Question Paper

Exam Date & Time: 23-Dec-2021 (10:20 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST PROFESSIONAL MBBS (CBME) DEGREE EXAMINATION - DECEMBER 2021
SUBJECT: PHYSIOLOGY - PAPER I

All questions are compulsory. Write brief, clear and legible answers.
Illustrate your answers with diagrams and flow charts wherever appropriate.

Marks: 80 **Duration: 160 mins.**

Answer all the questions.

Essay Questions:

1. A 42-year-old woman who has peripheral edema is referred to the nephrologist for evaluation of renal function.The patient was diagnosed with type 1 diabetes mellitus at the age of 12 and has been managing her blood glucose with three daily injections of insulin. Over the past 5 years, the blood glucose has not been as well managed, and 2 years ago urine analysis showed microalbuminuria. Based on the findings she was diagnosed to be having diabetic nephropathy.
Plasma analysis:
Fasting glucose: 300 mg/dL (normal: 60-110 mg/dL)
● BUN: 32 mg/dL (normal: 7-18 mg/dL)
● Creatinine: 2.0 mg/dL (normal: 0.6-1.2 mg/dL)
● Plasma albumin: 1.5 g/dL (normal: 3.5-5 g/dL)
● Glycosylated hemoglobin: A1c (HbA1c) levels7.8 (normal: < 6)
Urinalysis:
● Glucose: +3 (normal: 0)
● Albuminuria: 200 mg/24 hr (normal: 0)

1A. What is the pathophysiology of glycosuria in the above case? (2)
1B. Explain the terms Transport maximum and renal threshold. Give their values for glucose. (2)
1C. Explain the mechanism for glucose reabsorption in the kidney. (3)
1D. What does the elevated level of HbA1c indicate? (2)
1E. Mention the cause for nephropathy in the above case. (1)

2. A 68-year-old man comes to his primary care physician complaining of tiredness and difficulty in sleeping. Six months earlier he was diagnosed with MI for which he was treated accordingly. Now he complains of breathlessness on lying down. He was diagnosed to be in heart failure.
Examination revealed:Temperature 37°C, Pulse 80/min, Respiratory rate 18/min and shallow, BP100/70 mm Hg. Chest radiography: Enlarged left atrium and ventricle, interstitial pulmonary edema. Echocardiography: Ejection fraction of 40%. Arterial blood gases: PO_2 85 mm Hg, PCO_2 40 mm Hg, pH 7.3

2A. Why did the patient complain of breathlessness on lying down? (1)
2B. Comment on his ejection fraction. (1)
2C. How is cardiac output measured? (3)
2D. Mention the factors affecting cardiac output. (2)
2E. Explain the factors regulating cardiac output when there is a change in the initial length of the muscle fiber. (heterometric regulation) (3)

Short Answer Questions:

3A. Explain the physiological basis of using dialysis in the treatment of renal failure patient. (4)

3B. A 53 year old security guard came to the clinic with swelling in the legs and ankles after long periods of standing.He also complains of aching and tiredness in his legs. On examination he was diagnosed with chronic venous insufficiency (CVI) where the valves of the veins are not working effectively in the lower limbs.

i) What will be the implication of this on the venous return to the heart? (1)

ii) Explain the pathophysiology of the same. (2)

iii) What are the other factors affecting venous return to the heart? (1)

3C. Diagrammatically represent the left ventricular, atrial and aortic pressure changes during single cardiac cycle. (4)

3D. Draw a neat labelled diagram of an ECG recorded from limb lead II. Write any two changes in ECG of a Myocardial Infarction patient. (2+2 = 4 marks)

3E. Discuss the ventricular action potential in terms of:

i) Phases. (2)

ii) Ionic basis of each phase. (2)

3F. deep sea cable laying worker complained of severe joint pains, dizziness and confusion after rapid ascent to the sea level.
Identify the above condition and explain its pathophysiology.
Give two measures for its prevention.
(1+2+1 = 4 marks)

3G. Name the forms in which carbon dioxide is transported in the blood. Explain Haldane effect.
(1½+2½ = 4 marks)

