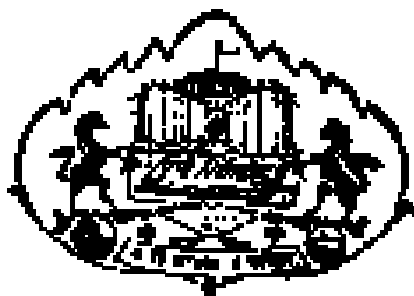


UNIVERSITY OF PUNE, PUNE



SYLLABUS FOR

**University Department &
PG Centers at Affiliated Colleges**

**Master of Science
In
Biochemistry**

PART- II
(Semester III and IV-Credit system)
w.e.f. July 2014 (for Part- II)

Course	Name of the Course	Credits
Semester III Theory Courses:		
BCH-370	Molecular Biology	5
BCH-371	Medical Biochemistry and Immunology	5
BCH-372	Neurochemistry and Biochemistry of Specialized Tissues	4
BCH-373	Toxicology and Plant Biochemistry	5
Semester IV Theory Courses:		
BCH-470	Physiological Biochemistry and Endocrinology	4
BCH-471	Fermentation Technology and Tissue culture	4
BCH-472	Genetic Engineering	4
BCH-473	Optional Course (any 2 of the following) 1. Evolution and Developmental Biology 2. Clinical Nutrition 3. Food technology 4. Recent Advances in Biochemistry	4
Practical Courses for Part II:		
BCH-367	Molecular Biology	3
	Special experiments	2
BCH-368	Clinical Biochemistry	3
BCH-467	Project	7

**M. Sc. Biochemistry Part II Syllabus
SEMESTER – III**

BCH: 370 Molecular Biology

1. DNA Replication: Enzymes involved in DNA synthesis e.g. topoisomerase, helicase, ligase and others. DNA polymerase I, II, III, origin of locus, Okazaki fragments, replication fork. Mechanism in Prokaryotes and Eukaryotes.
2. DNA Repair: DNA damages, detection and repair systems. Pyrimidine dimer formation and its repair. Defective repair system and diseases, Ames test.
3. Gene rearrangements: Recombination pathways, Holliday structures, rec A,B,C,D. SOS response, mobile genetic elements.
4. Transcription and splicing: RNA polymerases, promoters, sigma and Rho factors, initiation, elongation and termination of transcription (Prokaryotes), Inhibitors of transcription. Transcription in Eukaryotes, RNA pol I,II,III, enhancers. Post transcriptional modifications of t,r and m-RNA, 5' capping, 3' poly A tailing, RNA editing.
5. Splicing: Splicing phenomenon. Mechanism, spliceosomes, alternative splicing, self splicing, ribozyme (catalytic RNA).
6. Translation: Role of t-RNA and Ribosome in protein synthesis. Mechanism in Prokaryotes and Eukaryotes. Inhibitors of protein synthesis.
7. Protein targeting: Intracellular protein targeting. Signal hypothesis, signal sequences, glycosylation, Targeting of protein to mitochondria, lysosomes, ER, plasma membrane, Peroxisomes, chloroplast, protein degradation.
8. Eukaryotic chromosome and gene expression: Chromatin structure, transcription factors, chromatin remodeling, control of gene expression at post transcription level.
9. Molecular virology: Information of adenoviruses, retroviruses (HIV and H1N1).

Reference Books

1. Biochemistry (III/IV/V/VI edition, 2008) L. Stryer, WH Freeman and Co.
2. Molecular biology of the gene (V edition, 2004) J D Watson, Person education Inc.
3. Molecular Cell Biology (7th edition.2013) by Harvey Lodish et al.
4. Molecular biology of the cell (2008) B. Alberts, Garland Pub. In., NY
5. Genes X (2010), B. Lewin, John Wiley and sons, NY.

