

**PONDICHERRY UNIVERSITY
SCHOOL OF LIFE SCIENCES
DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY**

Revised syllabus submitted for the School Board Meeting

SL. NO.	COURSE CODE	NAME OF THE COURSE	CREDIT
1	BMB 402	HUMAN PHYSIOLOGY	3
2	BMB 403	CELL BIOLOGY	3
3	BMB 406	METABOLISM & REGULATION	3
4	BMB 411	GENERAL MICROBIOLOGY	3
5	BMB 412	CLINICAL BIOCHEMISTRY	3
6	BMB 414	MOLECULAR BIOLOGY	3
7	BMB 502	MOLECULAR IMMUNOLOGY	3
8	BMB 503	PLANT BIOCHEMISTRY & BIOTECHNOLOGY	3
9	BMB 506	PROTEOMICS	3
10	BMB 509	GENETIC ENGINEERING	3
LAB COURSE			
1	BMB 453	CELL BIOLOGY	1
2	BMB 455	METABOLISM & REGULATION	1
3	BMB 459	GENERAL MICROBIOLOGY	1
4	BMB 551	MOLECULAR IMMUNOLOGY	1
5	BMB 552	PLANT BIOCHEMISTRY & BIOTECHNOLOGY	1

BMB 402**HUMAN PHYSIOLOGY****3 CREDITS****UNIT I**

Introduction- Internal environment and homeostasis- coordinated body functions. 3 Lectures

Digestion- digestive processes at various regions of digestive system, regulation of - gastric secretion and motility- intestinal secretion and motility-role of gastrointestinal hormones. 6 Lectures

UNIT II

Cardiophysiology- functional anatomy of heart- genesis and spread of cardiac impulses- cardiac cycle- heart sound- cardiac output- cardiovascular regulatory mechanisms- basic E.C.G. 7 Lectures

UNIT III

Respiratory physiology- functional anatomy of air-passages and lung- respiratory muscles- mechanism of respiration- lung volumes and capacities- gas exchange in the lungs- regulation of respiration. 6 Lectures

UNIT IV

Renal physiology- structure of nephron- glomerular filtration- tubular reabsorption and secretion- formations of urine- regulation of water and mineral excretion- counter current multiplier and exchanger- renal role in acid base balance. 6 Lectures

UNIT V

Nerve physiology-Structure of neuron and synapse- excitability- action potential- conduction of nerve impulse-synaptic transmission- neurotransmitter systems. 4 Lectures

Muscle physiology- skeletal and smooth muscle- electrical properties and ionic properties- types of muscle contraction- Neuromuscular transmission. 4 Lectures

Text Book:

1. Pal, G.K. Textbook of Medical Physiology, Ahuja Publishing House, Delhi, 2007
2. Hall. J.E. Guyton and Hall Textbook of Medical Physiology. 12th ed. Saunders, Elsevier Inc., , 2011.

Suggested Reading:

1. Barrett KE, Brooks HL, Boitano S and Barman SM, Ganong's Review of Medical Physiology, 23rd Ed., McGraw-Hill Medical, 2009.

UNIT- I

Dynamics of the eukaryotic cell- Molecules of life- Cellular evolution- assembly of macromolecules and Origin of life- integrated structural organization of prokaryotic and eukaryotic cells- Concept of a composite cell and Molecular composition of cells. 9 Lectures

Biomembranes- Structural organization- Models of a plasma membrane, Membrane permeability- Transport across cell membranes- Transmembrane signals- Artificial membranes- liposome.

UNIT- II

Micro bodies-Peroxisomes, Glyoxysomes and Lysosomes and their functions. 6 Lectures

The Cytoskeleton-microtubules and microfilaments.

The extracellular matrix-collagen, elastin, fibrillin, fibronectin, laminin and proteoglycans.

UNIT- III

Molecular organization and function of mitochondria- components of respiratory chain- Chemiosmotic theory- Kinetics of electron transport, ATP formation- uncouplers of oxidative – phosphorylation- mitochondrial DNA and Semiautonomy. 6 Lectures

UNIT- IV

Endomembrane system- Endoplasmic reticulum- protein segregation- microsomes- functions of endoplasmic reticulum- Golgi complex and cell secretion- Protein glycosylation. 8 Lectures

Ribosomes- Structural organization.

Nucleus- Internal organization- Nuclear pore complex- Nucleosomes, Chromatin.

