



All India Institute of Medical Sciences, Kalyani
First Professional MBBS Examination, September 2025

Time: 3 Hrs.

Biochemistry (Paper-I)

Marks: 100

INSTRUCTIONS:

- Answer all questions.
- Illustrate your answers with well labelled diagram wherever necessary.
- Answer section B and C in a separate answer booklets.

SECTION – B (40 MARKS)

1. Define lipoproteins and enlist the different types found in our blood? Explain the metabolic significance of reverse cholesterol transport. (4+4)
2. Describe the fluid-mosaic model of biological membranes. (4)
3. A 20-year-old man presented with early fatigue and muscle pain during exercise. However, he can resume exercise after a period of rest, experiencing a temporary improvement in his symptoms. He was diagnosed to have a Glycogen Storage Disorder. (2+2)
 - a. Identify the condition. *McArdle's*
 - b. What is the biochemical basis of his early fatigability?
4. Classify proteins based on shape; give one example of each class. What are derived proteins? (2+2)
5. A 3-day-old male child reported to have stunted development and also mental sub normality. The HPLC and Mass spectrometry showed high Phenylalanine and low tyrosine level. (2+1+1)

PKC What is the diagnosis? Mention the enzyme defect. Name the co-enzyme needed for this reaction.
6. What is "Bohr's effect"? How does it allow hemoglobin to transport oxygen to and from tissues? (4)
7. A 32-year-old young army man, who was posted in the borders during Operation Sindoor. Following an exposure to a Nerve Gas during the war, he had developed neurological manifestations and fainted. It was later found that the nerve gas was an inhibitor of Electron Transport Chain (ETC) (2+2)
 - a. Explain why inhibitors of ETC cause Neurological manifestations.
 - b. Describe the role of a physiological uncoupler of the ETC ✓
8. A 40-year-old male is admitted to hospital in a comatose state. Examination findings include dehydration, signs of toxicity, a particular breathing pattern, and a sweet, fruity odor on the breath. Laboratory results are as follows: random blood glucose = 380 mg/dL, blood ketone bodies = 8 mg/dL, Benedict's test on urine: brick red (++++), Rothera's test on urine: positive, serum $\text{HCO}_3^- = 15 \text{ meq/L}$, plasma pH = 7.25. (1+1+1+1)

DKA What is the diagnosis? What accounts for the fruity odor on the breath? What is the name of the observed breathing pattern? List three types of ketone bodies. *Acetone*
9. A newborn baby was diagnosed with jaundice, just 2 days after birth. Doctors reassured the parents but still monitored levels of unconjugated bilirubin of the baby. They also started keeping the baby in an incubator under blue light. The baby gradually recovered without any medications and was discharged from the hospital after two weeks. (1+1+2)
 - a. What is the most likely diagnosis in this case? *Neonatal*
 - b. Why is unconjugated bilirubin considered more dangerous in newborns? *Kernic*
 - c. What is the biochemical reason for exposing the baby to blue light? *6h*

SECTION - C (40 MARKS)

1. Describe with the help of a diagram the Intestinal absorption of dietary Iron. Add a note on how Iron from Non-vegetarian sources have better absorption than Iron from vegetarian sources. (6+2)
2. A 35-year-old sedentary man, whose diet has lacked fresh fruits and vegetables for months, presents with joint swelling, petechiae on his legs, swollen and painful gums, and anaemia (haemoglobin 8 g/dL). ^{vite} Which vitamin is deficient? What is the likely diagnosis? ^{ceruloplasmin} What could explain the anaemia? What are this vitamin's key functions? (1+1+1+1)
3. A 20-year-old woman with abdominal pain, diarrhea, jaundice, and negative hepatitis serology is found to have low serum ceruloplasmin and high urinary copper. Her parents are first cousins. ^{Wilson's disease} (1+1+2)
What is the likely diagnosis? What is the underlying cause? Which additional lab tests and physical findings would confirm the diagnosis, and how should it be managed? ^{LFK}
4. A 5 year old boy had several bouts of loose watery stools and vomiting. He was lethargic, feeling weak and was found to be having acute Dehydration. (2+2)
 - a. What are the common causes of dehydration?
 - b. What is the biochemical basis of using oral rehydration solution (ORS) for management of dehydration? ^{Na⁺ pm}
5. What are isoenzymes? Explain the clinical implications of isoenzymes in disease diagnosis, giving relevant examples. (4)
6. A patient's lab test result showed serum albumin to be lower than globulin. On clinical examination he had ascites and pedal edema. (2+2)
Explain the reason of such clinical finding based on the lab findings. Describe the major functions of albumin.
7. Write a short note on the "Folate trap". (4)
8. Describe the different types of enzyme inhibition with examples. (4)
9. A 7-year-old boy reported to the primary health centre with malnutrition and complaint of night vision defect. ^{vita} (1+3)
Which vitamin deficiency is to be suspected? Explain the role of this vitamin in vision.

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