M.Sc. BIOCHEMISTRY
I SEMESTER
BC 1.1: CHEMISTRY OF BIOMOLECULES

Course Outcomes:

CO1: To offer detailed knowledge of biomolecules for living systems
CO2: To provide basic concepts of structural organization and characterization of proteins
CO3: To learn about Oligosaccharides and lectin interactions in biochemical processes
CO4: To acquire knowledge on physicochemical properties and characterization of fats and oils
CO5: To understand the structure of DNA and RNA and their types

Course Specific Outcomes:

CSO1: To provide the concept of Oligosaccharides and lectin interactions in biochemical process
CSO2: To study salient features of Bacterial and Plant lipids
CSO3: To gain knowledge on nucleotides as energy carriers and other important functions

Course Learning Outcomes:

LO1: Students will acquire an insight into various biomolecules which constitute the living organisms
LO2: Students will learn the structure and properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins, glycolipids and their importance in biological systems
LO3: Students will develop perception on the sequencing of proteins and nucleic acids
LO4: Students will gain knowledge on the Structure and properties of Porphyrins

Unit – 1

Carbohydrates: Classification, Physicochemical properties; Chemistry, Biological roles and Structural elucidation of polysaccharides - homo and heteropolysaccharides, Peptidoglycans, Glycosaminoglycans; Glycoconjugates – Proteoglycans, Glycoproteins and Glycolipids; Oligosaccharides - Lectin interactions in biochemical processes

Unit – 2

Amino acids: Classification, Structure and Physicochemical properties; Peptide bond, Peptides of biological importance; Chemical synthesis of peptides – Solid phase peptide synthesis; Proteins – Classification, Isolation, Purification and Characterization of proteins, Criteria of homogeneity; Protein sequencing; Structural organization of Proteins – Ramachandran plots; Denaturation of proteins

Unit – 3

Lipids: Classification; Structure, Properties and Biological roles of Phospholipids and Sphingolipids; Fatty acids and their physicochemical properties; Fats and Waxes - Physicochemical properties and characterization of fats and oils; Structure, Properties and functions of Eicosanoids - Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes; Chemistry and Properties of Sterols and Steroids – Bile acids and Bile salts; Salient features of Bacterial and Plant lipids

Unit – 4

Nucleic acids: Bases, Nucleosides, Nucleotides; Nucleotides as Energy carriers, Enzyme co-factors and Chemical messengers; Synthetic nucleotide analogs; Chemical synthesis of oligonucleotides; Structure of DNA and different types of DNA, Supercoiled DNA; Structure of RNA and different types of RNA

Unit – 5

Physicochemical properties of Nucleic acids: Denaturation and Renaturation kinetics of nucleic acids - Melting temperature, Cot curves; Sequencing of Nucleic acids – Enzymatic and Chemical methods; Porphyrins – Structure and properties of Porphyrins –Heme, Chlorophylls, Bacteriochlorophylls and Cytochromes

Reference books:

1. Text book of Biochemistry –E.S.West, W.R.Todd et al., 4th ed
2. Principles of Biochemistry by Lehninger –D.L.Nelson, M.M.Cox7th ed
3. Text book of Biochemistry with clinical correlations-Thomas M.Devlin, 7th ed
4. Harper's review of Biochemistry –D.W. Martin, 19th ed
5. Biochemistry – J.M.Berg, J.L.Tymockzo, L.Stryer, 5th ed
6. Biochemistry-Reginald H. Garret, Charles M.Grisham 6th ed
7. Biochemistry-R.W.McGilvery
8. Biochemistry –J.David Rawn

M. Sc. BIOCHEMISTRY

I SEMESTER

BC1.2: BIOCHEMICAL TECHNIQUES

Course Outcomes:

CO1**:** Enable the students to acquaint with basic principle, instrumentation, procedure, and applications of various classical as well as sophisticated Biochemical techniques

CO2: Develop competence in various chromatographic techniques and apply them in isolating and characterizing different biological molecules

CO3: Develop Understanding the principles of Electrophoresis and its applications in biological investigations/experiments and expose the students with various microscopic techniques to study subcellular organelles

CO4: Provide information on fundamental laws relating to photochemistry and Applications of UV-visible, Fluorescence and IR spectrophotometry in analytical determination and characterization of biomolecules

CO5: Apply the principles of radiochemistry to analytical determination of biomolecules and life processes

Course Specific Outcomes:

CSO1: Students will be exposed to various chromatographic techniques and their applications in isolation of different biological molecules

CSO2: In addition to understanding the applications of centrifugation and chromatography in biological investigations, they will gain insight into purification of proteins by affinity chromatography using epitope tags

CSO3: In addition, Advanced instrumental techniques learned by students may be used for the determination of nutrients, major ions and trace elements, biological samples

CSO4: The gained knowledge in Photochemistry enables the students to undertake further studies in biochemistry and related areas or in multidisciplinary areas that involve biochemistry

CSO5: To develop a range of generic skills that are relevant to wage employment, self- employment, and entrepreneurship

Learning Outcomes:

After completion of the course, a student will be able to achieve these outcomes.