UNIT- V

Cell cycle - Different stages of mitosis – significance of meiosis - Cohesins and condensins in chromosome segregation, Microtubules in spindle assembly, Structure of kinetoshore, centrosomes and its functions, Components in cell cycle control - Cyclin, CDKs, Check points in cell cycle, phase dependent cyclic CDK complexes. 7 Lectures

Text Book:

1. Essential Cell Biology, 3rd edition, by Alberts *et al.*, Garland. Publishing Co., 2009.
2. Raven, P.H *et al*, Biology, 7th edition Tata McGrawHill publications, New Delhi, 2006.

Suggested Reading:

- 1.Campbell NA and Reece JB. Biology, 8th edition, Pearson Benjamin Cummings, San Francisco. 2008.

BMB 406**METABOLISM AND REGULATION****3 CREDITS****UNIT-I**

General introduction- Metabolism- Anabolism- Catabolism- Vitamins- Coenzymes-Antimetabolites. **2 Lectures**

UNIT-II

Carbohydrates metabolism- Pentose phosphate pathway- Glyoxylate pathway- Xenobiotic metabolism. **4 Lectures**

Metabolism of Lipids- Oxidation of fatty acids - Beta oxidation, alpha oxidation and omega oxidation, Oxidation of fatty acids with odd number of carbon atoms. Ketogenesis, Biosynthesis of saturated fatty acids and unsaturated fatty acids. Biosynthesis and degradation of triacylglycerol and phospholipids. Biosynthesis and degradation of cholesterol. Arachidonate metabolism- Prostaglandin biosynthesis. **6 Lectures**

UNIT-III

Metabolism of Proteins- Synthesis of Non-essential amino acids, Urea cycle reactions - interrelations between metabolism of carbohydrates, lipids and amino acids. **6 Lectures**

Biosynthesis and Catabolism of Porphyrins- Heme- Bile pigments-transport and excretion- Biosynthesis and Catabolism of Purines and Pyrimidines. **7 Lectures**

UNIT-IV

Genetic errors of metabolism- Representative examples - phenylketonuria, alkaptonuria, sickle cell anemia- galactosemia, cystinuria, Thalasemia. **5 Lectures**

UNIT-V

Metabolic regulation-Regulation of carbohydrate metabolism- Glycogen metabolism- TCA cycle regulation, Regulation of lipid metabolism-Regulation of fatty acid biosynthesis- Regulation of cholesterol biosynthesis-Regulation of fatty acid oxidation, Regulation of purine and pyrimidine biosynthesis. **6 Lectures**

Text Book:

1. Nelson.D.L, Cox. M. M. Lehninger s Principle of Biochemistry. 5th ed. Freeman, 2008
2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper s Biochemistry. 27th ed. McGraw Hill, 2006.

Suggested Reading:

1. Berg.J.M, Tymoczko.J.L, Stryer, L. Biochemistry. 6th ed. Freeman, 2006.
2. Zubay. Biochemistry. 4th ed. William C. Brown Publication, 1998
3. Voet and Voet. Biochemistry.4th edition, John Wiley, 2010.

UNIT I

History and Scope of Microbiology; Classification of Microorganisms-Bacteria, Fungi, Virus, Alga, Protozoa ; sterilization techniques, disinfectant and antiseptic agents.

6 Lectures

Microscopy - types of microscopes and their applications-simple and compound, bright field, dark field, fluorescence, phase-contrast and electron microscopes.

UNIT II

Major groups of bacteria- Archaeobacteria, Actinomycetes, Chemoautotrophs, Eubacteria, Pseudomonads, cyanobacteria, Rickettsias, chlamydias and spirochetes; Bacterial cell- structure and functions of cellular components-cell wall composition of Gram positive and Gram negative bacteria, sub-cellular organizations, flagella, capsule and spores; Bacterial Staining; antimicrobial agents-antibiotics, and antibacterial agents and their mode of action; antibiotic resistance.

6 Lectures**UNIT III**

Classification, morphology and characteristics of Virus, and Fungi - structure of DNA, RNA viruses, replication of animal viruses, bacteriophages- Lysogeny and Lytic cycle; virus like agents- satellites, viroids and prions; mode of action of antiviral and antifungal drugs ; Classification of Protozoa and Helminthic parasites; Life cycle of malarial and filarial parasites; Antihelminthic and antiprotozoan drugs.

8 Lectures**UNIT IV**

Microbial culture –continuous culture and synchronous culture; composition of culture media -solid and liquid media, chemically defined media, complex and differential media; Effect of pH, temperature and radiation on microbial growth.

