presents with ptosis and diplopia which appear towards the end of the day. Administration of edrophonium, an anticholinesterase, immediately reverses these symptoms. Electromyography reveals a progressive decline in the amplitude of muscle action potentials with repeated voluntary contraction. A diagnosis of Myasthenia gravis is made.

i) Explain safety factor in neuromuscular transmission. (1.5)

ii) Explain the physiological basis for the occurrence of patient's symptoms.Give the basis for the immediate improvement observed with edrophonium administration. (1½+1 = 2½)

3I) Describe the sliding filament theory of skeletal muscle contraction. (4)

3J) Explain the mechanism of action of all intravascular natural anticoagulants that normally keep the blood in fluid state within a healthy blood vessel. (4)

3K) Describe the stages of phagocytosis by neutrophils. (4)

3L) A 24-year-old Rh negative female had a second trimester abortion and the pregnancy was terminated. After 2 years she gave birth to an infant, which showed evidence of severe hemolysis. The condition of her newborn infant could have been prevented by administering anti-D antibodies on termination of her previous pregnancy. Explain the cause for hemolysis seen in the newborn infant. (4)

3M) An 84-year-old woman was diagnosed with obstructive jaundice. Comment on her expected urine and stool examination findings with their physiological basis. Add a note on Van den Bergh test results anticipated in this patient with reasons for the same. (2+2 = 4)

3N) Explain the 'Indicator-dilution Principle' used for estimation of fluid volumes in the different body fluid compartments. (4)

3O) Explain the genesis of resting membrane potential in a neuron. (4)

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Question Paper

Exam Date & Time: 16-Jan-2022 10:20 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST PROFESSIONAL YEAR MBBS DEGREE EXAMINATION - JANUARY 2023
SUBJECT: PHYSIOLOGY - PAPER Ii
(CBME BATCH – REGULAR/REPEATERS)

Marks: 80 Duration: 160 mins.

Answer all the questions.

Write brief, clear and legible answers.

Illustrate your answers with diagrams and flow charts wherever appropriate.

Essay questions:

1) A 49-year-old woman presented with the complaints of coffee color vomiting. She had been suffering with sharp epigastric pain, especially in the morning, for one week. The pain was relieved by food or antacids and re-appeared after 2-3 hours post meal. She had been frequently taking oral painkillers for headache. An upper-GI-endoscopy revealed ulcer near pylorus. The patient was prescribed Pantoprazole 40 mg/day for 2 months.

1A) Mention the factors causing theabove clinical condition and explain its pathophysiology. (2)

1B) Describe the physiological basis for coffee color vomiting, sharp epigastric pain, and the pain being relieved by food. (3)

1C) Explain the role of Pantoprazole in the above case. (1)

1D) Discuss the mechanism of acid secretion in the stomach. (4)

2) A 59 years old male suffered with cerebral stroke causing the paralysis of right half of the body. He had been on medication for his hypertension for 20 years. MRI scan shows a lacunar infarct in the central parts of internal capsule due to an occlusion of a single penetrating branch of the middle cerebral artery (MCA).

2A) With the help of a neat labelled diagram describe the origin, course, termination and functions of the affected tracts that caused the paralysis. (4)

2B) Explain the four other clinical features which will be most probably present in this patient. (4)

2C) Analyze the roles of any two descending tracts that is functional in this patient. (2)

3) **Short answer questions:**

3A) When someone holds your hand,

i) Name the receptors involved and describe the changes in the membrane potential in one of the receptors. (2)

ii) Explain how the brain differentiates the intensities of the above sensation. (2)

3B) Discuss and explain the following

i) Why a dull aching pain is poorly localized and doesn't let us sleep? (2)

ii) How rubbing or shaking the near-by area of the injured part relieves the pain? (2)

3C) 42-year-old man was brought into the emergency department after a deep stab injury on the upper dorsomedial part of left arm. He was not able to extend his elbow and wrist of the same side and remarkable sensory loss in posterolateral side of the same limb.

i) Explain with reasons the type of nerve injury observed in the above case. (1)

ii) Describe the expected changes occurring in the distal part of his injured axons. (3)

3D) 62-years old woman noticed slight shakiness in her hands and she had difficulty rising from a chair. During clinical examination it was found that her face was expression less and walk was slower with little swinging of her arms while walking. The resting hands showed a tremor. There were no dysmetria or ataxia, no signs of cranial nerve damage and sensory modalities were normal.

i) What is the most likely clinical condition and mention the commonly prescribed drug in this case. (1)

ii) Explain the physiological basis of her clinical symptoms. (3)

3E) Compare and contrast between the different divisions of autonomic nervous systems. (4)

3F) A 20 year old girl fell from a motorbike and suffered a concussion injury. When she awoke, she was able to understand and follow commands, including repeating language spoken to her, but had difficulty understanding the written language and naming the objects.

i) With the help of a neat labelled diagram prepare the speech pathway for naming the object after it is seen and point out the site of lesion in this case. (2)

ii) Name the other conditions which may arise due to the damage in the various other parts of this pathway. (2)

3G) Prepare a flow chart of the taste pathway and explain how we are able to differentiate between the tastes of sugar and salt. Add a note on any two defects in taste perception.(2+1+1 = 4 marks)

3H) Describe the following in brief.

i) Attenuation reflex (2)

ii) Cochlear microphonic potential (2)

3I) A 48-year-old woman goes to her physician as she is having difficulty threading the needles. She complains, as soon as she brings the needle and thread closer to her eyes, she can't see them clearly. The visual acuity for far vision is normal and for near vision is "N4" in both eyes. Name the clinical conditions and explain the pathophysiology and the corrective measures. (1+2+1= 4)

3J) A 12-year-old boy presents to the emergency department with complaints of weight loss, fatigue, polyphagia, polydipsia, and polyuria. A urinalysis reveals glycosuria and markedly elevated fasting blood sugar.

i) Name the clinical condition and mention its type. (1)

ii) Describe the pathophysiological basis of the above features. (3)

3K) A 35-year-old man with the height of 5 feet 6 inch comes to hospital for remarkable changes in his appearance. Physical examination showed disproportionately enlarged hands and feet. Skin was excessively moist, coarse, oily and thickened. Supraorbital ridges were prominent and jaw was protruded. His fasting blood glucose level was 170 mg/dl.

i) Name the clinical condition and the hormone level responsible for this. (1)

ii) Describe the mechanism of action and functions of the hormone involved. (3)

3L) Describe the role of hypothalamus in regulation of feeding behavior. Add a note on feeding disorders. (3+1 = 4 marks)

3M) A 35-year-old woman is admitted for fractured tibia. Bone scans of the spine and hip reveal low bone density. Laboratory tests show normal plasma calcium but low vitamin-D levels.

i) Explain the mechanism of reduction of bone mass in this case. (2)

ii) Mention the role of other hormones in maintaining the plasma calcium. (2)

3N) A newly married couple wants to delay their pregnancy. Describe the four methods which they can follow and give the physiological basis of their action. (4)

3O) A 26 year old, newly married sister of a medical student complains of amenorrhea for 2 months and early morning nausea for 15 days. Otherwise, she is perfectly healthy and not on any medication.

i) Mention the hormone and explain its role which appears in this condition. (3)

ii) Mention the test to detect it along with its physiological basis. (1)

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