LO1: The students will the exposed to different chromatographic techniques like gel filtration, Ion-exchange, thin layer, etc. Students will also learn about various Electrophoretic techniques such as Polyacrylamide Gel Electrophoresis, A garose Gel electrophoresis etc., and their applications in analysing proteins and nucleic acids

LO2: The students will learn about Homogenization and Centrifugation techniques

LO3: The students will also learn the principles of electron microscopy more especially of SEM and TEM and their applications in characterizing biological samples

LO4: The students will be able to implement the use of instruments like and UV-VIS

spectroscopy, NMR, CD, ORD in biological research

LO5: The students will get the theoretical knowledge of various instruments and their practical applications like Geiger-Muller counter, Liquid scintillation counter, Radioactive Isotopes, and safety. X-ray crystallography

Unit–1

Chromatography separation Techniques: Principles, methods, types, and applications of chromatography Techniques – Paper chromatography, Thin layer chromatography, High performance thin layer chromatography, Ion-exchange chromatography, Gel-filtration chromatography and Affinity chromatography: Gas Chromatography, High performance Liquid Chromatography and Chromatofocussing

Unit- 2

Techniques of Electrophoresis: Principles,methods, types anda pplications of electrophoresis: Moving boundary electrophoresis, Zone electrophoresis,P aper and High voltage electrophoresis Polyacrylamide Gel Electrophoresis, A garose Gel electrophoresis, Pulsed Field Gel electrophoresis, Isoelectric focusing of proteins, T wo-dimensional electrophoresis of proteins, Capillary electrophoresis

Unit– 3

Tissue homogenization Techniques – Disruption of tissues & Cells: Centrifugation Techniques – Basic Principles, instrumentation, types, and applications. Differential and density gradient centrifugation, Preparative and analytical ultra-centrifuge:
Principles and applications of Manometer and Oxygen electrode
M icroscopy: Principle, types and applications of microscopes; Phase Contrast, Fluorescent and Electron Microscope

Unit– 4

Spectrophotometry: basic laws of light absorption, instrumentation, and applications of UV –Visible spectrophotometer and IR spectrophotometer
NMR and ESR spectroscopy, Atomic absorption and Mass spectroscopy,
Fluorimetry, Flamephotometry and Nephelometry: Optical Rotatory Dispersion (ORD), Circular Dichroism (CD) and X-ray Diffraction

Unit–5

Radioactive isotopes: Nature of radioactivity, Biochemical uses of Radioactive isotopes: Detection and measurements of radioactivity- Liquid scintillating counting, Geiger-Muller counting; Radioactive isotopesand safety- Radiation hazardsandmethodsof radioactivematerial disposal

Reference Books:

1. Principles and Techniques of Biochemistry and Molecular Biology- K. Wilson, John Walker, 6th ed
2. Biophysical chemistry – Upadhyay, Upadhyay, Nath (Himalaya publications)
3. Physical Biochemistry – D. Friefelder, 2nd ed
4. Physical Biochemistry – K.E. VanHolde, W.Curtis Johnson et al.,
5. Techniques in Molecular biology- J.M. Walker, Wim Gaastra, vol II
6. An introduction to spectroscopy for Biochemists – S.B. Brown
7. Analytical Biochemistry- David J.Holme, Hazel Peck, 3rd ed
8. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, 7th ed
9. Text book of Biochemistry – E.S.West, W.R.Todd et al., 4th ed
10. Asokan P, Analytical biochemistry, 2009, Chinna publication

M.Sc. BIOCHEMISTRY
I SEMESTER
BC 1.3: PHYSIOLOGY AND BIOENERGETICS

Course Outcomes:

CO1: To understand the role of various physiological processes in the body
CO2: To know the general mechanism of muscle contraction and nerve impulse transmission
CO3: To understand the energy transformations in the living system
CO4: To know the mechanism of ATP synthesis
CO5: To know the importance of various components involved in photophosphorylation