6 Lectures**UNIT V**

Microbes and Diseases-major human diseases caused by bacterial, viral and fungal pathogens, Diseases of the respiratory tract-diphtheria, tuberculosis, pneumonia, influenza, mumps; Diseases of the skin- systemic mycoses, candidiasis; herpes viral infections, chicken pox, zoster and small pox; Genito-urinary infections- Gonorrhea, syphilis, and HIV; Diseases of GIT- Cholera, shigellosis, salmonellosis, amebiasis, Escherichia gastroenteritis- ETEC, EIEC; Typhoid; Hepatitis; Major human protozoan diseases- Malaria, Trypanosomiasis, meningoencephalitis, Toxoplasmosis.

10 Lectures**Text Books:**

1. Prescott, Harley and Klein- Microbiology-5th edition; Publisher: McGraw Hill science 2002
2. Gerard J. Tortora, Berdell, R. Funke, Christine L. Case, , Microbiology: An Introduction. 8th edition Hardcover: 944 pages, Publisher: Benjamin Cummings. 2004.

Suggested Reading:

1. Jacquelyn G. Black Microbiology-Principles and explorations 6th edition: Publisher John Wiley & Sons 2004
2. Robert W. Bauman Microbiology Brief edition : Pearson Benjamin Cummings 2004

BMB 412

CLINICAL BIOCHEMISTRY

3 CREDITS

UNIT – I

Automation in the clinical biochemistry: Precision, reliability, reproducibility and other factors in quality control. Normal values in health and diseases.

6 Lectures

UNIT- II

Kidney & Liver function tests: Renal function tests, osmolarity and free water clearances, acute and chronic renal failure.

7 Lectures

Liver function tests: clinical features and test based on bile pigments level, plasma changes, prothrombin time.

UNIT- III

Gastric function tests: Gastric function tests: collection of gastric contents, examination of gastric residium, FTM, stimulation tests, tubeless gastric analysis.

6 Lectures

UNIT- IV

Prenatal Diagnosis: Newborn screening: PKU, cystic fibrosis and sweat tests.

8 Lectures

Prenatal diagnosis of diseases, amniotic fluid and fetal blood examination.

Acetylcholinesterase and other tests on amniotic fluid.

Chromosomal abnormalities by cytogenetics.

UNIT – V

Molecular diagnosis of genetic defects: Diagnosis of genetic diseases by molecular biology techniques (cystic fibrosis, Hemachromatosis, thalassemias, sickle cell diseases) DNA probes; restriction fragment length polymorphism (RFLP); polymerase chain reaction (PCR); amplification of mRNA. AIDS: Clinical diagnosis.

9 Lectures

Text Books

1. Tietz Fundamentals of Clinical Chemistry. Burtis, Ashwood. 5th ed. Saunders, 2002.
2. Practical Clinical Biochemistry, Harold Varley, Interscience Publishers Inc, 2002

Suggested Reading

1. Lecture Notes Clinical Biochemistry (8th Edition). Simon Walker, S., Ashby, P. , Rae, P., and Beckett, G., Blackwell, 2010.
2. Textbook of Biochemistry With Clinical Correlations. Devlin, D.M., (Ed). Wiley-Liss, 2010.
3. Clinical Chemistry: Theory, Analysis and Correlation. Kaplan, L.A. and Pesce, A.J., 4th ed. Mosby, 2003.
4. Handbook Of Clinical Biochemistry, Swaminathan, R. Oxford University Press; 2004
5. Textbook of Medical. Biochemistry, Chatterjee, M.N. and Rana Shinde, 5 th ed. Jaypee Medical Publishers, 2002

UNIT I

History and scope of molecular biology- Discovery of DNA- evidence for DNA as the genetic material. The genomes of bacteria, viruses, plasmids, mitochondria and chloroplast- Gene transfer in microorganisms- conjugation- transformation, transduction - protoplasmic fusion. 9 Lectures

UNIT II

Organisation of eukaryotic genome- components of eukaryotic chromatin- chromatin and chromosome structure- DNA-supercoiling -linking number- satellite DNA- possible functions- Cot curve- C- value paradox. 5 Lectures

UNIT III

DNA replication- Prokaryotic and eukaryotic DNA replication, mechanism of replication. Enzymes and necessary proteins in DNA replication. Telomeres, telomerase and end replication. Role of telomerase in aging and cancer. 9 Lectures
DNA Repair- Mismatch, Base-excision, Nucleotide-excision and direct repair
DNA recombination- Homologous, site-specific and DNA transposition

UNIT IV

Transcription- Prokaryotic and eukaryotic Transcription- RNA polymerases- general and specific transcription factors- regulatory elements- mechanism of transcription regulation- Transcription termination. Post transcriptional modification- 5' cap formation-3' end processing and polyadenylation- splicing- editing- nuclear export of mRNA- mRNA stability. 8 Lectures