BCH: 371 Medical Biochemistry and Immunology

Medical Biochemistry:

1. Mechanism of action at molecular level of selected antibiotics: inhibitors of cell wall, plasma membrane, nucleic acids and protein synthesis. Mechanism of action of anti metabolites, analgesics, hallucinogens, antiviral, antifungal, antiprotozoal and mechanism of resistance to antibiotics and other drugs.
2. Lysosomes and their physiological role: Structure and function of lysosomes, role in animal and plant cells. Physiological role in various types of digestive phenomenon disturbances to lysosomes, (lysosomal pathology); lysosomal storage disease.
3. Molecular basis of hemoglobinopathies: concept of hemoglobinopathies, β and α thalassemias, sickle cell anemia, pathophysiology, biochemistry, types of mutations.
4. Ischemic heart disease/CHD: myocardial infarction and coronary heart diseases (pathophysiology); laboratory findings, enzymes involved.
5. Cancer: carcinogenesis, microevolution process, molecular genetics of cancer, causative agents, role of viruses, control of cancer –basic approaches by WHO.

6. Biochemistry of diseases: Influenza: life cycle, transmission, biochemical mechanism, Malaria: epidemiology, life cycle, biochemical mechanism; Alzheimer: dementia, biochemical mechanism, formation and tangles and plaques.
7. Apoptosis: extrinsic and intrinsic mechanism, role in diseases and physiology.

Reference Books

1. Biochemistry of antimicrobial action (4th ed) TJ Franklin, Chapman hall (1989)
2. Mechanism of microbial diseases, M Schaechter et al, Williams and Wilkins Int. Ed.(1989)
3. Microbiology an application based approach, M.J Pelczar, ECS Chan, N.R.Krieg
4. Biochemistry, L Stryer (3rd ed), Freeman and Co.
5. Biochemical aspects of human diseases (1983), RL Elkeles, Slackwell scientific publishers, Oxford
6. Biochemistry and diseases, Robert Cohn Carl S Roth.
7. Hereditary, Genetics and Genetic diseases, RN roy, 2011
8. Text book of Medical Physiology- Guyton (2010)
9. Molecular biology of the cell, third edition, Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, JD Watson
10. General Microbiology, Pelczar, Rard and Chan (1987)
11. Mechanism of microbial diseases, M Schaechter et al, Williams and Wilkins Int. Ed.(1989)

Immunology:

1. Cellular basis of immunity: immunological memory, specificity, diversity, discrimination between self and non self, primary and secondary lymphoid organs, cell mediated and humoral immuneresponses, T and B lymphocytes, autoimmunereactions.
2. Clonal selection theory of antibody production, monoclonal and polyclonal antibodies, catalytic antibodies (abzymes).
3. Antigen and antibody: antigen, antigenic determinant, immunopotency, structure of antibody, constant and variable regions, Fab, F(ab₂) and Fc fragments, different classes of antibodies and their functions, fine structures of antibodies, X ray diffraction studies, isotypes, allotypes and idiotypes.
4. Multigene Organization of Ig Genes: variable gene rearrangement, generation of antibody diversity and class switching among constant region genes.
5. Measurement of antigen- antibody interaction: immunodiffusion, immunoelectrophoresis, radioimmunoassay, immunoflorescence, ELISA, Western blotting
6. Complement system: classical, alternate and lectin pathway pathway
7. T lymphocytes and cell mediated immunity, T cell sub populations, immune response genes, MHC gene complex, polymorphism, graft rejection, graft versus host response
8. Hypersensitivity and allergy, immunodeficiency diseases (AIDS)
9. Vaccines
10. Blood antigens: blood group substances and Rh factor

Reference books

1. Immunology 5th ed Janis Kuby
2. Fundamental Immunology 5th edition (August 2003): by William E., Md. Paul
3. (Editor) By Lippincott Williams & Wilkins Publishers
4. Essential Immunology, Ivan M. Roit (1994)– Blackwell Scientific Pub, Oxford.
5. Cellular and Molecular Immunology, 3rd ed, Abbas

BCH: 372 Neurochemistry and biochemistry of specialized tissues

Neurochemistry:

1. Brain and behavior, Nerve cells and behavior
2. Anatomical organization: Central nervous system, spinal cord, different regions of the brain, peripheral and autonomic nervous system afferent and efferent pathways.
3. Neurotransmitters: Synthesis, storage, uptake degradation and action of neurotransmitters. Acetyl choline, GABA, Serotonin, Dopamine, Glutamate Aspartate, Nitrous Oxide etc., Neuropeptides.
4. Receptors: Types of receptors, properties of receptors, sensory modalities and sensory circuits. Sensory perception, Cerebrospinal fluid, blood- brain barrier
5. Learning and memory : Mechanism of short term memory and long term potentiation. NMDA and AMPA glutamate receptors. Retrograde messengers in synaptic transmission. Role of CAM kinase II, Calcium, Protein kinase, CAMP, No, Calpain and other proteins in memory and learning process.
6. Circadian rhythms

Biochemistry of specialized tissues:

1. Muscle contraction and cell motility: skeletal muscle structure of muscle cell, ultra structural organization, protein components of myofibrils, molecular organization of thick and thin filaments, mechanism of muscle contraction, metabolism of muscle, cardiac muscle contraction, regulation of contraction, contractile proteins in cells other than muscle filaments, microfilaments, microtubules, cilia and flagella of eukaryotic cells, chemotaxis.
2. Nerve Conduction: Structure and composition of nervous tissue, creation and propagation of nerve impulse , action potential, Na⁺ and K⁺ channels, transmission of nerve impulse , cholinergic receptors, electroplaxs as a source of acetyl choline receptor , acetyl choline esterase, nerve poisons.
3. Biochemistry of vision: Structure of eye, lens, and retina, perception of light , rods and cones, rhodopsin, primary events in visual excitation, cyclic GMP, transducin in generation of nerve impulse, colour vision.
4. Biochemistry of sense of taste and smell.
5. Biochemistry of sense of touch and hearing.

Reference books

1. Text book of physiology- Guyton
2. Principles of neural science Kandel ER, Schwartz JH, Elsevier, N.Holland, NY
3. Neurobiology, Shepherd GM , Oxford Univ. Press
4. Nerve and muscle excitation Junge D, Sinauer assoc, Sanderland, mass
5. Biochemistry , L Stryer, Freeman and Co, NY
6. Biochemistry, Zubay, Addison Wesley and Co.

BCH: 373 Toxicology and Plant Biochemistry

Toxicology

1. Principles of toxicology: Different areas of toxicology, spectrum of toxic dose, risk and safety. Classification of toxic agents, characteristics of exposure, route and site of exposure. Duration of frequency of exposure. Spectrum of undesired effects: Allergic reactions, Idiosyncratic reactions, Immediate versus delayed toxicity, Reversible versus irreversible toxicity, Local versus systemic toxicity. Interaction of chemicals, Tolerance, Dose response. Selective toxicity.

2. Evaluation of Toxicity: Descriptive Animal toxicity tests: Acute lethality, Sub acute, sub chronic and chronic toxicity testing. Teratology and reproduction, Mutagenicity.
3. Biotransformation of toxicants: Phase I and II biotransformation reactions, Detoxication and toxication. Components of Cytochrome P-450 monooxygenase system, Mechanism of phase I and II reactions. Bioactivation, Toxicity of insecticides i.e. organophosphorous, carbamates and chlorinated insecticides metals, animal and plant toxins, industrial solvents and vapors.
4. Applications of toxicology: forensic, clinical and occupational health and industrial hygiene

Reference books

1. Haye's principles and methods of Toxicology Ed. A Wallace Hayes, Pub. Raven press, NY
2. Casarett and Doull's Toxicology ed. John Doull, Curtio D Kleassen and Mary D Aunder, McMillan publisher Co, NY
3. Appraisal of the safety of chemicals in foods, drugs and cosmetics. Ed. The Editorial Committee of Association of Food and Drug Officials of the United States
4. Toxicology- Mechanisms and analytical methods, Vol I and II, ed Stewart CP and Stolman A, Pub Academic press
5. Veterinary toxicology by RJ Garner ed Beilliere, tindall and Cox London
6. The chemistry and microbiology of pollution (1975) IJ Higgins and RG Burns Acad Press, NY
7. Introduction to ecological biochemistry JB Harbone Acad Press, NY (1977)

