

JIWAJI UNIVERSITY, GWALIOR-474011
M.SC. BIOCHEMISTRY

CURRICULUM - 2015-2017

Semester	Course Code	Title of the Paper	Type	Credits			
				L	T	P	Total
First	BCH-101	Fundamentals of Cell Biology	Core	03	-	-	03
	BCH-102	Biomolecules	Core	03	-	-	03
	BCH-103	Microbial Biochemistry	Core	03	-	-	03
	BCH-104	Bioinstrumentation	Core	03	-	-	03
	BCH-105	Lab Course I	Core	-	-	03	03
	BCH-106	Lab Course II	Core	-	-	03	03
	BCH-107	Seminar	Core	-	-	01	01
	BCH-108	Assignment	Core	-	-	01	01
	BCH-109	Comprehensive Viva Voce	Virtual	-	-	-	04
			Total Credits				24
Second	BCH-201	Fundamentals of Molecular Biology	Core	03	-	-	03
	BCH-202	Bioenergetics and Metabolism	Core	03	-	-	03
	BCH-203	Immunochemistry	Core	03	-	-	03
	BCH-204	Enzymology	Core	03	-	-	03
	BCH-205	Lab Course III	Core	-	-	03	03
	BCH-206	Lab Course IV	Core	-	-	03	03
	BCH-207	Seminar	Core	-	-	01	01
	BCH-208	Assignment	Core	-	-	01	01
	BCH-209	Comprehensive Viva Voce	Virtual	-	-	-	04
			Total Credits				24
Third	BCH-301	Genetic Engineering	Core	03	-	-	03
	BCH-302A	Plant Biotechnology	Generic	03	-	-	03
	BCH-302B	Biochemical Toxicology	Elective				
	BCH-303A	Diagnostic Technology	Centric	03	-	-	03
	BCH-303B	Genomics and Proteomics	Elective				
	BCH-304	Physiology & Endocrinology	Core	03	-	-	03
	BCH-305	Lab Course V	Core	-	-	03	03
	BCH-306	Lab Course VI	Generic	-	-	03	03
	BCH-307	Seminar	Core	-	-	01	01
	BCH-308	Assignment	Core	-	-	01	01
BCH-309	Comprehensive Viva Voce	Virtual	-	-	-	04	
		Total Credits				24	
Fourth	BCH-401A	Cellular and Molecular Processes	Generic/	03	-	-	03
	BCH-401B	Frontiers in Biochemistry	Centric				
	BCH-402	Practical	Generic/	-	-	03	03
	BCH-403	Seminar	Core	-	-	01	01
	BCH-404	Assignment	Core	-	-	01	01
	BCH-405	Project Work	Core	-	-	12	12
	BCH-406	Comprehensive Viva Voce	Virtual	-	-	-	04
		Total Credits				24	
Total Credits for the Course							96

-Minimum Number of credits be earned for award of degree-

96 credits

[Valid credits 80 + Virtual credits 16]

101: Fundamentals of Cell Biology

UNIT I

1. Cellular and Chemical Foundations of Life
2. Prokaryotic and Eukaryotic Cells: Comparative Study; Cells as Experimental Models
3. Cell Membrane: Physicochemical Properties; Molecular Organization – asymmetrical organization of lipids, proteins and carbohydrates; and Functions
4. Molecular Models and Biogenesis of Cell Membrane

UNIT II

1. Transport of Small Molecules Across Cell Membranes: Types and Mechanism
2. Active Transport by ATP-Powered Pumps: Types, properties and mechanisms
3. Transport of proteins into mitochondria and chloroplast
4. Transport of proteins into and out of nucleus

UNIT III

1. Transport of proteins into endoplasmic reticulum
2. Processing of Proteins in Endoplasmic Reticulum and Golgi Apparatus
3. Transport by vesicle formation: Endocytosis and Exocytosis
4. Molecular Mechanism of vesicular transport

