2019 and 2024 Scheme

Q.P. Code: 116001 **Reg. no.: ……**

First Professional MBBS Degree Regular/Supplementary Examinations August 2025
Biochemistry Paper - II

Time: 3 Hours **Total Marks: 100**

- ***Answer all questions to the point neatly and legibly • Do not leave any blank pages between answers***
- ***Indicate the question number correctly for the answer in the margin space***
- ***Answer all parts of a single question together • Leave sufficient space between answers***
- ***Draw table/diagrams/flow charts wherever necessary***

1. **Multiple Choice Questions** **(20x1=20)**

The responses for MCQ questions (Q.No. i to Q.No. xx) shall be written in the space provided for answering MCQ questions at page No. 51 of the answer book (the inner portion of the back cover page (PART III)). Responses for MCQs marked in any other part/page of the answer book will not be valued

Questions i-v are single response type questions

i. Which of the following is **NOT** a nucleoside
   a) Adenosine b) Guanosine c) Inosine d) Cytosine

ii. Deficiency of all the following enzymes causes hyperuricemia **EXCEPT**
   a) Adenosine deaminase b) HGPRTase c) Glucose 6-phosphatase d) Aldolase B

iii. Which of the following proteins is **NOT** a part of core histone octamer
   a) H2 b) H1 c) H3 d) H4

iv. Mechanism of action of methotrexate is inhibition of which of the following enzymes
   a) Ribonucleotide reductase c) Thymidylate synthase
   b) PRPP synthetase d) Dihydrofolate reductase

v. P_{50} of adult hemoglobin HbA is
   a) 50 mmHg b) 20 mmHg c) 5 mmHg d) 26 mmHg

Question numbers vi-x are multiple response type questions. Read the statements and mark the answers appropriately.

vi. Which of the following statements regarding replication and transcription are TRUE
   1) Both processes require topoisomerase for removing supercoils during unwinding
   2) Polymerization of nucleotides in both processes occurs in 5'→3' direction
   3) Both processes require RNA primers for initiating the process
   4) Both processes are accurate because both exhibit proof reading activity
   a) 1, 2 are correct b) 1, 2, 3, 4 are correct c) 2, 3, 4 are correct d) 3, 4 are correct

vii. Eukaryotic replication is similar to prokaryotic replication but requires a complex array of proteins. Which of the following proteins are not required for eukaryotic replication
   1) DNA polymerase III 2) Replication protein A
   3) Proliferating cell nuclear antigen 4) DnaG protein
   a) 1, 2, 3, 4 are correct b) 2, 3 are correct c) 1, 4 are correct d) 3, 4 are correct

viii. Which of the following are TRUE regarding structure and functions of immunoglobulins
   1) IgG crosses placental barrier and protects the fetus
   2) IgA exists as a dimer and is present in body secretions
   3) IgE plays a major role in hypersensitivity reactions
   4) IgM is the main antibody produced during secondary response
   a) 1, 2, 3, 4 are correct b) 1, 2, 4 are correct c) 2, 4 are correct d) 1, 2, 3 are correct

ix. Which of the following enzyme defects causes orotic aciduria
   1) Orotate phosphoribosyl transferase 2) PRPP synthetase
   3) Orotidylate decarboxylase 4) Ornithine transcarbamoylase
   a) 1, 2, 3 are correct b) 2, 4 are correct c) 1, 2 are correct d) 1, 3, 4 are correct

x. TRUE statements regarding hemoglobin structure are
   1) One molecule of 2,3-bisphosphoglycerate binds to each subunit of HbA
   2) α-chain contains 141 amino acids and β-chain contains 146 amino acids
   3) α helix is the common secondary structure present in hemoglobin
   4) Oxygenated state of hemoglobin is said to be in T state or taut state
   a) 1, 2, 3, 4 are correct b) 2, 3 are correct c) 2, 3, 4 are correct d) 1, 2, 3 are correct

For Questions xi-xv there are two statements marked as - Assertion (A) and Reason (R). Mark your answer as per the options provided

xi. **Assertion:** Photosensitivity is seen in ALA dehydratase deficiency
   Reason: Accumulation is porphobilinogen which when activated by light exposure causes skin damage
   a) Both A and R are correct but R is not the reason for A c) Both A and R incorrect
   b) A incorrect R correct d) Both A and R are correct R is reason for A

xii. **Assertion:** Taq polymerase needs to be added to PCR mixture after each cycle
   Reason: Enzymes are temperature sensitive and are denatured
   a) Both A and R are correct but R is not the reason for A c) Both A and R incorrect
   b) A incorrect R correct d) Both A and R are correct R is reason for A

xiii. **Assertion:** High level of serum unconjugated bilirubin in a neonate is a medical emergency
   Reason: Elevated unconjugated bilirubin causes liver fibrosis and failure
   a) Both A and R are correct but R is not the reason for A c) A correct R incorrect
   b) A incorrect R correct d) Both A and R are correct R is reason for A