UNIT V

Translation- Genetic code- Prokaryotic and eukaryotic translation- translational machinery- Mechanism of initiation- elongation and termination- Regulation of translation. 5 Lectures

Text Book:

1. Watson. J. D, Baker. T. A, Bell. S. P, Gann. A, Levine. M, Losick. R. Molecular Biology of Gene. 6th The Benjamin / Cummings Pub. Co. Inc, 2008
2. Lehninger's Principles of Biochemistry, sixth Edition, 2009
Publisher: W. H. Freeman; 6th edition | ISBN: 071677108X

Suggested Reading:

1. Darnell, Lodish and Baltimore. Molecular Cell Biology, Scientific American Publishing Inc, 2000
2. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Molecular biology of the Cell. 4th ed. Garland publishing Inc, 2002
3. Benjamin Lewin. Gene VII. Oxford University Press, Nelson Cox.

UNIT I

Types of Immunity - Innate and acquired immunity; Innate basic immunity -physical, physiological defenses, acute phase proteins and interferons; Acquired Immunity-natural, artificial, active and passive immunity; Humoral and Cell mediated immunity; cells of the immune system – myeloid lineage and lymphoid lineage; Inflammatory response and Phagocytic system- Role of mononuclear phagocytes, macrophages, neutrophils; Toll like receptors, Role of B cells and T cells in innate immunity; Role of complement system in immunity

5 Lectures

UNIT II

Organs, and tissues of Immune system- Primary and Secondary Lymphoid organs Thymus, Bone marrow; Lymph node, spleen and tonsils, MALT, GALT; cells of the adaptive Immunity - T lymphocytes B lymphocytes. Role of MHC molecules- Antigen Presenting Cells-Macrophages, dendritic cells, mechanism of antigen processing and presentation in CMI; Development of T cells and B cells in the Primary and Secondary Lymphoid organs-Positive and Negative selection, Central tolerance;

5 Lectures

UNIT III

Humoral Immunity- Antigens – nature of antigens, Immunogenicity, antigenicity, Nature of antigens; Factors that influence immunogenicity ; Antibodies - Structure, types and biological function - Polyclonal response; primary and secondary immune response; T cell B-cell interaction; B-cell diversity- Antibody genes- molecular basis of antibody diversity– gene recombination, somatic hypermutation, N- and P-nucleotide insertion, Class Switching; Tests based on Ag-Ab reactions –principle and applications of tests based on precipitation, agglutination, complement fixation, Immunoelectrophoresis, ELISA, Western Blotting, and Immunofluorescence techniques; -Development of murine monoclonal antibodies - Hybridoma technique and their applications; genetically engineered antibodies-humanized antibodies and their therapeutic applications

10 Lectures

UNIT IV

Cell mediated Immunity -MHC restriction - T-cell receptors –T-cell activation & differentiation into effector T cells; Lymphocyte recirculation; Functions of Effector T cells- Mode of recognition of target cells by CTL and NK cells and mechanism of killing; Role of Lymphokines and Cytokines in immune regulation; Antiviral and antitumor immunity; Development of Vaccines- conventional vaccines- attenuated, killed organisms and subunit vaccines; modern vaccines-recombinant vaccines and DNA vaccines

8 Lectures

UNIT V

Immunopathology -Hypersensitivity reactions- Immediate and delayed type reactions, their causes and treatment; Immunodeficiency diseases –types, causes and treatment; Tolerance mechanisms, Breakdown of Self-tolerance and Autoimmunity; Types of autoimmune diseases- Organ specific and Systemic autoimmune diseases - causes and treatment; Transplantation immunity- mechanism of graft rejection; prevention of graft rejection – Immuno suppressors-Physical, chemical and biological immuno suppressants; cancer immunity and cancer immunotherapy

8 Lectures

Text Book:

1. Janeway' s Immunobiology 7th ed. Garland Science, Taylor & Francis Group, 2008
2. [Thomas J. Kindt](#), Barbara A. Osborne, [Richard A. Goldsby](#). Kuby Immunology. 6th ed. W. H. Freeman & Company, 2006.

Suggested Reading:

1. David Male, Jonathan Brostoff, David B. Roth, Ivan Roitt. Essential Immunology. 11th ed. Elsevier, 2006

BMB 503 PLANT BIOCHEMISTRY AND BIOTECHNOLOGY 3 CREDITS

UNIT- I

Introduction to Plant cells

8 Lectures

Photosynthesis: Chloroplast- structure and function; Photosynthetic pigments and light harvesting complexes, Photo inhibition of photosynthesis, Photosynthetic carbon reduction (PCR) cycle, C4 syndrome and Crassulacean acid metabolism. Oxidative respiration, Alternate electron pathways and Respiration rate.

