

Question Paper

Exam Date & Time: 29-Jan-2021 (10:20 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST MBBS DEGREE EXAMINATION - JANUARY 2021 SUBJECT:
BIOCHEMISTRY - PAPER I

Marks: 80

Duration: 160 mins.

Answer all the questions.

Section Duration: 20 mins

LONG ANSWER QUESTIONS:

1. A 42-year-old female was diagnosed to have pheochromocytoma. On examination, BP was 180/100 mmHg, pulse was 76/min. She was taking beta blockers. Other examination findings were unremarkable.
- 1A) Write **TWO** clinical symptoms seen in patients with pheochromocytoma (1)
- 1B) Explain the synthesis of the compound that is excreted in the urine of the above patient (3)
- 1C) Write in detail the synthesis of neurotransmitters associated with pheochromocytoma (6)
- 2A) Describe **FOUR** factors influencing enzyme activity (4)
- 2B) Explain competitive enzyme inhibition. Write applications of **TWO** competitive enzyme inhibitors used in the treatment. (2+2 = 4 marks)
- 2C) Explain **TWO** therapeutic applications of enzymes (2)
3. **Short answer questions:**
- 3A) Classify polysaccharides with examples and write their importance (4)
- 3B) Explain the digestion and absorption of dietary carbohydrates (4)
- 3C) Explain the key reactions of the metabolic pathway which provides glucose to maintain the blood level from lactate. (4)
- 3D. A 6-months old child presented with liver enlargement, hypoglycemia, cataract and jaundice. Biochemical tests revealed that blood glucose level - 50mg/dL, lactic acid - 15mmol/L and cholesterol -300mg/dl. Urine benedict test was positive.
- i) What is the probable diagnosis? (1)
- ii) What is the biochemical basis of the disorder and the treatment? (2+1 = 3 marks)
- 3E) Write the normal range of post prandial plasma glucose level. Explain the hormonal regulation of blood glucose level (1+3 = 4 marks)
- 3F) Explain the features of primary and secondary structural organization of proteins with examples (4)
- 3G) Describe the digestion and absorption of dietary proteins (4)

- 3H) Explain the pathway for detoxification of ammonia in liver (4)
- 3I) Explain the metabolic adaptations that occur during starvation. (4)
- 3J) Write the components and their sequence of electron transport chain. Write a note on uncouplers (3+1 = 4 marks)
- 3K. An 18-year-old female was taken to the emergency room in coma. Her parents noticed that she had polydipsia, polyuria, and rapid weight loss which started approximately 1 month ago and had worsened in the last week. She had not been taking any medications and the clinical history was otherwise unremarkable. On examination, breathing was deep and rapid (Kussmaul respiration), pulse rate was 100 beats per minute, and blood pressure 110/70 mmHg; she also had signs of dehydration. She was drowsy and confused. Biochemical tests showed glucose 520 mg/dl, urea 50 mg/dl, creatinine 0.8 mg/dl. Arterial pH was 7.0, PO₂ 98 mmHg, PCO₂ 25 mmHg, HCO₃⁻ 12 mEq/L, and O₂ sat 98%.
- i) What is the probable diagnosis? (1)
- ii) Explain the biochemical basis for the above presentations (3)
- 3L. Explain the significance of unsaturated, saturated, trans and cis fatty acids with examples. (4)
- 3M. A 50 year-old male obese and hypertensive patient presented with fatigue and right upper quadrant pain. Physical examination showed moderate hepatomegaly. Biochemical investigations revealed hyperlipidemia, elevated aminotransferases and gamma-glutamyltranspeptidase. Liver biopsy showed necroinflammation and fibrosis. Explain the causes for above findings and add a note on lipotropic factors (3+1 = 4 marks)
- 3N. A 48-year-old male patient was on the drug statin which acts by competitively inhibiting the enzyme HMG CoA reductase. Outline the steps involved in the biosynthesis of the molecule which is affected by the above drug. Add a note on its regulation (3+1 = 4 marks)
- 3O. A 55-year-old male accountant, presents to your clinic with a chief complaint of chest pain. He enjoys walking his dog in the park near his house, but now finds himself having to take frequent breaks to catch his breath and relieve temporary chest pain. He has been a smoker (1 pack/day) since college, and has not visited a doctor in many years. His BP is 160/100, HR 68, RR 18, T 98.8F. Explain the biochemical mechanism of the most likely underlying cause in this patient? (4)

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MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST MBBS DEGREE EXAMINATION - JANUARY 2021 SUBJECT:
BIOCHEMISTRY - PAPER II

Marks: 80

Duration: 160 mins.

