B.Sc.Biotechnology: Semester-IV

BST404: Enzymology

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week Tutorials: 1 hrs/Week	Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks
Credits: 4	End Semester Exam – 70 marks

Prerequisite:-BST303: Bioenergetics and Thermodynamics, BST103: Cell biology,BST102: Introduction to biotechnology, BST202:Biochemistry, BST203 Microbiology

Course Objectives:

1. To give Overview of a brief introduction; Mechanisms of Enzyme Action
2. To give complete knowledge of Acid Base Catalysis; Covalent catalysis, Metal ion Catalysis
3. Arrhenius Law; Transition State Theory; Kinetics of single substrate reactions; turnover number
4. To describe Random Sequential Bi Bi mechanism; Ordered Sequential Bi Bi mechanism, and Ping Pong Bi Bi mechanism
5. To explain Antigen recognition by T cells and B cells
6. To explain Types of Inhibition- kinetic models: Competitive, Uncompetitive and Non-Competitive
7. To explain the Enzyme Purification and their methods of characterization of enzymes

Course Outcomes:

After completing the course, students will be able to:

CO1: Students will understand the basic concept of enzymes and their activity.

CO2: Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.

CO3: Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

CO4: Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.

CO5: Basic knowledge of structure and functions of major bio-molecules will make the students to understand and implement the acquired knowledge in future.

CO6: Students will gain the understanding of metabolic pathways (catabolism as well as anabolism), their diversity and how these are specifically regulated and interrelated in different cells.

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CO7: This study will make the students for Practical knowledge and hands on tools and techniques for the characterization of bio-molecules that will help the students in advanced research programs

Detailed Syllabus:

UNIT-1 Enzymes: Introduction and Classification
Enzyme commission (E. C.) nomenclature, a brief introduction; Mechanisms of Enzyme Action: General Acid Base Catalysis; Covalent catalysis, Metal ion Catalysis. Mechanism of Chymotrypsin catalysis (Serine Proteases), Specificity of enzyme action: Active Site, Stereospecificity, Lock and Key and Induced Fit Models. Arrhenius Law; Transition State Theory; Kinetics of single substrate reactions; turnover number; Importance of KM, estimation of Michaelis-Menton parameters. Lineweaver Burk plot; Multi-substrate reaction mechanisms and kinetics: Random Sequential Bi Bi mechanism; Ordered Sequential Bi Bi mechanism, and Ping Pong Bi Bi mechanism.
UNIT-2 Types of Inhibition
Types of Inhibition- kinetic models: Competitive, Uncompetitive and Non-Competitive. Regulation of enzymes activity: Allosteric Modification-Sigmoidal kinetics, Feed Back Inhibition and Covalent Modification. Factors affecting the kinetics Enzyme catalysed reactions; Physical and Chemical techniques for enzyme Immobilization – adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding - examples; Biosensor; Glucose Biosensor
UNIT-3 Immobilization
Advantages and disadvantages of different Immobilization techniques; Overview of applications of immobilized enzyme systems, Applications of enzymes in analysis; Design of enzyme electrodes and their applications as biosensors in industry, health care and environment. Enzyme Purification and their methods of characterization of enzymes; development of enzymatic assays- ONPG Assay (colorimetric assay), Coupled kinetic Assay and RIA of enzymes

Text and Reference Books

1. Fundamentals of enzymology by Nicolas C. price and Lewis stevens . Oxford University Press
2. Enzymes by Trevor palmer, East west Press
3. Enzyme Technology by Messing
4. Enzymes : Dixon and Webb.(IRL Press)
5. Enzyme technology by Chaplin and Bucke. Cambridge Univerity Press
6. Alan Fersht, Structure and Mechanism in Protein Science.

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