

# Question Paper

Exam Date & Time: 08-Mar-2021 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST MBBS DEGREE EXAMINATION - MARCH 2021  
SUBJECT: PHYSIOLOGY - PAPER I

**Marks: 80**

**Duration: 160 mins.**

**Answer all the questions.**

**All questions are compulsory. Write brief, clear and legible answers.**

**Illustrate your answers with diagrams and flow charts wherever appropriate.**

### Essay questions:

1A) Explain the O<sub>2</sub>-Hb dissociation curve. Describe the factors affecting affinity of hemoglobin for oxygen.

(3+3 = 6 marks)

1B) Discuss the physiological basis for the change in affinity of hemoglobin for oxygen in these cases (4)

- i) Metabolic Acidosis
- ii) Fever
- iii) Acclimatized Individual
- iv) Carbon monoxide poisoning

2. A 54-year-old hypertensive patient complains of chest pain, shortness of breath and sweating after lifting heavy boxes. He is smoker for the past 25 years. On examination his heart rate was 55 beats/min and regular. The ECG showed ST-segment elevation in anterior chest leads V1 and V2. Further estimation of cardiac enzymes after several hours, showed an increase in cardiac enzyme levels.

- 2A) Name the most likely condition in above case (1)
- 2B) Give the physiological basis for ECG changes. (3)
- 2C) Write any two differences between angina pectoris and Myocardial infarction (MI). (2)
- 2D) Explain special features of coronary circulation (4)

### 3. Write Short Answers:

3A) Compare and contrast between secondary active transport and facilitated diffusion using suitable examples. (4)

3B) List any four anticoagulants. Explain the mechanism of action of any one of them. (2+2 = 4 marks)

3C) A patient dies of acute renal failure on twelfth day following a mismatched emergency blood transfusion.

- i) Discuss the reasons for renal failure in the above case.
- ii) Explain how this can be prevented by doing hematological tests.

(1+3 = 4 marks)

- 3D) A child suffering from Protein Energy Malnutrition (PEM) presents with edematous limbs and bloated abdomen.
- Explain the cause for edema in this case
  - What is reversible equilibrium between plasma proteins and tissue proteins?
- (3+1 = 4 marks)
- 3E) 60-year-old hypertensive male patient suffering from congestive cardiac failure undergoes echocardiography and his report shows end diastolic volume is 150ml and end systolic volume of 100 ml. i) Calculate his ejection fraction. ii) Explain how pressure volume loop is altered in this case.
- (2+2 = 4 marks)
- 3F) Briefly explain the factors regulating the venous return. (4)
- 3G) Explain with diagram, the effect of sympathetic and vagal stimulation on the rate of discharge and slope of pacemaker potential of SA node. Mention the neurotransmitters involved.
- (3+1 = 4 marks)
- 3H) A patient with angina was given Nitroglycerine tablet following which there was improvement in the coronary blood flow.
- What is the physiological basis of the above treatment?
  - Explain with the help of formula the relation between the blood flow and diameter of blood vessel.
- (1+3 = 4 marks)
- 3I) A premature baby born in the labor room had difficulty in breathing. Baby was diagnosed to have Infant Respiratory Distress Syndrome.
- Deficiency of which substance is responsible for above condition?
  - Explain the composition, natural source and functions of this substance
- (1+3 = 4 marks)
- 3J) In a diabetic individual GFR was 125ml/min and the blood glucose level was 100mg/dl. How much will be the tubular load of glucose in this patient. How much is the normal renal threshold for glucose and what is the significance of this value?
- (1+1+2 = 4 marks)
- 3K) Calculate the clearance of a substance when its concentration in the plasma is 1mg /dl. Its concentration in the urine is 100mg/dl, and urine flow rate is 2ml/min. Why creatinine is used clinically in measurement of GFR?
- (2+2 = 4 marks)
- 3L) An elderly man with chronic diabetes mellitus with renal failure, having generalized edema comes to nephrology department for dialysis.
- Describe the basic principles of dialysis
  - Give the reason for dialysis in the above patient?
  - What is artificial kidney?
- (2+1+1 = 4 marks)
- 3M) Forty five years female with complaints of increasing difficulty in swallowing, drooping of eyelids and weakness of muscles as the day progresses. Investigations showed a mass in mediastinum (thymoma) and antibody test for Ach receptors was positive.
- What is the physiological basis for the above symptoms?
  - Discuss the action of any two drugs used to improve this condition.
- (2+2 = 4 marks)

