

## SEMESTER-III

### Paper-S-3042

Bioinorganic, Bioorganic and Biophysical Chemistry

**Time: 3 Hrs.**

**M.M. 75 marks**

**Note: The paper will be divided into two sections.**

Section-A One question with 10 parts (short answer word limit 20) spread over whole syllabus. Each part will be of 1 mark and candidate is required to attempt all the ten parts

**Total 10 marks**

Section-B Five questions (answer not exceeding 500 words) are from each Unit with internal choice will be asked and the candidate is required to attempt all five questions. Each question will be of 13 marks

**Total 65 marks**

### UNIT I

#### Metal Ions in Biological Systems

Essential and trace metals. Na/K<sup>+</sup> Pump, Role of metals ions in biological processes.

**Bioenergetics and ATP Cycle** DNA polymerisation, glucose storage, metal complexes in transmission of energy; chlorophylls, photosystem-I and photosystem-II in cleavage of water. Model systems.

### UNIT II

**Transport and Storage of Dioxygen:** Heme proteins and oxygen uptake, structure and function of hemoglobin, myoglobin, hemocyanins and hemerythrin, model synthetic complexes of iron, cobalt and copper

### UNIT III

**Enzyme and Mechanism of Enzyme Action:** Introduction of enzymes, enzyme action, Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chymotrypsin, ribonuclease, lysozyme and carboxypeptidase A.

### UNIT IV

**Co -Enzyme Chemistry:** Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD<sup>+</sup>, NADP<sup>+</sup>, FMN, FAD, lipoic acid, vitamin B<sub>12</sub>. Mechanisms of reactions catalyzed by the above cofactors

### UNIT V

**Bioenergetics** :Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.

**Thermodynamics of Biopolymer Solutions** Thermodynamics of biopolymer solutions, osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system.

**Cell Membrane and Transport of Ions** Structure and functions of cell membrane, ion transport through cell membrane, irreversible thermodynamic treatment of membrane transport. Nerve conduction.

### **Books Suggested**

1. Bioorganic Chemistry: A Chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag.
  2. Understanding Enzymes, Trevor Palmer, Prentice Hall.
  3. Enzyme Chemistry: Impact and Applications, Ed. Collin J Suckling, Chapman and Hall.
  4. Enzyme Mechanisms Ed, M. I. Page and A. Williams, Royal Society of Chemistry.
  5. Fundamentals of Enzymology, N.C. Price and L. Stevens, Oxford University Press.
  6. Immobilized Enzymes: An Introduction and Applications in Biotechnology, Michael D. Trevan, John Wiley.
  7. Enzymatic Reaction Mechanisms, C. Walsh, W. H. Freeman.
  8. Enzyme Structure and Mechanism, A Fersht, W.H. Freeman.
  9. Biochemistry: The Chemical Reactions of Living Cells, D. E. Metzler, Academic Press.
  10. Principles of Biochemistry, A. L. Lehninger, Worth Publishers.
  11. Biochemistry, L.Stryer, W.H.Freeman.
  12. Biochemistry, J. David Rawn, Neil Patterson.
  13. Biochemistry, Voet and Voet, John Wiley.
  14. Outlines of Biochemistry, E. E. Conn and P. K. Stumpf, John Wiley.
  15. 7 Macromolecules: Structure and Function, F. Wold, Prentice Hall.
  16. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
  17. Bioinorganic Chemistry, I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.
  18. Inorganic Biochemistry vols I and II. ed. G.L. Eichhorn, Elsevier.
- Progress in Inorganic Chemistry, Vols 18 and 38 ed. J.J. Lippard, Wiley