

M.B.B.S. FIRST PROFESSIONAL EXAMINATION, SEPTEMBER-2025**BIOCHEMISTRY****PAPER - FIRST****[Time allotted: Three hours]****SET-A****[Max Marks: 100]****Q. 1. Multiple choice questions (Darken the single best response in OMR sheet. Time allotted 20 minutes) (20 x 01 = 20)**

1. A 55-year-old chronic alcoholic male presents with confusion, ataxia, and ophthalmoplegia. He has a history of poor diet and frequent vomiting. What could be the probable cause?
 - a. Vitamin B6 (Pyridoxine) deficiency
 - b. Vitamin B1 (Thiamine) deficiency
 - c. Vitamin B12 (Cobalamin) deficiency
 - d. Folate deficiency
2. Following is the primary energy source for the brain after 3-day religious fast?
 - a. Glucose from liver glycogen
 - b. Free fatty acids
 - c. Ketone bodies
 - d. Amino acids from muscle breakdown
3. A patient is on a strict low-carb and high protein diet. Which of the following amino acids is purely ketogenic?
 - a. Isoleucine
 - b. Tyrosine
 - c. Leucine
 - d. Phenylalanine
4. A newborn presents with vomiting, lethargy, and seizures. Blood ammonia is markedly elevated. Which of the following enzyme deficiencies is most likely responsible?
 - a. Ornithine transcarbamoylase (OTC)
 - b. Arginase
 - c. Aspartate transaminase
 - d. Carbamoyl phosphate synthetase II
5. A 6-year-old child presents with photosensitive rash, diarrhea, and behavioral changes. Urinalysis shows elevated levels of neutral amino acids. Which amino acid's deficiency may lead to these symptoms?
 - a. Tryptophan
 - b. Tyrosine
 - c. Methionine
 - d. Cysteine
6. A child with leukemia is started on methotrexate. Which enzyme is inhibited by methotrexate?
 - a. Dihydrofolate reductase
 - b. PRPP synthetase
 - c. Thymidylate synthase
 - d. HGPRTase
7. A 3-year-old boy presents with developmental delay, self-mutilation (biting lips/fingers), and hyperuricemia. Urinary uric acid is elevated. Which enzyme is deficient in this child?
 - a. Adenosine deaminase
 - b. Xanthine oxidase
 - c. HGPRTase
 - d. PRPP synthetase
8. A 45-year-old man presents with acute pain and swelling in the first metatarsophalangeal joint. Joint fluid analysis reveals negatively birefringent needle-shaped crystals. What could be the cause?
 - a. Deficiency of Carbamoyl phosphate synthetase I
 - b. Deficiency of Xanthine oxidase
 - c. Deficiency of Hypoxanthine-guanine phosphoribosyl transferase (HGPRTase)
 - d. Deficiency of PRPP Synthase
9. A lab technician finds that the DNA from a viral genome contains 20% Cytosine. What percentage of Thymine is most likely present?
 - a. 30%
 - b. 20%
 - c. 40%
 - d. 70%
10. A medical student is analyzing nucleic acids extracted from tissue. Sample shows the presence of thymine and a ribose sugar. Which type of nucleic acid is most likely present in the sample?
 - a. DNA
 - b. mRNA
 - c. tRNA
 - d. rRNA
11. What is the basis of Rifampin as antitubercular drug
 - a. Inhibit bacterial RNA Polymerase
 - b. Inhibit the 30S ribosomal subunit.
 - c. Inhibit the 50S ribosomal subunit.
 - d. Inhibit bacterial DNA Polymerase
12. In one of the hemoglobinopathy, genetic analysis shows a point mutation resulting in glutamic acid being replaced by valine in the β -globin gene. Which type of mutation is this?
 - a. Silent mutation
 - b. Nonsense mutation
 - c. Missense mutation
 - d. Frameshift mutation
13. A researcher isolates DNA fragments and needs to separate them based on their size. Which technique will be appropriate?
 - a. Western blot
 - b. ELISA
 - c. Gel electrophoresis
 - d. Northern blot
14. A student accidentally exposed to cyanide gas in the lab and rapidly became unconscious, what could be the best explanation
 - a. Inhibition of NDH Oxidoreductase
 - b. Uncoupling of oxidative phosphorylation
 - c. Inhibition of cytochrome c oxidase
 - d. Depletion of NADH
15. How many ATPs yield from the complete oxidation of one molecule of acetyl-CoA through the TCA cycle.
 - a. 8 ATP
 - b. 10 ATP
 - c. 12 ATP
 - d. 15 ATP
16. A 10-year-old boy is suspected to have sickle cell anemia. A molecular test is done to confirm the mutation in the β -globin gene. Which following techniques should be used?
 - a. Northern blot
 - b. Southern blot
 - c. Western blot
 - d. ELISA
17. Which immunoglobulin class (anti-D immunoglobulin) is administered in pregnant woman to prevent haemolytic disease of the newborn?
 - a. IgA
 - b. IgE
 - c. IgG
 - d. IgM
18. A 69-year-old male presented in OPD with generalized swelling, he was diagnosed with nephrotic syndrome. Lab reports show serum albumin: 1.8 g/dL and proteinuria. Clinical condition will be best explain as
 - a. Increased capillary permeability
 - b. Decreased oncotic pressure
 - c. Decreased sodium excretion
 - d. Elevated interstitial osmotic pressure
19. An elevated serum alkaline phosphatase (ALP) was found in a 12-year-old healthy child. Which isoenzyme of ALP was raised?
 - a. α 1 ALP
 - b. Pre β ALP
 - c. α 2 heat labile ALP
 - d. α 2 heat stable ALP
20. Which enzyme is drastic increases in acute hepatitis?
 - a. ALP
 - b. Amylase
 - c. AST
 - d. ALT