- 3N) List the energy sources of muscle contraction. Describe the basis of muscle fatigue  
(2+2 = 4 marks)
- 3O) A person with cervical injury comes with history of paralysis of biceps. After few months the person develops twitches and fasciculation in upper arm muscles. What is the cause for his symptoms? Describe the series of events taking place in this patient following the injury.  
(1+3 = 4 marks)

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# Question Paper

Exam Date & Time: 09-Mar-2021 (10:20 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST MBBS DEGREE EXAMINATION - MARCH 2021

SUBJECT: PHYSIOLOGY - PAPER II

**Marks:80**

**Duration: 160 mins.**

**Answer all the questions.**

### Essays

1. A 65-year-old man visits OPD complaining of trembling hands and difficulty in walking. On examination, resting tremor of the hand was observed that diminished when asked to perform a task. On examination of muscles, the muscles were rigid, causing "cogwheel" motion during stretching. The patient's facial expressions were reduced.
  - 1A) Give the probable diagnosis and identify the neural structure involved in the above case. (1)
  - 1B) Draw neural pathways to depict the internuclear connections of the involved structure. (5)
  - 1C) Describe the functions of the involved structure. (4)
  
2. A 55-year-old man visits his emergency department complaining of burning abdominal pain. The patient has experienced pain associated with eating for the past few months. The patient gives history of smoking for 35 years. Endoscopy with gastric mucosal biopsy revealed an ulcer and biopsy positive for H. pylori infection. He was prescribed Omeprazole (proton pump inhibitor).
  - 2A) Using a diagram explain the cellular mechanism of hydrochloric acid secretion in the gastric phase of gastric secretion (2)
  - 2B) Explain the various stimuli that regulate acid secretion in the gastric phase of gastric secretion (3)
  - 2C) Briefly explain how H. Pylori disrupts normal physiology of the stomach leading to ulcer. (2)
  - 2D) Explain the physiological basis of prescribing the patient with proton pump inhibitors. (3)
  
3. **Short Essay: (3)**
  - 3A) Describe the normal EEG waves and the EEG characteristics during sleep. (4)
  - 3B) Explain each of the following using day-to-day examples:
    - a) Explicit memory b) Implicit memory c) Working memory d) Consolidation of memory. (4)
  - 3C) Explain how the sensory system codes for the localization of two closely applied tactile stimuli on tip of the finger. (4)
  - 3D) Explain "Alpha-gamma co-activation" and its role in muscle contraction. (4)

- 3E) List the features following prefrontal lobotomy. Derive the functions of prefrontal lobe. (4)
- 3F) Compare the causes of conductive and sensorineural hearing loss and the tests used to distinguish between them. (4)
- 3G) Predict the visual field deficits that would occur after lesions in  
a) Left Optic Tract b) Right Optic Radiation c) Left Optic Nerve d) Optic Chiasm.  
Explain why each of the deficits occur. (4)
- 3H) Trace the neural pathway for Light Reflex. Explain the clinical significance of assessing Light Reflex. (4)
- 3I) Briefly explain the cellular mechanism of action of a) Insulin b) Adrenaline (4)
- 3J) A 55 year-old, female visits the OPD with complains of fever, restlessness and loss of weight. Her lab tests reveal elevated T3 and decreased TSH. She is diagnosed with hyperthyroidism. Explain other expected clinical findings in the patient. Give the basis of her T3 and TSH levels. (4)
- 3K) A 46-year-old woman has hirsutism, hyperglycemia, obesity, hypertension and muscle wasting. Probable diagnosis is made for Cushing's syndrome.  
a) Which hormonal abnormality is responsible for the above-mentioned disease?  
b) Based on the actions of the hormone, explain the features seen in this patient. (4)
- 3L) A 41-year-old woman had undergone thyroid surgery. Following surgery she developed carpopedal spasms. Lab investigations revealed hypocalcemia, hyperphosphatemia, and decreased urinary phosphate excretion.  
a) Which hormone levels are abnormal in this patient and what is the most likely diagnosis?  
b) Explain the physiological actions of the hormone involved in the above case. (4)
- 3M) A 17-year-old, seemingly normal female visits the OPD with a complaint that she has never had a menstrual cycle. She is diagnosed with androgen insensitivity disorder.  
a) Describe what other features that may be present in the patient. What is her expected genotype?  
b) Give the pathophysiological basis of androgen insensitivity disorder. (4)
- 3N) Name the stages of spermatogenesis and explain the regulation of spermatogenesis. (4)
- 3O. Briefly explain the role of different hormones in mammary gland development and milk secretion. (4)

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