



**RAN-2506000101032702/2406000101030702**

**1<sup>st</sup> M.B.B.S. Examination November - 2025**

**Biochemistry (Paper-II, Set-III)**

**સૂચના : / Instructions**

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.  
Fill up strictly the above details on your answer book

Seat No.:

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Student's Signature

**Instructions for Section A:**

- All questions are compulsory.
- Each MCQ has only one correct answer.
- One Mark for correct answer. No negative marking.

**SECTION : A**

**Q.1. Multiple Choice Question.**

**(1 × 20 = 20 Marks)**

- All are oncogene products, except
  - Growth factors
  - Tyrosine kinase
  - Interleukin - 2
  - Transcription factors
- Which specific DNA sequence does the hormone-receptor complex interact with to regulate gene transcription?
  - TATA box
  - CAAT box
  - Hormone response element
  - Promoter enhancer region
- Which of the following biomarkers is most commonly used to monitor epithelial ovarian cancer?
  - Beta-human chorionic gonadotropin ( $\beta$ -hCG)
  - Alpha-fetoprotein (AFP)
  - Cancer antigen 125 (CA-125)
  - Carcinoembryonic antigen (CEA)
- Plasma differs from serum by the presence of :
  - Albumin
  - Globulin
  - Fibrinogen
  - Immunoglobulin
- A 30-year-old woman presents with low-grade fever, dry cough, and mild chest discomfort for one week. Chest X-ray reveals patchy infiltrates. Laboratory tests and clinical findings suggest a typical pneumonia, most likely due to *Mycoplasma pneumoniae*. She is started on erythromycin. Erythromycin helps treat this infection by interfering with which one of the following bacterial processes?
  - DNA replication
  - Elongation of protein synthesis
  - Cell wall synthesis
  - Folate metabolism

6. An operon is best described by:
  - a. A constitutively expressed gene system
  - b. An unregulated gene system
  - c. A co-ordinately regulated gene system
  - d. A gene that produces a monocistronic mRNA
7. HIV primarily targets which of the following cells?
  - a. B lymphocytes
  - b. CD8+T cells
  - c. CD4+ T helper cells
  - d. Natural killer cells
8. The human immunodeficiency virus:
  - a. Has two RNA strands as its genetic material
  - b. Infection is spread by mosquito
  - c. Is diagnosed by immune electrophoresis
  - d. Provides resistance to the patient against other viral infections
9. The role of Taq polymerase in PCR is critical because:
  - a. It can synthesize RNA from DNA
  - b. It binds to primers during denaturation
  - c. It is stable at high temperatures and catalyzes DNA synthesis
  - d. It regulates the melting temperature of the DNA template
10. Which of the following chromatographic techniques is based on molecular size?
  - a. Gel filtration chromatography
  - b. Ion exchange chromatography
  - c. Paper chromatography
  - d. Affinity chromatography
11. A 26-year-old woman is brought to the emergency department with complaints of severe lower abdominal pain, anxiety, muscle weakness, and tingling in her hands and feet. She reports no fever, vomiting, or diarrhea. She mentions starting a new weight-loss diet and took over-the-counter herbal supplements for the past week. She had a similar episode six months ago after recovering from a viral illness. Physical examination reveals mild tachycardia but a soft, non-tender abdomen. Her urine is reddish-brown and turns dark purple upon standing in light. No signs of infection or inflammation are noted. Which of the following is the most likely diagnosis?
  - a. Lead poisoning
  - b. Acute intermittent porphyria
  - c. Crohn's disease
  - d. Renal colic
12. Lesch-Nyhan syndrome is due to the lack of :
  - a. Adenine Phosphoribosyltransferase
  - b. Adenosine deaminase
  - c. Hypoxanthine-Guanine Phosphoribosyltransferase
  - d. PRPP amidotransferase
13. Enzyme A digest protein in stomach and Enzyme B digests proteins in small intestine, which of the following is not true?
  - a. Enzyme A would be denatured in the small intestine.
  - b. Enzyme A works best in acidic conditions.
  - c. Enzyme A can also work in the small intestine.
  - d. Enzyme A helps in the hydrolysis of proteins

14. Enzyme responsible for respiratory burst is :
  - a. NADPH Oxidase
  - b. Nitric oxide synthase
  - c. Glutathione peroxidase
  - d. Catalase
15. Which of the following is the correct sequence in the degradation of heme?
  - a. Heme → Bilirubin → Biliverdin → Urobilinogen
  - b. Heme → Biliverdin → Bilirubin → Urobilinogen
  - c. Heme → Urobilinogen → Biliverdin → Bilirubin
  - d. Heme → Bilirubin → Urobilinogen → Biliverdin
16. Anticancer drug 5' flurouracil inhibits enzyme :
  - a. Thymidylate synthase
  - b. Adenosine kinase
  - c. PRPP synthetase
  - d. Nucleoside phosphorylase
17. Which of the following enzymes is most commonly used in ELISA techniques?
  - a. Amylase
  - b. Urease
  - c. Horseradish peroxidase
  - d. DNA polymerase
18. In reversible non-competitive enzyme activity inhibition
  - a. Inhibitor bears structural resemblance to substrate
  - b. Inhibitor lowers the maximum velocity attainable with a given amount of enzyme
  - c.  $K_m$  is increased
  - d.  $K_m$  is decreased
19. A child with short stature, brittle bone and blue sclera is found to have mutation in collagen. Which of the following is the recurring amino acid is the most likely to be altered in mutation that distort collagen molecule?
  - a. Glycine
  - b. Lysine
  - c. Proline
  - d. Tryptophan
20. In Maple syrup urine disease, which of the following compound is accumulated?
  - a. Homogentisate
  - b. Methylmalonyl-CoA
  - c. Branched chain alpha keto acid
  - d. Homocysteine

**Instructions for Section B and C:**

- a. Use Blue/Black Ball-point pen only.
- b. The numbers on the right indicates full marks.
- c. Draw Labelled diagrams wherever necessary.