Course Specific Outcomes:

CSO1: The course highlights the importance of blood clotting and factors involved
CSO2: The course highlights the role of lungs in exchange of gases and kidneys in acid base balance
CSO3: Major emphasis was on the mechanism of muscle contraction and nerve impulse transmission
CSO4: Particular emphasis on understanding the organization of mitochondrial electron transport system and mechanism of ATP synthesis
CSO5: The course covers the role and importance of photophosphorylation in plants

Learning Outcomes:

LO1: Students will understand various physiological and biochemical processes taking place in the living system
LO2: Students will acquire a good knowledge in biochemistry of muscle contraction, nerve impulse transmission and biochemistry of vision
LO3: Students will be aware of free energy transformations, oxidation and reduction reactions that take place in the cells
LO4: Students will understand the transport of electrons in mitochondria through a series of electron carriers and how ATP synthesis takes place
LO5: Students will acquire knowledge about absorption of light by chlorophylls and other accessory pigments and mechanism of photophosphorylation

Unit –1

Digestion and Absorption of Carbohydrates, Lipids and Proteins
Blood: Composition, properties, and functions - Erythrocytes, Leucocytes, Thrombocytes; Mechanism and Regulation of Coagulation of Blood and Fibrinolysis
Respiration - Mechanism of respiration, Hemoglobin, and transport of gases
Physiology of Heart; Kidney - Structure of kidney and nephron, Regulation of electrolyte, water and acid base balance

Unit –2

Muscle Cell: Structure and organization, Types of muscles, Mechanisms of contraction and relaxation of muscle, Biochemical changes associated with muscle contraction and relaxation
Nerve Cell: Structure and organization, Membrane potential, Mechanism of propagation of nerve impulse in unmyelinated and myelinated nerve fibers; Synapse – Types of synapses, Neurotransmitters, Transmission at adrenergic and cholinergic nerve endings; Blood brain barrier; Biochemistry of vision - Rods and Cones, Sensory transduction in vision

Unit – 3

Bioenergetics and Thermodynamics: Principles of thermodynamics - Free energy, Enthalpy and Entropy, Free energy changes in biological transformations in living systems, Equilibrium constant, Coupled reactions; High-energy compounds - Phosphoryl group Transfers and ATP, Thioesters
Biological oxidation and reduction reactions: Electrochemical cell, Nernst Equation, Redox potential; Oxidation and reduction enzymes, Superoxide dismutase, Catalase

Unit – 4

Mitochondrial electron transport system: Organization of components and importance, Q cycle, Thermodynamics of electron transport, Respiratory chain inhibitors, Microsomal electron transport system
Oxidative phosphorylation - Mechanism and theories of Oxidative Phosphorylation, Structure of ATP synthase, Regulation of oxidative phosphorylation – Acceptor control; Uncouplers and Inhibitors of oxidative phosphorylation; Mitochondrial shuttle systems; Substrate level phosphorylation; Bioluminescence

Unit – 5

Photophosphorylation: Light harvesting complexes – Chlorophylls, accessory pigments; Reaction centers -PSI and PS -II -their location; Mechanism of quantum capture and energy transfer between photo systems, Structure of ATP synthase of chloroplasts, Proton gradient and ATP synthesis, Inhibitors of PS-I & PS-II

Reference books:

1. Textbook of Medical Physiology – A. G. Guyton and J. E. Hall, 10th ed
2. Ganong's Review of Medical Physiology - Kim E. Barrett, Susan M. Barman, 29th ed
3. Human Physiology - Stuart Fox, 15th ed
4. Text Book of Human Physiology – S.Subrahmanyam, K.Madhavankutty
5. Human Physiology – C.C. Chatterjee's, 13th ed
6. Human Physiology - Bryan H. Derrickson, 2nd ed
7. Biochemistry - Reginald H. Garret, Charles M.Grisham, 6th ed
8. Principles of Biochemistry - Lehninger 7th ed
9. Principles of Bioenergetics - Skulachev Vladimir P, Alexander V. Bogachev et al.,
10. Bioenergetics: The Molecular Basis of Biological Energy Transformations – Albert L. Lehninger, 2nd ed

M.Sc. BIOCHEMISTRY
I SEMESTER
BC 1.4: ENZYMOLOGY

Course Outcomes:

CO1: To understand the enzymes, one of the most important types of proteins in the living organisms, enzyme names and commission numbers relate to reactions they catalyze, specific properties
CO2: To acquire knowledge of biochemical principles with specific emphasis on different metabolic pathways and regulators
CO3: To gain knowledge on models of enzyme active site, formation of enzyme-substrate complex, enzyme mapping, factors influencing enzyme activity
CO4: To know about kinetics of enzymatic reactions and different types of enzyme inhibitions explain how enzymes work and behave in living organisms
CO5: To learn the general principles of mechanism of enzyme catalysis including the role of coenzymes
CO6: To study the enzyme regulation including allosteric enzymes – characteristics, models, examples and Multi - enzyme systems
CO7: To understand the molecular basis of various pathological conditions from the perspective of biochemical reactions

Course Specific Outcomes:

CSO1: To understand structure, and functions of enzymes. Learning kinetics of enzyme catalysed reactions and regulatory process, Enzyme activity, Enzyme Units, Specific activity
CSO2: Have a deeper insight in to the fundamentals of enzyme structure, function and kinetics of enzymes. Discussion on current applications and future potential of enzymes.
CSO3: Have a complete understanding of rate of reactions and order of reactions. To gain knowledge on enzyme catalysis and isoenzymes and on multienzyme complexes
CSO4: To learn the models of enzyme action and mapping of enzyme active site
CSO5: To acquire knowledge on latest concepts of evolution of catalysis
CSO6: To provide concept of importance of kinetics of enzyme inhibitions and how they influence drug action
CSO7: To learn the role of enzyme inhibitors in drug discovery and drug design
CSO8: To gain insight into catalytic mechanisms of enzymes and allosteric regulation of enzymes

Learning Outcomes:

LO1: The students will be able to assign systemic name to enzymes and from the E.C. number they can explain the reaction it catalyzes
LO2: They will acquire knowledge to analyze the kinetics of different

enzymatic reactions.

LO3: The students will be able to learn how to analyze mechanistic data and they will be able to design experiments to investigate the enzyme inhibition

LO4: They will be able to perform enzyme purification, handling and to characterize new enzymes

LO5: The students will be able to understand the regulation of enzyme activity is so important to coordinate the different metabolic processes and for homeostasis

Unit – 1

Introduction to Enzymes – Nomenclature and Classification of enzymes (IUB), Remarkable properties of enzymes – catalytic power, specificity. Enzyme localization and assay of enzymes, Units of enzyme activity. Active site – Fisher and Koshland models, formation of enzyme – substrate complex and experimental evidences. Nature of active site, mapping of enzyme active site through chemical procedures and site directed mutagenesis. Factors affecting enzyme activity. Modern concepts of evolution of catalysis, ribozymes, abzyme and synzymes

Unit – 2

Enzyme kinetics-Velocity of a reaction, order of a reaction, progress curve for enzyme catalyzed reactions.Kinetics of single substrate enzyme catalyzed reactions, Michaelis – Menten equation, Lineweaver - Burk, Eadie – Hofstee and Hanes plots. Significance of Vmax, Km, Kcat, specificity constant (Kcat/Km)
Kinetics of multisubstate reaction – Classification with examples. Rate expression for non-sequential (ping-pong) and sequential (ordered and random) mechanisms.Use of initial velocity, Inhibition and exchange studies to differentiate between multi substrate reaction mechanisms. Flexibility and conformational mobility of enzymes. Reversible inhibition – competitive, non-competitive, uncompetitive and mixedinhibition; Irreversible inhibition -suicide inhibition, Determination of Ki values

Unit – 3

Strategies of enzyme catalysis – General acid – base, electrostatic, covalent, intermolecular, metal – ion catalysis; Proximity and orientation.Mechanism of reaction catalyzed by serine proteases – trypsin and chymotrypsin; carboxypeptidase, Subtilisin, lysozyme, triose phosphate isomerise, ribonuclease. Rotational catalysis – ATPase

Unit – 4

Roleof coenzymes in enzyme catalyzed reactions– Coenzymes and Cofactors. Pyridoxal phosphate, Nicotinamide nucleotides, Flavin nucleotides, Thiamine pyrophosphate, Biotin, Tetrahydrofolate, Pantothenic acid, Cobalamine, Lipoic acid; Metalloenzymes,Isoenzymes-LDH, Creatine phosphokinase. Multifunctional enzymes, properties, Mechanism of action of Pyruvate dehydrogenase and Fatty acid synthase complex