Plant Biochemistry

1. Mineral nutrition: micro and macro elements, requirement, role, excess and deficiency disorders.
2. Photosynthesis: chloroplasts, photosystem, mechanism CO₂ fixation, C₃ and C₄ pathways
3. Nitrogen and Sulfur metabolism: Nitrogen cycle, nitrogen fixation, assimilation of nitrate and ammonium ions, nitrogen transformation during development, assimilation of sulfate.
4. Plant hormones: types and role in plant growth and development, Auxins gibberellins, cytokinins, ethylenes, abscisic acid, hormones in senescence and abscission.
5. Secondary metabolites: definition types, phenolics, flavanoids, lignins, terpenoids alkaloids, Gum Pectins Rubber: chemistry examples and applications
6. Biochemistry and physiology of seed germination and dormancy, seed storage proteins.
7. Plant diseases: Pest types, symptoms, treatment, pesticides.

Reference Books:

1. Biochemistry , L Stryer, Freeman and Co, NY
2. Plant physiology , Salisbury and Ross (2007) CBS publishers and distributors
3. Lehninger
4. Biochemistry and Physiology of Plant Hormones, Thomas Moore
5. Plant Biochemistry- Hans Walter Heldt
6. Introduction to Plant Biochemistry- T.W. Goodwin and E.L. Mercer
7. Plant Physiology- Devlin
8. Plant Biochemistry- Dey

SEMESTER – IV

BCH: 470 Physiological Biochemistry and Endocrinology

Physiological biochemistry

1. Liver: anatomy, physiological functions, Liver function tests, Liver disorders:- hepatitis, cirrhosis, Jaundice: etiology and symptoms
2. Kidney: anatomy, physiological functions, diseases/disorder, diagnostic tests
3. Respiration: Principles of gaseous exchange during respiration, Bohr effect, transport of oxygen and carbon dioxide in the blood, regulation of respiration.
4. Digestion and Absorption of food: Generalized structure of digestive tract and associated digestive gland. Function of different parts- peristalsis, regulation of saliva, gastric, pancreatic, Intestinal and bile secretion (i.e. digestion), Absorption – (carbohydrate, protein, lipid, minerals and vitamin) transport and excretion of nutrients.
5. Biochemistry of blood clotting ,clotting factors, intrinsic and extrinsic pathways, mechanism of formation of thrombin, fibrin, fibrin clot, role of vitamin K clotting process, lysis of fibrin clot. Conditions that cause excessive bleeding in humans.
6. Regulation of acid-base balance, types and functions of acid-base buffers, clinical abnormalities associated with acid-base imbalance.
7. Water and Mineral metabolism.

Reference Books

1. Biochemistry, L Stryer, Freeman and Co, NY
2. Biochemistry, Zubay, Addison Wesley and Co.
3. Textbook of Physiology, Guyton
4. Physiology, Berne and Levy
5. Harper's Biochemistry- 27th edition
6. Text book of Human Biochemistry- Ed. G. P. Talwar

Endocrinology

1. General characteristics of hormones: chemistry, structure, synthesis, secretion, transport, metabolism & mechanism of action of hormones of the thyroid, hypothalamus, pituitary, pancreas, adrenals, glands, prostaglandins and gastro intestinal hormones, secondary messengers and their mode of action, calcium signaling, zinc fingers
2. Disorders related to hormones.
3. Cell membranes and intracellular receptors for hormones
4. Hormonal inter relationship
5. Biosynthesis of steroid hormones, cholera toxin, adenylate cyclase and TP, hormone overproduction and target cell insensitivity
6. EGF, NGF, PDGF, Enkephalin

Reference books:

1. Vertebrate endocrinology- Norris DO (1985) 2nd ed
2. Endocrine physiology- Martin, CR (1985) Oxford Univ press (NY)
3. Physiological chemistry –Harper 17ed Lange medical
4. Biochemistry- Zubay (1983) Addison, Wesley publ. Co.
5. Text book of endocrinology –Williams, 6th ed Saunders Co (1981)
6. Biochemical endocrinology E. Frieden (1983)