UNIT IV

1. Intracellular Digestion: Ultra structure and Functions of Lysosomes
2. Peroxisomes: Ultra structure, Functions and Biogenesis
3. Cell Motility and Shape I: Structure and Functions of Microfilaments
4. Cell Motility and Shape II: Structure and Functions of Microtubules and Intermediate Filaments

UNIT V

1. Intracellular communication through cell junctions: Molecular structure, organization and functions of Occluding Junctions, Anchoring Junctions and Communicating Junctions
2. Molecular Mechanism of Cell-Cell Adhesion: Ca^{++} dependent and Ca^{++} independent cell-cell adhesion
3. Extra-cellular Matrix of Animals: Molecular Composition, Organization and Functions
4. Extra-cellular Matrix Receptors on Animal Cells: Molecular Structure, Types and Distribution of Integrins

Practical Exercises

1. Sub cellular fractionation
2. Chromosome Preparation: Mitosis – Onion root tip, rat/mouse cornea, rat/mouse bone marrow, human lymphocytes
3. Chromosome Preparation: Meiosis – Rat/mouse testis, Grasshopper testis
4. Polytene chromosome preparation from *Drosophila* salivary gland
5. Identification of tissue typing: Histological preparation of tissue
6. Identification of different biomolecules in different tissues by histochemical

techniques

7. Electron microscopy: Demonstration and good photographs for interpretation.

Reference Books

1. Molecular Biology of the Cell, Alberts, *et al*
2. Molecular Cell Biology, Lodish, *et al*
3. Working with Molecular Cell Biology: A study Companion, Storrie *et al*
4. Cell and Molecular Biology: Concepts and Experiments, Gerald Karp
5. The Cell: A Molecular Approach, G.M. Cooper
6. The Word of the Cell, Becker *et al*
7. Cell Proliferation and Apoptosis, Hughes and Mehnet
8. Essential Cell Biology, Alberts *et al*
9. Biochemistry and Molecular Biology of Plants, Buchanan *et al*
10. Harpers Biochemistry Murray *et al*

Note: All text books are of latest editions

102: BIOMOLECULES

UNIT I

- 1 Carbohydrates : Structure, classification, properties and functions
- 2 Home and heteropolysaccharides : carbohydrate derivatives
- 3 Lipids : Classification, structure, properties and functions
- 4 Lipids with special biological functions

UNIT II

- 1 Amino acids : Structure, classification, abbreviations, properties and functions
- 2 Peptides and polypeptides
- 3 Synthesis of peptides and protein sequencing
- 4 Proteins : Properties, covalent structure, secondary, tertiary and quaternary structure

UNIT III

- 1 Enzymes : Classification, mechanism of action, allosteric enzymes, multienzyme complex
- 2 Enzyme kinetics : Basic concepts
3. Water soluble vitamins : Structure, distribution, interaction and biological functions (mechanism of action not included)
4. Fat soluble vitamins : Structure, distribution and functions

UNIT III

- 1 Nucleotides : Structure of purine and pyrimidine bases, nucleosides, nucleotides
- 2 DNA : Structure and Conformation
- 3 DNA : denaturation, degradation, modification, repair, recombination and rearrangement
- 4 RNA : Structure, types and functions

UNIT V

- 1 Animal hormones : Structure and biological roles
- 2 Plant hormones : Structure and biological functions
- 3 Plant phenolics: Classification and functions
- 4 Alkaloids : Classification and functions

Practical Exercises

- 1 Titration of amino acids
- 2 Colorimetric determination of pKa
- 3 Model building using space filling/ ball and stick models
- 4 Reaction of amino acids, sugars and lipids
- 5 Quantitation of proteins and sugars
- 6 Analysis of oils : iodine number, saponification value, acid number

Reference Books

- 1 Principles of Biochemistry by Nelson, Cox and Lehninger
- 2 Biochemistry by G.Zubay
- 3 Biochemistry by Stryer
- 4 Biochemistry by Garrett and Grisham
- 5 Biochemical Calculations, Irwin H. Seigel, John Wiley and Sons Inc.
- 6 Biochemistry, DVoet and JG. Voet , J Wiley and Sons.
- 7 Biochemistry, D Freifilder, W.H. Freeman & Company.