Unit-5

Regulation of enzyme activity – covalent modification, zymogen activity and protein proteininteraction.Allosteric enzymes (ATCase).Cooperativity phenomenon. Hill and Scatchard plots. Sigmoidal kinetics and their physiological significance, Symmetric and sequential models of action of allosteric enzymes and their significance. Feedback inhibition and feed forward stimulation.Control of enzymatic activity by products and substrates.Reversible and irreversible activation. Regulation of Multi-enzyme systems, Pyruvate dehydrogenase and Fatty acid synthase complex

Reference books:

1. Biochemistry - Reginald H. Garret/Charles M.Grisham 6th ed
2. Principles of Biochemistry - Lehninger 7th ed
3. Understanding enzymes: Palmer T., Ellis Harwood ltd.,2nd ed
4. Enzyme structure and mechanism. Alan Fersht, Freeman & Co 2nd ed
5. Enzyme kinetics Siegel interscience – Wiley
6. LehningerPrinciples of Biochemistry - David L. Nelson, Michael M.CoxPublisher: W.H. Freeman 8th ed
7. Enzyme kinetics-Kent M. Plowman
8. Biological chemistry; H.R. Mehler& E.H Cordes Harper &Rev.
9. Lecture notes on Enzymology-L.G.Whitby, et al.,
10. The Enzyme Molecule-W.Ferdinand
11. Enzymes:Physical Principles-H.Gutfreund
12. Fundamentals of Enzymology, The cell and molecular basis of catalytic proteins - Nicholas C price , Lewis Stevens, 3rd ed
13. Enzyme Kinetics: A Modern Approach - Alejandro G. Marangoni, Wiley online library

M.Sc. BIOCHEMISTRY
I SEMESTER
PRACTICAL – I
BC 1.5: QUALITATIVE ANALYSIS AND BIOCHEMICAL TECHNIQUES

Course Outcomes:

CO1: To acquire hands on experience to perform general and confirmatory qualitative tests For identification of Carbohydrates (Monosaccharides, Disaccharides, Polysaccharides), Proteins and amino acids, Lipids, Nitrogen bases – Purines, Pyrimidines/Nucleic acids

CO2: To get hands on experience on various biochemical techniques such as Paper chromatography, Thin layer chromatography, Ion-exchange chromatography, Affinity chromatography, Gel filtration, Paper electrophoresis, SDS-PAGE, 2D Electrophoresis, Differential and Density gradient centrifugation, and handling Colorimeter, Spectrophotometer, and Polarimeter

Course Specific Outcomes:

CSO1: Students exposure to basic reactions of biomolecules

CSO2: To gain knowledge to determine presence of biomolecules like carbohydrates, proteins, lipids etc. in known and unknown samples

CSO3: The students should be able to determine the extent of adulteration in samples containing Biomolecules

CSO4: The students should obtain hands-on training in basic separation techniques in biochemistry like chromatography, electrophoresis, etc.

CSO5: They gain expertise in the isolation of various biomolecules and organelles

CSO6: To develop competence in applying various chromatographic techniques in isolating and characterizing different biological molecules

CSO7: Understanding the principles and applications of chromatography, centrifugation, electrophoresis, spectrophotometry and ELISA tools in biological investigations/experiments

Learning Outcomes:

LO1: The students will be able to learn to identify carbohydrates, proteins, amino acids, lipids, nitrogen bases - purines, pyrimidines/Nucleic acids from a given unknown sample

LO2: The students will get the expertise for analysis of any biological or non biological sample for identification of its chemical composition

LO3: The students will develop skills to perform various Biochemical Techniques such as Paper chromatography, Thin layer chromatography, Ion-exchange chromatography, Affinity chromatography, Gel filtration, Paper electrophoresis, SDS-PAGE, 2D Electrophoresis, Differential and Density gradient centrifugation, and their applications for separation of different biomolecules and isolation of cells and tissues for studying their functional abnormalities

LO4: The students will be able to learn techniques for isolation, purification and chemical characterization of compounds from plants and microbes which will have medical or commercial importance

LO5: The students will be able to measure and detect the biomolecules and molecules involved in a reaction using the colorimeter

LO6: The students will be able to learn application of UV-visible spectroscopy

LO7: The students will learn different methods of protein estimation

LO8: The students will be able to learn the principles of Peptide mapping and Isoelectric focusing

LO9: The expertise gained by the student from this practical experiments can be useful in Pharmaceutical and Biotech industries

QUALITATIVE ANALYSIS (A)