BCH: 471 Fermentation Technology and Tissue culture

Fermentation Technology

1. Characteristics of industrial microorganisms
2. Strain improvement, use of auxotrophic mutants
3. Methods and parameters of cultivation of microorganisms , media for industrial fermentation
4. Fermenters, design of fermenters, fermentation process, and maintenance of aseptic conditions, aeration and agitation.
5. Downstream processing, recovery and purification of fermentation products, effluent treatment
6. Applications of fermentation technology
7. Manufacturing by fermentative process: beer, Citric acid, Glutamic acid, lipase, Penicillin, L-asparaginase

Reference Books

1. Principles of Fermentation technology, PF Stanbury, A Whitaker, SJ Hall (2008)
2. Molecular biology and biotechnology- edited by JM Walker and FB Gingold, Royal society of chemistry (1988)
3. Industrial Microbiology – Casida
4. General Microbiology Stainer R.Y. et al (1987) 5th Ed., Macmillan Press Ltd. London

Tissue culture

Plant tissue culture

1. Media requirements: Sterilization and role of growth regulators, Requirements of a plant tissue culture laboratory,
2. PTC Techniques: Callus and cell suspension culture, Micropropagation, Conditioning of tissue culture plants (weaning and hardening), Somatic cell hybridization, Haploid (anther) culture, Embryo culture, Protoplast fusion, Somatic embryogenesis, Somaclonal variations, Cybrids and Allopheny, Agrobacterium mediated hairy root culture
3. Active principles in medicinal plants and phytochemistry of the metabolites of medicinal importance.

Animal tissue culture

1. Media requirements: preparation of medium and sterilization techniques, Advantages and disadvantages of natural and synthetic media
2. Cell culture methods: Hanging drop, suspension and monolayer culture, Behaviour and characteristics of cells in culture, Primary and established cell lines, characteristics of transformed cells, Methods of cell preservation.
3. ATC techniques: Primary cultures and secondary cultures, cloning, heterocaryons, variant cells, contact inhibitions, Organ culture and cell and tissue banking

Reference Books:

1. Principle and practice of Animal tissue culture by Sudha Gangal
2. Molecular cell Biology by Lodish, Baltimore, et al W.H. Freeman & Co. 1996
3. Tissue Culture by John Paul
4. Plant cell tissue and Organ culture by Gamburg Phillips
5. Plant tissue culture basic and applied T B Jha and B Gosh.
6. Culture of Animal Cells by Ian Freshney
7. Molecular Biotechnology by S. B. Primrose

BCH-472: Genetic Engineering

Section I:

1. Genetic engineering concepts: early development in genetics, concept of gene cloning and its importance.
2. Manipulation of DNA: Enzymes in genetic engineering, Restriction endonucleases, restriction map, Ligase, polymerase modifying enzymes, ligation; putting sticky ends to blunt ended molecules.
3. Cloning vectors: Vectors for E Coli: Plasmids, M 13 bacteriophage vectors, λ bacteriophage, Cosmid. Eukaryotic cloning vectors: Cloning vectors for yeast, other fungi, YAC, cloning vectors for higher plants, Ti plasmid, Ri plasmid, plant viruses for cloning, cloning vectors for insects, viruses as cloning vectors for mammals.
4. Introduction of DNA in living cells: Transformation, identification of recombinants, introduction of phage DNA into bacterial cells (transfection), identification of recombinant phage.
5. Selection of recombinant DNA clones: construction of genomic and c DNA library, colony and plaque hybridization probing, Southern blotting,
6. Sequencing genes and genomes: chain termination using ddNTPs, pyrosequencing, shotgun and clone contig approaches, chromosome walking, and genetic maps.
7. Characterization of recombinant gene: studying RNA transcript of a gene S1 nuclease mapping, studying regulation of gene expression, foot printing using DNase 1, reporter genes.

