DEVI AHILYA VISHWAVIDYALAYA, INDORE M.Sc. CHEMISTRY (SEMESTER –IV)

Paper No. Compulsory / Optional Max. Marks : III (Code-MCH-512) : Compulsory

: 100

PAPER III: BIOCHEMISTRY

Unit-1	Metal Ions in Biological Systems
	Bulk and trace metals with special reference to Na, K, Mg, Ca, Fe, Cu, Zn, Co, and
	K+/Na+ pump.
	Bioenergetics and ATP Cycle.
	DNA polymerisation, glucose storage, metal complexes in transmission of energy;
	chlorophyll's, photosystem I and photosystem II in cleavage of water.
	Transport and Storage of Dioxygen
	Heam proteins and oxygen uptake structure and function of haemoglobin's, mygolobin,
	haemocyanms and hemerythrin, model synthetic complexes of iron, cobalt and copper.
Unit-2	Electron Transfer in Biology
	Structure and function of metal of proteins in electron transport processes cytochrome's
	and ion-sulphure proteins, synthetic models.
	Nitrogen fixation
	Biological nitrogen fixation, and its mechanism, nitrogenase, Chemical nitrogen fixation.
Unit-3	Enzymes
	Introduction and historical perspective, chemical and biological catalysis, remarkable
	properties of enzymes like catalytic power, specificity and regulation. Nomenclature and
	classification, extraction and purification. Fischer's lock and key and Koshalnd's induced
	fit hypothesis, concept and identification of active site by the use of inhibitors, affinity
	labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics,
	Michael's-Menten and Lineweaver Burk plots, reversible and irreversible inhibition.
	Mechanism of Enzyme Action
	Transition-state theory, orientation and Steric effect, acid-base catalysis, covalent
	catalysis, strain or distortion. Examples of some typical enzyme mechanisms for
	chemotrypsin, ribonuclease, lysozyme and carboxypeptidase.
	Kinds of Reactions Catalysed by Enzymes
	Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the
	coupling of ATP cleavage to endergonic processes. Transfer of sulphate, addition and
	elimination reactions, enolic intermediates in Isomerisations reactions, b-Cleavage and
	condensation, some isomerization and rearrangement reactions. Enzyme catalyzed
	carboxylation and decarboxylation.
Unit-4	Co-Enzyme Chemistry
	Cofactors as derived from vitamines, coenzymes, prosthetic groups, apoenzymes.
	Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal
	phosphate, NAD+, NADP+, FMN, FAD, lipoic acid, vitamin B12. Mechanisms of
	reactions catalyzed by the above cofactors. Enzyme Models
	Host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular
	asymmetry and prochirality Biometric chemistry, crown ether, cryptates. Cyclodextrins,
	cyclodextrion-based enzyme models, clixarenes, ionospheres, micelles synthetic enzymes
	or synzymes.

Remon 1.9.16 Sharing 1-9-2016

nos 16 Apra 25, 201

9 mg 10 20016

22.01

Biotechnological Applications of Enzymes

large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheesemaking, syrups from cron starch, enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA Technology.

Biological Cell and its Constituents Unit-5

Biological cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coils transition.

Bioenergetics

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

Biopolymer Interactions

Forces involved in biopolymer interactions. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibrium and various types of bidning processes in biological systems. Hydrogen ion titration curves.

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. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
- 2. Bioinorganic Chemistry, 1. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, University Science Books.
- 3. Inorganic biochemistry vol. I and II ed. G.L. Eichhorn, Elsever.
- 4. Progress in Inorganic Chemistry, Vol 18 and 38 ed J.J. Lippard, Wiley.
- 5. Bioorganic Chemistry: A chemical Approach to Enzyme Action, Hermann Dugas and C. Penny, Springer Verlag.
- 6. Understanding Enzymes, Trevor Palmer, Prentice Hall.
- 7. Enzyme Chemistry: Impact and applications, Ed. Collin J suckling, chemistry.
- 8. Enzyme Mechanisms Ed. M.I. Page and A Williams, Royal Society of Chemistry.
- 9. Fundamentals of Enzymology, N.C. Price and L. Stevens. Oxford University Press.
- 10. Immobilized Enzymes: An Introduction and Applications in Biotechnology, Michael ID. Trevan, Hohn Wiley.
- 11. Enzymatic Reaction Mechanisms. C. Walsh. W.H. Freeman.
- 12. Enzyme Structure and Mechanism, A Fersht, W.H. Freeman
- 13. Biochemistry: The Chemical Reactions of Living Cells, D.E. Metzler, Academic Press.

(Ples . 9.16