General reactions of Carbohydrates
Reactions of Polysacharides
General colour reactions of proteins
Identification of unknown sugars
Identification of unknown amino acids
General reactions of lipids
Reactions of cholesterol
Identification of unknown lipids
General reactions of nitrogen bases
Reactions of nucleic acids
Identification of unknown nitrogen bases/ nucleic acids

BIOCHEMICAL TECHNIQUES (B)

Separation of amino acids by ascending paper chromatography
Separation of amino acids by descending paper chromatography
Separation of sugars by ascending paper chromatography
Separation of nucleic acids by ascending paper chromatography
Separation of amino acids by thin layer chromatography
Separation of lipids by thin layer chromatography
Separation of plant pigments by column chromatography
Separation of amino acids by ion exchange chromatography
Affinity Chromatography
Separation of amino acids by paper electrophoresis
Separation of serum proteins by Polyacraylamide Gel Electrophoresis
Molecular weight of protein by SDS-PAGE
Absorption spectrum of chlorophyll extracted from green leaves
Absorption spectrum of aromatic amino acids, purines, pyramidines and heme
Estimation of proteins by Spectrophotometric method
Determination of Molar absorption coefficient of tyrosine
Sub – cellular fraction of organelles of liver cells and identification by the marker enzymes.
Optical rotation of glucose and fructose using polarimeter.

N and C terminal analysis of proteins. (End group analysis of proteins)
Peptide mapping
Density gradiant centrifugation – Isolation of rat liver mitochondria
2- Dimensional electrophoresis of proteins
Isoelectric focussing

Reference books:

1. Experimental Biochemistry-B.Sashidhar Rao, Vijay Deshpande
2. Principles and Techniques of Practical Biochemistry-Wilson and Walker
3. An introduction to Practical Biochemistry-David T.Plummer, 3rd ed
4. Laboratory Manual in Biochemistry-J.Jayaraman
5. Principles and Techniques of practical Biochemistry. Eds. Williams and Wilson.
6. A Biologists guide to Principles and Techniques of practical Biochemistry
   – Ed.Bryan, L.Willians& Keith Wilson (Edward Arnold).

M.Sc. BIOCHEMISTRY
I SEMESTER
PRACTICAL – II
BC 1.6: ENZYMOLOGY I AND ENZYMOLOGY - II

Course Outcomes:

CO1: To become familiar with the basic methods of studying enzymes
CO2: To understand the mechanism of action of enzymes
CO3: To get familiar with the kinetics of enzyme reactions
CO4: To apply appropriate methods for determination of catalytic parameters
CO5: To adopt the systematic procedure to purify enzymes

Course Specific Outcomes:

CSO1: The course gives in depth knowledge in understanding the mechanism of enzyme action
CSO2: The effect of parameters like P^H, temperature on enzyme activity were thoroughly understand by students
CSO3: To understand the effect of inhibitors on the mechanism of enzyme action

Learning Outcomes:

LO1: Students will acquire practical knowledge on isolation of enzymes from different sources, handling and preservation of enzymes without losing their activity
LO2: Students will learn how to calculate enzyme activity and how the velocity of the reaction changes in presence of inhibitors
LO3: Students will learn different techniques for purification of enzymes which enable them to use these techniques in future research and also to find appropriate jobs in scientific-research laboratories
LO4: Students will gain knowledge about applying enzymes and their inhibitors in medicine and various industries

ENZYMOLOGY - I (A)

Assay of Amylase from saliva
Assay of Acid phosphatase from potato
Assay of Trypsin
Assay of urease from Horse – gram
Assay of Succinate dehydrogenase from the liver
Enzyme purification by 3 or 4 steps

a) Acetone precipitation
b) Ammonium sulphate fractionation
c) Ion – exchange chromatography
d) Gel filtration
e) Electrophoresis

Isoenzymes of LDH – electrophoretic separation and specific staining technique

ENZYMOLOGY - II (B)

Time course of enzyme activity
Effect of pH on enzyme activity and determination of optimum pH
Effect of temperature on enzyme activity and calculation of energy of activation Effect of substrate concentration on enzyme activity and determination of Michealis constant
Effect of metal ions on enzyme – Alcohol dehydrogenase
Effect of substrate and regulators on allosteric enzyme – Phosphorylase or ATCase
Enzyme inhibition – irreversible inhibition of Papain or Serine proteases by appropriate inhibitors

Reference books:

1. An introduction to Practical Biochemistry-David T.Plummer, 3rd ed
2. Hans Bisswanger, Practical Enzymology, 2nd Edition, Wiley Online Library
3. Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis- - Robert A. Copeland, 2nd ed