(PTO)

xiv. **Assertion:** Number of purines is equal to pyrimidines in dsDNA
Reason: A purine always pair with pyrimidine and vice versa
a) Both A and R are correct but R is not the reason for A c) Both A and R incorrect
b) A incorrect R correct d) Both A and R are correct R is reason for A

xv. **Assertion:** Mismatch repair mechanism remove wrongly paired nucleotide from either of the DNA strands
Reason: It is not possible to detect which strands carries wrong nucleotide
a) Both A and R are correct but R is not the reason for A c) Both A and R incorrect
b) A incorrect R correct d) Both A and R are correct R is reason for A

Question numbers xvi-xx are case scenario-based questions

A 65-year-old male patient came to medicine department with complaints of decreased urine output with generalized edema for past 3 weeks. He was a known osteoarthritic patient and was taking NSAIDs for past 6 years.

xvi. Microalbuminuria is excretion of albumin in urine of
a) <30 mg/day b) 30–300 mg/day c) 300–1000 mg/day d) >1000 mg/day

xvii. All the following formulae are used to calculate estimated glomerular filtration rate in adults **EXCEPT**
a) CKD−EPI formula b) Schwartz formula c) MDRD formula d) Cockcroft Gault formula

xviii. Which of the following clinical condition is an example for overflow proteinuria
a) Hemoglobinuria b) Glomerulonephritis c) Fever d) Diabetic nephropathy

xix. Gold standard method to study glomerular filtration rate is
a) Inulin clearance b) Creatinine clearance c) Urea clearance d) Uric acid clearance

xx. Fractional excretion of sodium of <1% indicates
a) End stage renal disease b) Renal failure c) Normal renal function d) Prerenal failure

Long essays **(2x10=20)**

2. A 35-year-old male patient was admitted with complaints of drowsiness and vision loss. Detailed history revealed he has consumed alcohol adulterated with cheap methanol on the previous day. His Arterial blood gas analysis report is as follows.
Blood pH: 7.2, HCO_3^-: 16 mmol/L, pCO_2: 41 mm Hg
   a) What acid base imbalance, the patient probably has
   b) What are the normal reference ranges for the given ABG parameters
   c) What are buffers. List any TWO intracellular and extracellular buffers
   d) Explain the role of kidneys in blood pH regulation. (1+2+3+4)
3. A 45-year-old known alcoholic for 15 years was admitted to emergency with hematemesis in an unconscious state. On examination he was jaundiced with massive ascites. His serum bilirubin was 11 mg/dL.
   a) What is your probable diagnosis
   b) Explain the metabolism of bilirubin in the body
   c) What are types of hyperbilirubinemias and their causes
   d) Differentiate different types of jaundice based on biochemical investigations in a table format (1+2+3+4)

Short Essays: **(6x6=36)**

4. What is an operon. Draw the basic structure of Lac operon. Explain the regulation of Lac operon under following conditions, a] presence of glucose only and b] presence of lactose only. (1+1++2+2)
5. A 23-year-old man attended endocrinology department with complaints of loss of weight in spite of good appetite and intolerance to heat. His eyes are appearing bigger in the past few weeks. His physician suggested thyroid profile.
   a) What is the probable diagnosis
   b) What is the basis for protruding eyes in this patient
   c) What biochemical changes are expected in the thyroid profile in primary and secondary conditions (1+1+4)
6. A two-year-old was brought to the pediatrics with complaints of increased tiredness and duration of sleep for past 6 weeks. On examination the child was anemic with frontal bossing and dental malocclusion. His Hb electrophoresis was as follows: HbA: 93.6% and HbA2: 6.4%.
   a) What is the probable diagnosis
   b) What are the types, clinical features and treatment of this disorder. (1+5)
7. Protooncogenes are normal cellular genes which are activated to oncogenes. Explain the mechanisms by which protooncogenes are converted to oncogenes with relevant examples.
8. Explain how are free radicals scavenged in the body.
9. Explain how collagen structure is modified after it is synthesized. Add a note on any ONE clinical condition that affects post translational modifications of collagen. (4+2)

Short Answers **(6x4=24)**

10. Methemoglobinemias
11. Restriction endonucleases – types, action and applications.
12. Cytochrome p450.
13. Lifelong learning is essential for a physician.
14. Biochemistry basis of
   a) Paradoxical aciduria in metabolic alkalosis b) Hyperbaric oxygen therapy in CO poisoning (2+2)
15. A 55-year-old man was admitted with altered sensorium in emergency department. His lab report was as follows.
Serum sodium: 115 mmol/L, serum potassium 4.3 mmol/L, plasma glucose: 83 mg/dL.
   a) From the given lab report, what is the probable electrolyte imbalance seen in this patient.
   b) List any THREE causes of the imbalance.
   c) How is the said serum electrolyte level maintained in the body. (0.5+1.5+2)

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