Section II:

1. Polymerase chain reaction: concept, types, methods and applications.
2. Expression of foreign gene: gene expression in E coli, production of recombinant proteins in Eukaryotes, fungi, yeast, mammalian and insect cells systems.
3. Genetic engineering of plants: Gene transfer methods, vectors; Transgenic plants: Pest resistant, herbicide resistant, antisense RNA and other applications.
4. Transgenic animals: Gene transfer strategies, production of recombinant proteins and other applications.
5. Recombinant DNA technology applications in medicine and industry: Recombinant hormones, recombinant vaccines. Human proteins (antibodies, clotting factors, antibody engineering) RFLP and application in forensic science.
6. Protein Engineering: In vitro mutagenesis, Oligonucleotide directed, PCR based, applications of protein engineering
7. Study of genomes: genome annotations, study of transcriptome, proteome.
8. RNA interference and its applications

Reference Books

1. Gene cloning- An introduction, T.A Brown, 2nd and 3rd ed, Chapman &Hall.
2. Recombinant DNA- genes and genomes a short course JD Watson, R.M.Myers, A.M.Caudy, J.A.Witkowski, WH Freeman &Co. 2007 (II/ III rd ed)
3. Principles of gene manipulation, SB Primrose (6th ed).
4. Principles and Techniques of Biochemistry and Molecular Biology, K Wilson and J Walker, 7th edn
5. Genetic Engineering, Smita Rastogi, Neelam Pathak, Oxford University press, 2009.

BCH: 473 Optional Course (Students can choose any 2 of the following)

- I. Evolution and Developmental Biology**
- II. Clinical Nutrition**
- III. Food technology**
- IV. Recent Advances in Biochemistry**

I. Evolution and Developmental Biology

1. Theories of Evolution.-the time scale and some evolutionary principles. Chemical evolution and origin of life. Prototypes of metabolic pathways.
2. Genesis of oxygen generating photosynthesis and aerobic respiration. Methanogens- evolution of prokaryotes
3. Evolution of protists
4. Origin of eukaryotes
5. Theories regarding origin of mitochondria and chloroplast, the five kingdom classification of living organisms, outline of eukaryote evolution- evolution of primates.
6. Construction of phylogenetic trees- molecular data set based on sequences
7. Evolution of proteins and nucleic acid – elastic analysis.
8. Evolution of introns
9. Evolutionary view of exon domain relationships
10. Developmental Biology—Cell differentiation, hierarchy of genes, measurement of time during development, nature of differentiation, DNA rearrangements& amplification, genetic control of morphogenesis, plant molecular genetics.

Reference Books:

1. Evolution and Diversity of life, E. Mayer Belknap Press Pub, 1976
2. Population species and evolution (1973), E Mayer Press Pub.
3. Biochemistry , Lehninger (1975) Worth pub
4. Origin of Eukaryotic cells, Margulis L.(1977)

II. Clinical Nutrition:

1. Diet and nutrition in India: Assessment of nutritional status
2. Factors affecting digestion and absorption of food
3. Effects of irradiation, cooking, refining, sprouting and fermentation on nutritional quality of food
4. Food toxins, adverse effects of alcohol, tobacco, tea
5. Interrelationship between dietary lipids and cholesterol metabolism
6. Malnutrition and infection
7. Malnutrition and mental development
8. Infant and geriatric nutrition
9. Nutritional basis of behavior, neutral tranquilizers
10. Amino acid therapy
11. Acidic and alkaline foods
12. Dietary fiber- chemical composition and importance
13. Physiological effects and metabolic adaptation during exercise
14. Nutritional management of inborn errors of metabolism

Reference books:

1. Essentials of food and nutrition M Swaminathan Vol. II, Applied aspects (1974), Ganesh Pub, Madras
2. Human biochemistry – James Orten and Otto Neuhaus, 10th ed , CV Mosby co London
3. Human nutrition and dietetics-Davidson and Passmore

4. Amino acids in therapy – Leon Chaitwo, Thorsons publishers Inc. NY
5. Physiological chemistry- Hawk

III. Food Technology:

1. Foods of animal and plant origin
2. Monitoring food quality
3. Primary feedstock
4. Proteins from unconventional sources- OCP, SCP etc
5. Starch production, manufacture of natural and synthetic sweeteners and syrups
6. Enzymes in food analysis, toxins, alcohol, amino acids, glucose
7. Enzymes in food processing, meat tenderization and fruit juice technology
8. Biochemistry of food spoilage, principles of food preservations
9. Food additives, starches, sugars, syrups and sweeteners, flavoring agents, colors
10. Genetically modified foods

