BTS 404 ENZYMOLOGY (SOFT CORE COURSE) Hours: 40

Course outcomes:

After successful completion of the course, students will be able to:

CO 1. Learn about enzymes, their nomenclature, classification, isolation, purification,properties etc.
CO 2. Comprehend kinetics of enzyme catalysed reaction, multi-substrate reactions andinhibitors.
CO 3. Acquire knowledge about Allosteric enzymes, sigmoid kinetics and nature,
CO 4. Understand the mechanism of action of various enzymes, protein engineering, immobilization of enzymes.

UNIT I (13 hrs)

Enzyme nomenclature and classification, isolation of enzymes, extraction of soluble and membrane bound enzymes, purification of enzyme- criteria for purification, assay of enzymes. Specific activity and molar activity. Structure and general properties of enzymes, active site and specificity of enzymes, Enzyme substrate complex, theories of enzyme catalysis, proximity and orientation, acid-base catalysis. Nucleophilic and electrophilic reaction of enzymes, factors affecting enzyme activity, temperature, pH, time substrate concentration. Isozymes, co-enzymes, metalloenzymes, multifunctional and multienzyme complexes -PDC.

UNIT II (13 hrs)

Kinetics of enzyme catalysed reactions, free energy of enzyme reactions, presteady state, steady state kinetics, Michaelis Menten equation for steady state and equilibrium state, Lineweaver-Burk, Eddie-Hofstee and Hanes plot, Cornish Bowden plot, fast kinetics to elucidate the intermediates and rate limiting steps. Multiple substrate reaction types with specific examples (bisubstrate). Enzyme inhibitors – types of inhibitors, mechanism of enzyme inhibition, competitive, non-competitive, uncompetitive and inhibition. Suicide inhibition, allosteric and irreversible inhibition – significance. Mixed kinetics of reversible inhibition, transition state analogs.

UNIT III (14hrs)

Allosteric enzymes and metabolic regulation, sigmoid kinetics, steady-state metabolic pathway, concerted and sequential models to explain the sigmoid nature of allosteric enzymes. Regulation of metabolic pathway by control of enzyme activity. Zymogen, substrate analogues and their uses. Mechanism of action of lysozyme, chymotrypsin, aspartate transcarbamylase, Alcohol dehydrogenase, RNA as enzyme. Synthetic enzymes, Ribozymes, Abzymes, clinical and industrial application of enzymes, enzymes and inborn errors of metabolism, enzymes as reagents in clinical chemistry, (Analytical tools), Enzyme engineering (Protein engineering), Immobilization of enzyme, kinetics of immobilized enzymes and their applications

References

1. Enzyme Biochemistry, Biotechnology and Clinical Chemistry. Palmer T., Harwood Pub.,2001
2. Enzyme Technology. Chaplin M.F. &Bucke C., Cambridge Univ. Press, 1990
3. Fundamentals of Enzymology. Price, N.C. & Stevens, L., Oxford Pub., 1999
4. Immobilized Enzymes and Cells. A. Rosevear et al., IOP Pub., 1987
5. Industrial Enzymes and their Applications. Uhlig H. John Wiley and sons, 1998
6. Thermostability of Enzymes. Gupta M.N., Narosa Pub., 1993