- 8 Laboratory Techniques in Biochemistry and molecular Biology, Work and Work
9 A Biologist's guide to Principles and Techniques of Practical Biochemistry, Wilson & Goulding, ELBS Edition.

Note: All texts are of latest editions.

103: MICROBIAL BIOCHEMISTRY

UNIT I

- 1 Classification of Microorganisms: Basis of microbial classification, Haeckel three kingdom, Whittaker's five kingdom concept.
- 2 Morphology and fine structure of eubacteria and archeobacteria cell wall, cytoplasmic membrane and other organelles.
- 3 Pure culture techniques and preservation methods.
- 4 Preparation of Culture media, microbial staining.

UNIT II

- 1 Sterilization: Physical and chemical methods
- 2 Microbial Growth: Bacterial growth curve, Mathematical expression, measurement of Growth and factors affecting growth
3. Microbial Nutrition: Nutritional classification of Microorganisms, common nutritional requirements, mode of nutrition, transport of nutrients across the bacterial membrane
4. Oxygen toxicity: Study of catalase, peroxidase, superoxide dismutase, mechanism of oxygen toxicity.

UNIT III

- 1 Virus: Types, Isolation, cultivation, identification and viral replication.
- 2 Structure and morphology of Bacteriophage, Lytic and lysogenic cycle.
- 3 Life cycle of DNA Viruses: SV 40, RNA Viruses: Retroviruses
- 4 Cynobacteria : General account and their importance

UNIT IV

- 1 Infection and disease, types of Infection, Mechanism of pathogenicity
- 2 Bacterial Diseases: Staphylococcal and Clostridial food poisoning, Salmonellosis Shigellosis
- 3 Fungal diseases: Histoplasmosis , Aspergillosis
- 4 Viral diseases: Chicken pox, Hepatitis B, and Poliomyelitis

UNIT V

- 1 Mycoplasmas and diseases caused by them
2. Bacterial Recombination: Transformation, Conjugation, Transduction, Plasmids and transposons
3. Chemotherapeutic agents: Classification of antibiotics, Broad spectrum antibiotics, Antibiotics from prokaryotes
4. Anti-fungal and antiviral antibiotics, mode of action of antibiotics and resistance to antibiotics

Practical Exercises

- 1 Preparation of liquid and solid media for growth of microorganisms.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution methods. Slants and stab cultures. Storage of microorganisms
3. Isolation of pure cultures from soil and water.
4. Growth; Growth curve; Measurement of bacteria population by turbidometry and serial dilution methods. Effect of temperature, pH and carbon and nitrogen sources on growth.
5. Microscopic examination of bacteria, Yeast and molds and study of organisms by Gram stain, Acid fast stain and staining for spores.

6. Study of mutations by Ames test.
7. Assay of antibiotics and demonstration of antibiotic resistance.
8. Analysis of water for portability and determination of MPN.
9. Bacterial transformation.
10. Biochemical characterization of selected microbes.
11. One step growth curve of coliphage.