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Note: Attempt all questions in sequence.
Draw suitable diagrams (wherever necessary)

Q. 2. Give reasons why: **(5 x 2 = 10)**

- a. Serum albumin level remain normal in acute liver disease.
- b. Statins are given in hypercholesterolemia.
- c. Photosensitivity is not seen in patients of acute intermittent porphyria.
- d. TCA cycle is common final oxidative metabolic pathway of major biomolecules
- e. Pellagra like symptoms are seen in carcinoid syndrome.

Q. 3. Problem based question: **(5 x 2 = 10)**

A farmer brought his 2-year-old son to the+ hospital with complaints of frequent diarrhea, poor appetite, and lethargy. He had been breastfed for the first six months of life but had transitioned to a diet mainly consisting of rice. On examination, the physician noticed that his abdomen appeared swollen, and his limbs appeared thin.

Laboratory Findings:

Serum Albumin: 1.8 g/dL

Haemoglobin: 8.0 g/dL

- a. What is the most probable diagnosis? Explain the biochemical basis for above clinical condition
- b. Enumerate three causes for hypoproteinaemia
- c. What are the factors that affect Basal Metabolic Rate?
- d. Calculate Body Mass Index for a 30-year-old man whose weight is 100 kg and height is 200cm.
- e. Define Specific dynamic action and Total energy expenditure.

Q. 4. Write briefly on: **(4 x 6 = 24)**

- a. Explain the mechanism of action of enzyme action with suitable diagram.
- b. Illustrate post transcriptional modification of m-RNA in prokaryotes. Write a note on Lesch nyhan syndrome.
- c. Recombinant DNA technology and write its clinical applications.
- d. Describe the trust and vulnerability in doctor-patient relationship.

Q. 5. Structured question:

(i) Describe the detoxification of ammonia in detail. Give an account on Folate trap **(6+4=10)**

(ii) Describe the process of replication in prokaryotes. Write a note on salient features of genetic code. **(7+3=10)**

Q. 6. Answer as indicated: **(4 x 4 = 16)**

- a. Illustrate catabolism of heme.
- b. Define Isoenzymes. Tabulate the isoenzymes of Lactate dehydrogenase on the basis of their physical properties
- c. Draw a labelled diagram of t-RNA. List the various DNA repair mechanisms.
- d. Differentiate between passive and active immunity.
