

**BIOCHEMISTRY**

**PAPER – I**

Time : 3 hours  
Max. Marks : 100

BIOCHEM/D/12/03/I

**Attempt all questions in order.  
Each question carries 10 marks**

1. Give the structure of insulin receptor. Write the mechanism of action of insulin highlighting its signal transduction pathway. 3+7
2. Explain how ketone bodies are synthesized and utilized in our body. How is their synthesis regulated at various levels? What is their clinical significance? 4+3+3
3. Discuss the absorption of iron from intestine along with its regulation. Add a note on hemochromatosis. 7+3
4. Write short notes on: 3+3+4
  - a) Protein trafficking
  - b) Richner Hanhart Syndrome
  - c) Glutathione and amino acid absorption.
5. Discuss the "one carbon" metabolism, indicating the sources, carrier and utilization. Highlight the significance of "folate trap". 7+3
6. Compare and contrast: 3+3+4
  - a) Nuclear DNA and mitochondrial DNA
  - b) SnRNAs and SiRNAs
  - c) Proteomics and Genomics
7. Write the differences in the transcription process occurring in prokaryotes and eukaryotes. Discuss the salient features of eukaryotic control of transcription initiation. 4+6
8. Describe the metabolism of ammonia in the human body. Discuss the clinical significance of hyperammonemia and its management. 7+3
9. What are porphyrias and how are they classified? 4+6  
Give the biochemical basis of symptoms seen in different porphyrias and the different laboratory findings seen in these conditions.
10. a) Describe the metabolic fates of glucose-6-phosphate in the body. 5+5  
b) Discuss basal metabolic rate and its hormonal regulation.

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**PAPER – II**

**Time : 3 hours**

**BIOCHEM/D/12/03/II**

**Max. Marks : 100**

**Attempt all questions in order.**

**Each question carries 10 marks.**

1. a) Classify and define the types of proteinuria and give two examples of each. 4+3+3  
b) Describe their underlying mechanism of action.  
c) Define microalbuminuria and discuss its clinical significance.
2. List various types of troponins and their biochemical basis. Discuss their diagnostic significance and compare it with that of "CPK enzymes". 4+6
3. What is the chemical nature and biochemical basis of: 5+5  
a) Tophi and renal stones in Gout.  
b) Dyslipidemia seen in diabetes mellitus.
4. Briefly discuss the biochemical significance of the following: 3+3+4  
c) Foetal hemoglobin in pregnant mother.  
d) Blood electrolytes in a young hypertensive.  
e) Anion gap in metabolic acidosis.
5. What do you understand by "foetal medicine"? Briefly discuss its scope and relevance in 'today's medicine'. Discuss the role of a medical biochemist in it. 2+3+5
6. a) Discuss the biochemical basis of hemolytic anemia. 5+5  
b) Describe the mechanism of action of any two anticancer drugs.
7. Briefly discuss the following: 4+3+3  
a) Measures of variance  
b) ROC curve  
c) Odd's ratio
8. Discuss in brief the biochemical basis and clinical importance of: 3+3+4  
a) FIGLU test  
b) Fructose intolerance  
c) Compare and contrast salivary amylase and pancreatic amylase
9. Describe briefly the functions of cholesterol. Outline its synthetic pathway. Define hypercholesterolemia according to NCEP guidelines and give its clinical significance. Discuss the biochemical approach to manage a middle aged executive with hypercholesterolemia. 3+2+2+3
10. Briefly discuss the following: 3+3+4  
a) SDA.  
b) Therapeutic use of monoclonal antibodies.  
c) PCR in diagnosis of disease

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**PAPER – III**

**Time : 3 hours**

**BIOCHEM/D/12/03/III**

**Max. Marks : 100**

**Attempt all questions in order.  
Each question carries 10 marks.**

1. Enumerate and explain the various characteristics or specifications required in a spectrophotometer. State its principle and list five applications of a spectrophotometer. 5+5
2. Write briefly the principle and application of:  
a) Hemodialysis. 5+5  
b) Neonatal exchange transfusion.
3. Define and classify neonatal hyperbilirubinemia. Discuss the pathophysiology of common causes of hyperbilirubinemia seen in a 6-days old child. Outline the biochemical work up on this child for diagnosis and management. 2+3+5
4. Define and classify Chronic Kidney Disease (CKD). Mention the principle of estimation of GFR by various methods including the mathematical models, and indicate the "Gold Standard" method. 2+6+2
5. Define metabolic acidosis and indicate its diagnostic criteria. Discuss its common causes along with metabolic alteration and compensation in them. Write a note on the biochemical approach to its management. 3+4+3
6. Write briefly on:  
a) Evaluation of coagulation in a case of deep vein thrombosis. 5+5  
b) Synthetic anticoagulants.
7. a) Describe the mechanisms by which a proto-oncogene gets converted into an oncogene. 5+5  
b) What are xenobiotics and how are they metabolized in the human body?
8. Briefly discuss the following: 5+5  
a) Biochemical basis of renal stones  
b) Biochemical evaluation of osteoporosis.
9. What is homocysteinuria? Mention its common causes and their biochemical basis. Add a note on its clinical significance with the underlying mechanism and its management. 1+4+5
10. Explain briefly: 3+4+3  
a) Cachexia  
b) Adipokines  
c) Antenatal screening for impaired glucose tolerance.

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**PAPER – IV**

Time : 3 hours

Max. Marks : 100

BIOCHEM/D/12/03/IV

Attempt all questions in order.  
Each question carries 10 marks.

1. Define the isoelectric pH of an amino acid. Explain how it can be calculated for a neutral, an acidic and a basic amino acid from the knowledge of different pK values. 1+3+3+3
2. Describe the nature of oxygen dissociation curve of hemoglobin and explain the effect of various allosteric effectors. State the effect of 2,3 bisphosphoglycerate along with its mechanism of action. 7+3
3. Write short notes on: 3+3+4
  - a) Cofactor and coenzyme
  - b) The structural difference between starch and glycogen and their functional implications
  - c) Plasma functional and non functional enzymes
4. What are the structural features of ATP which makes it an energy currency of the cell? Discuss the 'binding change model' of synthesis of ATP. 5+5
5. State the different levels of organization of protein structure. What are super secondary structures of proteins? Give their patho- physiological significance along with suitable examples. 3+2+5
6. What are heterotrimeric 'G' proteins? Mention their function. Give the mechanism of action of cholera, pertussis toxin and diphtheria toxin. 1+3+(2+2+2)
7. What are free radicals? Mention their harmful effects on various macromolecules. Discuss various antioxidants present in our body to counteract them. Give example of a useful free radical. 1+4+4+1
8. a) Enumerate the major lipids present in a mammalian membrane. 2+3+2+3
  - b) State their functions.
  - c) What is membrane asymmetry?
  - d) What is facilitated diffusion? Explain with an example.
9. With the help of an example discuss the mechanism of enzyme action by covalent catalysis. Add a note on catalysis by proximity, acid base catalysis and catalysis by strain. 5+5
10. Define glycoproteins and enlist the different sugars found in them. How are they synthesized? Add a note on their biological significance. 3+3+4

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