Reference Books

1. General Microbiology, R.Y. Ingraham, J.L. Wheelis, M.L. and Painter, P.R. The MacMillan Press Ltd.
2. Brock Biology of Microorganism, M.T. Martinko, J.M. and Parker, J. Prentice-Hall.
3. Microbiology, Pelzar, M.J., Chan , E.C.S. and Kreig, N.R., Tata McGraw Hill.
4. Microbial Genetics, Maloy , S.R., Cronan, J.E.Jr and Freifelder, D. Jones, Bartlett Publishers.
5. Microbiology-a Laboratory Manual,cappuccino, J.G. and Sherman, N. Addison Weseley.
6. Microbiological Applications, (A Laboratory Manual in General Microbiology) Benson, H.J. WCB: Wm C. Brown Publishers

Note: All text books are of latest editions

104 : BIOINSTRUMENTATION

UNIT I

- 1 Centrifugation: Basic principle, type, instrumentation and applications
- 2 Photometry: Basic principles of colorimetry, and UV visible spectrophotometry, instrumentation and applications
- 3 Infra red spectroscopy
- 4 Fluorimetry: Principle, instrumentation and applications

UNIT II

- 1 Chromatography: Principle, types, instrumentation and applications
- 2 Affinity chromatography, HPLC and FPLC
- 3 Electrophoresis: Principle, types and applications
- 4 Isoelectric focussing and isotachopheresis

UNIT III

- 1 Atomic absorption spectroscopy: Principle, instrumentation and applications
- 2 Flame emission spectroscopy: Principle, instrumentation and applications
- 3 Polarimetry: Principle, instrumentation and applications
- 4 ORD and CD

UNIT IV

- 1 ESR: Principle, instrumentation and applications
- 2 NMR: Basic principle, instrumentation and applications
- 3 X ray crystallography: Principle, instrumentation and applications
- 4 Mass Spectrometry: Principal, Mass Analyzers and Applications

UNIT V

- 1 Microscopy: Light, phase contrast, interference, fluorescence and polarization microscopy
- 2 Electron microscopy: Principle and Applications Princ
- Radioactivity: Principle, Geiger Muller Counter, liquid scintillation counter, solid scintillation counter, gamma counter
- 5 Autoradiography & Radio immunoassay: Basic principle and applications

Practical Exercises

- 1 Verification of Beer's law
- 2 Determination of absorption maxima
- 3 Electrophoresis of Proteins-native and under denaturing conditions.
- 4 Amino acid and carbohydrate separations by paper & thin layer chromatography
- 5 Gas chromatography
- 6 Ion exchange and gel filtration chromatography
- 7 Separation of blood cells by density gradient centrifugation

Reference Books

1. Physical Biochemistry: Applications to Biochemistry and Molecular Biology by Freifelder
- 1 Biochemical Techniques: Theory and Practice by Robyt and White
- 2 Principles of Instrumental Analysis by Skoog and West

- 3 Analytical Biochemistry by Holme and Peck
- 4 Biological Spectroscopy by Campbell and Dwek
- 5 Organic Spectroscopy by Kemp
- 6 A Biologist's Guide to Principles and Techniques of Practical Biochemistry by Wilson and Goulding
- 7 Principles of Instrumental Analysis by Skoog, Hollar and Nicman

*Note:*All text books are of latest editions.

201: FUNDAMENTALS OF MOLECULAR BIOLOGY

UNIT I

1. DNA Replication : General features of Chromosomal Replication; DNA Replication Machinery in Prokaryotes
2. DNA Replication Machinery in Eukaryotes
3. Enzymology of DNA Replication : DNA Polymerases; Primases; Ligases; Helicases; Topoisomerases; Gyrases and Single Stranded Binding Proteins
4. Regulation of DNA Replication

UNIT II

1. Transcription in Prokaryotes : Initiation, elongation and termination
2. Structure and functions of prokaryotic promoter
3. Control of transcriptional initiation in prokaryotes : Structure and functions of RNA Polymerase; Sigma factors – Types and functions
4. Control of transcriptional termination in prokaryotes : Intrinsic termination and Rho factor dependent termination; attenuation and antitermination

UNIT III

1. Regulation of Gene Expression in Prokaryotes : Operon concept, induction and repression, Structure and regulation of lactose, arabinose and tryptophan operons
2. Initiation of Transcription in Eukaryotes : RNA Polymerases – Types and properties; Promoter – Types, structure and properties
3. Transcription factors – Types and properties; Enhancers – Structure and properties; Response Elements
4. Post-transcriptional Modification Eukaryotes – 5' and 3' modification of mRNA