3H. A 40 year male patient complains of breathlessness at rest. Spirometer recording showed a vital capacity of 4.5 L, FEV1= 60%; PaO2=85%; Hb =15gm%. Define vital capacity and FEV1. Give their normal values.
Predict a condition where the above findings are seen.
(3+1 = 4 marks)

3I. What is resting membrane potential? Give its normal value in a large myelinated nerve fibre. Explain how it is established in a nerve fibre.
(1+1+2 = 4 marks)

3J. Discuss the conduction of impulses in myelinated and unmyelinated nerve fibers and their significance. Distinguish between orthograde and retrograde transmission.
(3+1 = 4 marks)

3K. Sam lifts 20 kg weights from the floor in the gym. What is the type of muscle contraction? Explain the steps involved in excitation contraction coupling in skeletal muscle.
(1+3 = 4 marks)

3L. A child suffering from marasmus, a form of protein energy malnutrition, was brought to the clinic with generalized edema. What is the cause for edema? Explain the pathophysiology behind the formation of edema.
(1+3 = 4 marks)

3M. Blood collected in capillary tube clots. Explain why and how this happens. How can it be prevented?
(3+1 = 4 marks)

3N. Explain the changes occurring during erythropoiesis. Name two sites of erythropoiesis in fetal life.

(3+1 = 4 marks)

3O. **Explain with examples:**

i) Positive feedback mechanism. (2)
ii) Active transport. (2)

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Question Paper

Exam Date & Time: 24-Dec-2021 (10:20 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST MBBS DEGREE (CBME) EXAMINATION - DECEMBER 2021
SUBJECT: PHYSIOLOGY - PAPER II

Marks: 80 Duration: 160 mins.

Answer all the questions.

Essays:

1A) Draw a labelled diagram of the receptor organ for hearing to show the location of hair cells, thesupporting structures and the different fluid compartments. Outline the role of the hair cells in auditory transduction.(6)

1B. Explain how sound pitch is discriminated and loudness is determined by the cochlear mechanisms.(4)

2. A 32-year-old man underwent a thyroid surgery that involved removal of considerable mass of thyroid tissue. Soon after surgery, he develops paresthesia, tingling sensation and muscle cramps involving the extremities. Chvostek sign was elicited.

2A) Explain the method by which Chvostek sign is elicited? Explain the basis for the sign being observed in this patient.(4)

2B) Explain why the structures that are inadvertently removed along with the thyroid gland during thyroid surgery are called essential endocrine glands. Explain the actions and regulation of secretion of the hormone secreted by these glands.(6)

3. Short notes:

3A) Explain the mechanism of post-rotatory nystagmus. Draw a simplified neural circuit involved in vestibulo-ocular reflex.(4)

3B) Describe the events leading to presynaptic inhibition with the help of diagram. (4)

3C) Cerebral cortex - Basal ganglia - Thalamus - Cortex loops are essential part of the neural control of voluntary movement. Draw the components of these loops and explain how they function in normal and diseased states.(4)

3D) Explain the following terms: (4)

i) Loading of muscle spindle.
ii) Lengthening reaction.
iii) Crossed extensor response.
iv) Occlusion in a neuronal pool.

3E) Explain the basis on which the cerebral hemispheric specialization is done. Explain the specialized functions of each hemisphere.(4)

3F) Describe the organization of Ascending Reticular Activating System (ARAS). Explain the functions of this system.(4)

3G) Describe how changes in the plasma osmolality and ECF volume regulate thirst mechanism. (4)

3H) Explain the role of renin-angiotensin mechanism in the regulation of secretion of aldosterone. Add a note on aldosterone escape.(4)

3I) Name the thyroid function tests. Explain how the test results are altered in primary and secondary hypothyroidism and hyperthyroidism? (4)

3J) Outline the process of sexual differentiation in fetal life. How is it affected in male pseudohermaphroditism? (4)

3K) Trace using graphs the pattern of secretion of estrogen, progesterone, FSH and LH during normal menstrual cycle.(4)

3L) Explain the role of Oxytocin in parturition and lactation. (4)

3M) Explain the defecation reflex. (4)

3N) Explain the role of bile salts in digestion and absorption of fat. (4)

3O) Draw a labelled diagram of nerve supply to salivary glands. Explain the effect of parasympathetic stimulation on primary salivary secretion.(4)

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