Answer all the questions.

1. Describe the process of translation. Explain how the primary protein is made functional using insulin as an example. (7+3 = 10 marks)

2. A 25-year-old man developed loss of appetite, mild fever and yellowish discoloration of the sclera after eating at a particular food joint over several days. He was diagnosed to have hepatitis A infection.
 - i) List the biochemical investigations in this patient to aid the diagnosis and give the normal values of the analytes.
 - ii) Discuss the metabolism of bilirubin in the body
 - iii) List any TWO causes of congenital hyperbilirubinemia with their associated defect (4+4+2 = 10 marks)

- 3A) Name the B-complex vitamin deficiencies, which can lead to neurological symptoms. Give the mechanism involved in each of them. (4)
- 3B) An AIDS patient was hospitalized for severe diarrhoea since 2 days. The anion gap was 10 meq/L on admission.
 - i) What is the likely acid-base disorder in this case?
 - ii) Comment on the anion gap.
 - iii) What will be the compensatory mechanisms to restore the pH? (1+1+2 = 4 marks)
- 3C) The SARS CoV- 2 virus is a retrovirus. The nucleocapsid genes are targeted during molecular testing. Describe the technique used in the extraction and amplification of the viral genes from the swabs for molecular testing. (4)
- 3D) Explain the clinical significance of
 - i) Creatinine clearance
 - ii) Serum TSH
 - iii) Cobalt-60
 - iv) Serum amylase (1 marks x 4 = 4 marks)

- 3E) Following a cholecystectomy surgery, a 40-year-old female gradually developed fatigue and joint pains.
- Name the micronutrient responsible for her complaints and explain the basis.
 - Discuss the formation of the physiologically active form of the same.
- (2+2 = 4 marks)
- 3F) Classify mutations with examples (4)
- 3G) Explain the outcome and effects of biotransformation of
- Methanol
 - Acetaminophen (Paracetamol)
- (2+2 = 4 marks)
- 3H) A 12-year-old girl was diagnosed with Wilson's disease.
- Mention the primary defect and describe the clinical features that lead to the diagnosis.
 - She was treated with D-Penicillamine and zinc. Explain the rationale of the treatment.
- (2+2 = 4 marks)
- 3I) Write briefly on:
- Tumour suppressor genes
 - Post transcriptional processing
- (2+2 = 4 marks)
- 3J) A 65-year-old man presented to the OPD with weakness, low back pain and recurrent infections. Xray showed osteolytic lesions in the skull. Laboratory investigations revealed an elevated serum calcium, LDH and serum creatinine. Serum protein electrophoresis and bone marrow study were requested.
- What is the most likely diagnosis? What will be the electrophoresis pattern?
 - What is the pathology involved in this condition
- (2+2 = 4 marks)
- 3K) Explain:
- Action of any **FOUR** minerals essential for carbohydrate metabolism
 - Immunological basis of Rh isoimmunisation
- (2+2 = 4 marks)
- 3L) The calorific requirement of a 57 kg female medical student is 2100 kcal
- Distribute the calories for BMR, SDA and physical activity.
 - Calculate the number of grams of carbohydrates, proteins and fats she needs to consume.
- (2+2 = 4 marks)
- 3M) Write briefly on:
- Applications of Henderson - Hasselbach equation
 - Consequences of obesity.
- (2+2 = 4 marks)
- 3N) A 50-year-old woman diagnosed with uterine fibroids was admitted with severe menorrhagia. She was found to have Hb -7.2%. What is the type of anaemia? What are the other investigations that can be done to confirm the same
- (1+3 = 4 marks)

30) Give biochemical reasoning

- i) Deficiency of pantothenic acid results in decreased fatty acid synthesis
- ii) Bleeding tendency is a feature of vitamin K deficiency
- iii) Inappropriate heme synthesis affects ATP production
- iv) Ascorbic acid is a good antioxidant

(1 marks x 4 = 4 marks)

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