UNIT IV

1. Post-transcriptional Processing of pre tRNA and pre tRNA transcripts
2. Post transcriptional Processing of pre rRNA and Catalytic RNA
3. Genetic Code : Evidence and properties; Wobble hypothesis
4. Translational adaptors and amino acyl tRNA synthetases

UNIT V

1. Translation: Successive stages of protein synthesis in prokaryotes and its comparison with eukaryotes
2. Post-translational Modification: Types and Significance
3. Regulation of Gene Expression in Eukaryotes: *cis*-acting DNA Elements; Chromatin organization and regulation of gene expression; Regulation at the level of processing of transcripts
4. Regulation of Gene Expression in Eukaryotes: RNA Editing; Gene Alteration; DNA methylation and gene regulation; Regulation of gene expression by hormones; Regulation of gene expression at translational level

Practical Exercises

1. Isolation of genomic DNA and restriction digestion
2. Size fractionation of restricted DNA fragments by Agarose Gel Electrophoresis
3. Quantitation of DNA
4. Determination of Amax of purified DNA fragments
5. Determination of Tm of nucleic acid

6. Isolation of RNA
7. Fractionation of poly (A)⁺ RNA
8. *In vitro* transcription
9. *In vitro* translation
10. Metabolic labeling of proteins and immunoprecipitation
11. Protein- DNA interaction

Reference Books

1. Genes VIII , by Benjamin Lewin
2. Molecular Biology, by Turner *et al*
3. Cell and Molecular Biology: Concepts and Experiments, by Gerald Karp
4. Transcriptional Regulation in Eukaryotes, by Carey and Smale
5. Translational control of gene Expression, by Sonenberg *et al*
6. Chromatin and Gene Regulation, by Turner
7. An Introduction to Genetic Analysis, by Griffiths *et al*
8. Genome, by Brown
9. Concepts of Genetics, by Klug and Cummings
10. Proteins, by Creighton
11. Molecular Cell Biology, by Lodhish *et al*
12. Biochemistry and Molecular Biology of Plants, by Buchanan
13. Plant Biochemistry and Molecular Biology, by Lea and Leegood
14. Plant Biochemistry, by Dey and Harborne

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202 : BIOENERGETICS AND METABOLISM

UNIT I

- 1 First and second laws of thermodynamics
- 2 Concept of free energy
- 3 ATP Cycle, ATP as high energy compound, functions of ATP
- 4 Other high energy biological compounds

UNIT II

- 1 Basic Concepts of intermediary metabolism
- 2 Carbohydrate metabolism: Glycolysis, Krebs' cycle, glycogenolysis, glycogenesis, pentose phosphate pathway, gluconeogenesis, glyoxalate pathway
- 3 Regulation of carbohydrate metabolism
- 4 Inborn errors of carbohydrate metabolism

UNIT III

- 1 Electron transport and oxidative phosphorylation
- 2 Biosynthesis and degradation of lipids
- 3 Regulation of lipid metabolism
- 4 Inborn errors of lipid metabolism

UNIT IV

- 1 Nitrogen assimilation
- 2 Biosynthesis of amino acids
- 3 Degradation of amino acids
- 4 Regulation of amino acid metabolism

UNIT V

- 1 Inborn errors of amino acid metabolism
- 2 Nucleic acid metabolism
- 3 Inborn errors of nucleic acid metabolism
- 4 Integration of metabolism and metabolomics

Practical Exercises

- 1 To observe the catabolism of carbohydrates by micro-organisms
- 2 To observe the production of gas by micro-organisms during fermentation
- 3 To demonstrate the production of pyruvate and acetaldehyde during fermentation of glucose by yeast
- 4 To demonstrate biological oxidation and electron transport in heart muscle tissue
- 5 To observe the effect of fasting on the metabolism of rats