Reference books:

1. Enzymes and food processing- GG Birch, N Blackbrough (1981)
2. Nutrition and food processing- MG Miller , G Tobin, AVI publishing Co, Creem Holm (1980)
3. Introduction to food sciences and technology –GF Stewart and MA Amerine (1973) Academic Press

IV. Recent advances in biochemistry:

1. Introduction to nanobiotechnology: Concept, Tools, Applications.
2. SEM (scanning electron microscopy), TEM (transmission electron microscopy), AFM (Atomic force microscopy)
3. Biosensors (types, construction, working, applications)
4. Drug development: challenges in the development of drugs, discovery of drug candidates: serendipity, screening or design, analyses of genomes holds great promise for drug discovery, stages of drug development.

Reference Books:

1. Biochemistry, L Stryer , J.M.Berg, J.L Tymoczko, W.H.Freeman Palgrave Macmillan 7th ed.
2. Molecular biology and biotechnology, J.D.Walker, Rapley, 5th edn, 2009.
3. Principles and Techniques of biochemistry and molecular biology, K Wilson and J Walker, 7th edn

PRACTICAL COURSES FOR M.Sc. PART II BIOCHEMISTRY

BCH: 367 Molecular Biology and Special Experiments

Molecular Biology

1. Isolation of DNA from bacterial/ liver/ plant/ yeast source
2. Isolation of RNA from bacteria/ plant/yeast/ mammalian source.
3. Spectrophotometric analysis of nucleic acids
4. Determination of T_m
5. Agarose gel electrophoresis of DNA and molecular size determination
6. Restriction digestion of DNA
7. Preparation of plasmid DNA
8. Transduction
9. Transformation

10. Conjugation and bacterial gene expression analysis
11. Ligation study
12. PCR analysis

Special Experiments: (Any six experiments should be conducted)

1. Subcellular fractionation with respect to marker enzymes
2. Isolation of PGP microorganisms and its characterization
3. Fermentation studies of suitable secondary metabolites with respect to media design and parameter optimization.
4. Plant Tissue Culture: media preparation, callus culture of suitable explant
5. Immobilization studies of enzymes/whole cells on suitable matrix.
6. Phytochemical screening of any suitable secondary metabolite and chemical characterization.
7. Identification of functional groups in a compound using IR (any solvent/ solution)
8. Identification of compound using NMR spectroscopy.
9. Demonstration of sophisticated analytical instrument working (GC/ GCMS/ LCMS/ XRD/ SEM/)
10. In vitro antioxidant assay of suitable plant extract (FRAP assay/ total antioxidant capacity/ hydroxyl radical scavenging assay)
11. Blood group typing

BCH: 368 Clinical Biochemistry

1. Estimation of Lipoproteins
2. Glucose tolerance test
3. Estimation of bilirubin
4. Estimation of blood urea
5. Blood sugar determination by Folin-Wu method
6. Estimation of creatine phosphokinase
7. Normal and abnormal constituents of urine
8. Determination of blood cholesterol
9. Determination of glucose by glucose oxidase method
10. Estimation of glycosylated hemoglobin
11. Estimation of LDH and its isozymes
12. Estimation of alkaline phosphatase from serum
13. Estimation of total protein and albumin from serum
14. Determination of SGPT and SGOT
15. Estimation of serum amylase

Reference Books:

1. Practical Biochemistry- David Plummer
2. Practical Biochemistry – J. Jayaraman
3. Biochemical methods – Sadasivam and Manickam
4. Biochemistry –Practical Approach – Kieth Wilson and J. Walker
5. Introductory Practical Biochemistry- Randhir Singh and Sawhney
6. Laboratory handbook on Biochemistry, S Shanmugam, 2010, PHI Pvt Ltd, New Delhi.

BCH 467 PROJECT

7 Credits

Student is required to carry out project work on a suitable topic and submit a dissertation based upon it.