**SECTION: B**

**Q.2. Long Question-Answers. (1 out of 2) (1 × 10 = 10 Marks)**

1. Describe the metabolism of Tyrosine. Enumerate important biological product synthesized from tyrosine. Add a note on various inborn error of metabolism related to tyrosine (3+2+5)
2. Define recombinant DNA technology. Describe steps of recombinant DNA technology. Enumerate clinical applications of recombinant DNA technology and explain any one of them. (1+5+4).

**Q.3. Justification Questions (5 out of 6) (5 × 3 = 15 Marks)**

1. Ammonia is toxic to brain.
2. Telomerase activity may be therapeutic target of cancer
3. Ethanol is given in Methanol Poisoning patients.
4. Alpha-1 antitrypsin deficiency leads to development of emphysema.
5. Barbiturate precipitates while glucose relieves the acute attack of porphyria.
6. Methotrexate used as anticancer drug.

**Q.4. Short Notes. (3 out of 4) (3 × 5 = 15 Marks)**

1. Clinical importance of Isoenzymes
2. Urea cycle
3. Enzyme Linked Immunosorbent Assays. (ELISA)
4. Describe the molecular basis of Cancer.

**SECTION: C**

**Q.5. Short Notes & Clinical Aspects (4 × 5 = 20 Marks)**

1. A 42-year-old man with a known history of joint issues presented with recurrent painful flareups affecting his ankles and fingers. He mentioned that the attacks had become more frequent and lasted longer over the past few months. Examination showed tender, swollen joints with signs of chronic inflammation. Investigations revealed elevated serum and urinary uric acid, and synovial fluid analysis showed urate crystals. He was diagnosed with recurrent gout, and further evaluation was planned to assess underlying causes.
  - a. What is the biochemical reason behind the development of inflammation around small joints? (2)
  - b. Write the mechanism of action of allopurinol. (1)
  - c. Alcohol precipitates an attack of Gout. Why? (2)
2. A 6-month-old female infant was brought to the pediatric outpatient clinic with complaints of poor head control and inability to roll over. The parents noted that she frequently vomits after feeds and has an unusual musty or mousy body odour. On examination, the child had hypopigmented skin and hair, microcephaly, and hyperreflexia. Her physical appearance was noticeably lighter compared to both parents. Developmental delays were confirmed, and further metabolic testing was advised;  
Serum phenylalanine: Markedly elevated (>20 mg/dL)  
Urine ferric chloride test: Green colour developed  
Tandem mass spectrometry: Elevated phenylalanine
  - a. What is the provisional diagnosis and biochemical base of this disorder? (2)
  - b. What causes the characteristic mousy odor? (1)
  - c. Why is tyrosine considered conditionally essential in this condition? (1)
  - d. What dietary advice will you give to this patient? (1)
3. A 3-day-old full-term newborn presents with yellowish discoloration of the skin and eyes since day 2 of life. The baby is active and feeding well. Examination reveals icterus up to the chest. Serum bilirubin shows unconjugated hyperbilirubinemia.
  - a. What is the diagnosis? Why do many neonates suffer from jaundice? (1)
  - b. How bilirubin is synthesized in the body. (3)
  - c. Explain the role of phototherapy in the treatment (1)

4. A 58-year-old male, known hypertensive and smoker, presented to the emergency department with severe, crushing chest pain radiating to the left arm and jaw, lasting for more than 30 minutes. The pain was associated with sweating, nausea, and breathlessness. On examination, the patient was anxious, diaphoretic, and had a heart rate of 110/min and blood pressure of 140/90 mmHg. Laboratory investigations were as following,

| Test                       | Value     | Normal Range          |
|----------------------------|-----------|-----------------------|
| Troponin I                 | 3.8 ng/mL | <0.04 ng/mL           |
| Creatine Kinase-MB (CK-MB) | 58U/L     | 0 - 25 U/L            |
| Total Creatine Kinase (CK) | 290 U/L   | 40-150 U/L            |
| Serum LDL Cholesterol      | 178mg/dL  | < 130 mg/dL (optimal) |
| Total Cholesterol          | 230 mg/dL | < 200 mg/dL           |
| Fasting Blood Glucose      | 128 mg/dL | 70-100 mg/dL          |

- What is the most likely diagnosis? (1)
- List two non-enzymatic cardiac markers which can be used in the diagnosis. (1)
- Write significance of different enzymes in the diagnosis of this condition. (3)

**Q.6.**

**Short Notes.**

**(4 × 5 = 20 Marks)**

- Role of Physician to Society and Community
- DNA Repair Mechanism
- Renal Clearance Tests
- Polymerase Chain Reaction (PCR)