203 : IMMUNOCHEMISTRY

UNIT I

- 1 Immune response: Innate immune mechanisms and characteristics of adaptive immune response, Hematopoiesis
- 2 Anatomical organization of immune system: Primary lymphoid organs, Secondary lymphoid organs. Ontogeny and Phylogeny of lymphocytes, Lymphocyte traffic
- 3 Cell of the immune system: Mononuclear cells and granulocytes, Antigen presenting cells, Lymphocytes and their subsets. Antigens, Heptanes: Factors affecting immunogenicity, properties of T and B Cell epitopes, Super antigens
4. Inflammation; its mediators and the process, Cell adhesion molecules and their role in inflammation, lymphocyte homing, tissue injury and immune response leading to an inflammatory reaction, role of anaphylatoxins, granulocytes in inflammatory process

UNIT II

- 1 Major histocompatibility systems: Structure of MHC I and II molecules, polymorphism, distribution variation and function. Organization of MHC complex in Mouse and Humans. Association of MHC with disease
- 2 Recognition of antigens by T and B Cells: Antigen processing, Role of MHC molecules in antigen presentation and Costimulatory signals
- 3 T – cell receptor complex, T-cell accessory membrane molecules, activation of T cells, Organization and arrangement of T-receptor genes
- 4 B-cell receptor complex, Activation of B-cells, Immunoglobulins: Molecular structure, types and functions. Antigenic determinants on immunoglobulins

UNIT III

- 1 Molecular mechanism of antibody diversity: Organization of genes coding for constant and variable regions of heavy chains and light chains. Mechanisms of antibody diversity, Class switching
- 2 Antibody engineering, Antigen-Antibody interaction, avidity & affinity measurement
- 3 Monoclonal antibodies: Production, characterization and applications in diagnosis, therapy and basic research
- 4 Complement system, components, activation pathways, and regulation of activation pathways, Complement deficiencies, Role of complement system in immune responses

UNIT IV

- 1 Cytokines: Structure and functions, cytokine receptors, signal transduction mediated by cytokine receptors, cytokine regulation of immune responses, cytokine related diseases and therapeutic applications of cytokines
- 2 Cytotoxic T cells and their mechanism of action, NK cells and mechanism of target cell destruction. Antibody dependent cell mediated cytotoxicity, Delayed type hypersensitivity. Techniques of Cell mediated immunity
- 3 Immunoregulation mediated by antigens, antibodies, immune complexes, MHC and cytokines
- 4 Hypersensitivity: Definition, IgE mediated hypersensitivity, mechanism of mast cell degranulation, mediators of type-I reactions and consequences. Type II reactions, Immune complex mediated hypersensitivity and Delayed type hypersensitivity

UNIT V

- 1 Autoimmunity: Organ specific diseases, Systemic diseases, Mechanisms of autoimmunity and therapeutic approaches
- 2 Immunodeficiency syndromes: Primary immunodeficiencies and Secondary

- immunodeficiencies and their diagnosis and therapeutic approaches
- 3 Vaccines: Active and passive immunization, Whole organism vaccines, Macromolecules as vaccines, Recombinant-vector vaccines, DNA Vaccines, Synthetic peptide vaccines and sub-unit vaccines
 - 4 Immunodiagnostics : Precipitation techniques, Agglutination, Fluorescence techniques, ELISA, RIA, Western blotting and Immuno-histochemical techniques

Practical Exercises

- 1 Blood Film preparation and identification of cells.
- 2 Lymphoid organs and their microscopic organization.
- 3 Immunization and production of polyclonal antibodies
- 4 Double diffusion and Immuno-electrophoresis.
- 5 Radial Immunodiffusion.
- 6 Purification of IgG from serum.
- 7 Separation of mononuclear cells by Ficoll-Hypaque.
- 8 Con-A induced proliferation of thymocytes (by MTT method).
- 9 Western -blotting.
- 10 ELISA
- 11 Preparation of antibody-enzyme conjugates

Reference Books

- 1 Kubey, Immunology, R.A. Goldsby, Thomas J. Kindt, Barbara, A. Osbarne. (Freeman).
- 2 Immunology-Ashort Course, -Eli Benjamini, Richard Coico, Geoffrey Sunshine.
- 3 Immunology by Tizzard
- 4 Fundamentals of immunology by William Paul.
- 5 Immunology by Roitt *et al*
- 6 Immunology by Abbas

Note: All text books are of latest editions.

304: ENZYMOLOGY

UNIT I

- 1 Enzyme: Historical aspects, classification and nomenclature, EC number.
- 2 Mechanism of enzyme catalysis and action
- 3 Sub cellular localization and organization of enzymes
Methods of enzyme assay: continuous and sampling techniques, coupled enzyme assay and methods and significance of enzyme turnover number; specific activity

UNIT II

- 1 Enzyme purification techniques: objectives and strategy; methods of homogenization; method of isolation; purification and crystallization
- 2 Criteria of purity and tabulation of purification data; stable storage of enzymes
- 3 Characterization of purified enzyme
- 4 Coenzymes, Cofactors and Isoenzymes

UNIT III

- 1 Enzyme Kinetics: Equilibrium and steady state theory, rate equation and determination of K_m and V_{max}
- 2 Factors affecting rate of enzyme reaction: pH, temperature and pressure
- 3 Enzyme inhibition: reversible and irreversible inhibition, their type, inhibitor constant and its significance
- 4 Rapid reaction techniques

UNIT IV

- 1 Protein-ligand binding: types, cooperativity, Hill and Scatchard plot, Allosteric enzymes : Models of allostery, types and kinetics
- 2 Regulation of enzymes
- 3 Mechanism of action of Chymotrypsin; Ribonuclease; Lysozyme; Metallo-enzymes
- 4 Degradation of enzymes

UNIT V

- 1 Enzyme immobilization; techniques; experimental procedures and effect of immobilization on kinetic parameters
- 2 Principle and Industrial application of immobilized systems
- 3 Enzymes in Medical diagnosis and enzyme therapy
- 4 Enzymes during aging

Practical Exercises:

- 1 Protein estimation methods: Lowry, Bradford and Spectrophotometric.
- 2 Urease estimation in plant tissues
- 3 Assay of Acid phosphatase in plant seeds
- 4 Assay of Alkaline phosphatase in Kidney and Liver
- 5 Determination of optimum pH, temperature & time
- 6 Determination of K_m value of alkaline phosphatase
- 7 Acetylcholinesterase estimation in Rat /Goat Brain
- 8 Enzyme purification: Ammonium sulphate precipitation, Ion exchange chromatography, molecular sieve chromatography.
- 9 Checking of purity of enzyme by PAGE

- 10 Molecular weight determination of enzyme by Gel Filtration
- 11 Immobilization of HRP (Horse reddish peroxidase).
- 12 Kinetic properties of Immobilised HRP
- 13 Sub-cellular fractionation of rat liver and marker enzyme assays.

Reference Books

- 1 The Nature of Enzymology by R.L. Foster
- 2 Enzymes by Dixon and Webb
- 3 Fundamentals of Enzymology by Price and Stevens
- 4 Enzyme Catalysis and Regulation by Hammes
- 5 Enzyme Reaction Mechanisms by Walsch
- 6 The Enzymes vol I and II by Boyer
- 7 Enzyme Structure and Mechanism by Alan Fersht
- 8 Enzyme Assays: A Practical Approach by Eisenthal and Danson
- 9 Enzyme Biotechnology by G. Tripathi
- 10 Practical Biochemistry by Plummer.
- 11 Practical Biochemistry by Sawhney and R. Singh

Note: All text books are of latest editions.