UNIT- II

Nitrogen metabolism: Physical and biological nitrogen fixation, Ammonification, Nitrification, Denitrification, Biochemistry and Genetics of nitrogen fixation and Ammonium assimilation.

10 Lectures

Plant Hormones: Biosynthesis, Physiological effects and mechanism of action of Auxins, Gibberellic acids, Cytokinins, Abscisic acid, Ethylene, Brassinosteroids and Polyamines.

UNIT- III

Plant Stress physiology: Plant stress, Plant responses to abiotic and biotic stresses, Water deficit and drought resistance, Flooding, Temperature stress, Salt stress, Ion toxicity, Pollution stress and potential biotic stress (insects and diseases).

6 Lectures

UNIT- IV

Introduction to tissue culture-Media composition and preparation.

6 Lectures

Culture types callus culture cell suspension culture, protoplast culture and etc., Somatic embryogenesis, organogenesis, Embryo culture and embryo rescue. Micropropagation.

Protoplast isolation, Protoplast culture and fusion, selection of hybrid cells, cybrids, somaclonal variation. Germplasm storage and cryo- preservation.

UNIT- V

Application of transgenesis in crop improvement – Insect resistance, disease resistance, virus resistance herbicide resistance, and resistance to abiotic stress.

6 Lectures

Transgenesis for male sterility and terminator seed. Transgenic plant-Bt cotton, Bt brinjal, Plant genome-Rice

Text Book:

- 1.Mukherji, S and Gosh A. K. Plant Physiology. 2nd ed. New Central Book Agency, Kolkata, 2005.
- 2.Slater A, NW Scott, MR Fowler. Plant bio technology, 2nd ed. Oxford University Press, 2008.

Suggested Reading:

1. Hopkins, W. G and Huner, N. P. A. Introduction to Plant Physiology. 3rd ed. John Wiley & Sons Inc. New York, 2004.

UNIT I

An introduction to genetic engineering, Enzymes used in genetic engineering- Restriction endonucleases, DNA polymerase, Reverse transcriptase, Polynucleotide kinase, DNA ligase, Terminal deoxynucleotidyl transferase, Alkaline phosphatase. Characteristics of *E. coli* as host for cloning, Vectors for cloning - Plasmids, Bacteriophage λ , Filamentous phage vectors, cosmids, BAC and YAC vectors, Shuttle vectors, Expression vectors. Ligation of DNA fragments with vectors- Homopolymer tailing, Linkers, Adaptors

8 Lectures

UNIT-II

Properties of yeast as host for cloning, Types of vectors designed for cloning in yeast, Vectors for cloning in animal cells- SV 40, Adenovirus, Baculovirus, Retrovirus vectors. DNA viruses that infect plants – Caulimoviruses vectors, Geminiviruses vectors, Types of vectors used in higher plants- Tumour-inducing (Ti) plasmids, binary and cointegrate vectors, Methods of introduction of foreign DNA in animal system- DNA/calcium phosphate coprecipitate method, Phospholipids as gene-delivery vehicles, Electroporation, Microinjection.

7 Lectures

UNIT-III

Introducing genes into prokaryotes - Natural gene transfer methods, Calcium chloride mediated transformation, Transfection with phage vectors, Cloning strategies- Construction of genomic and cDNA libraries, Shot gun cloning, Selection and screening of recombinant clones, Methods based on nucleic acid hybridization, Finding specific clones by functional complementation, Chromosome walking, Reporter genes

7 Lectures

UNIT-IV

Prokaryotic expression systems- Gene expression based in bacteriophage T7 RNA polymerase, Studying of gene function through protein interactions-Two hybrid screening, Phage display libraries, RNA interference- siRNA, miRNA, Concept of gene knock out technique.

6 Lectures

UNIT-V

Principles and methods for DNA sequencing, Advantages of automatic gene sequencers, Blotting techniques –Southern, Northern, Western, Polymerase chain reaction, Site directed mutagenesis, Transposon mutagenesis, Fluorescence *in-situ* hybridization, Electrophoretic mobility shift assay, DNA foot printing, Restriction mapping, DNA fingerprinting, Patenting and basic concepts of IPR.

8 Lectures

Text Books:

1. Sandy Primrose. 2006. Principles of Gene Manipulation and Genomics. 7th Edition, By Black Well Publishers.
2. Brown T.A. 2004. Gene Cloning and DNA analysis. 2nd edition. By ASM press.

Suggested Reading:

1. Desmond S. T. Nicholl. 2002. An introduction to genetic engineering. 2nd edition. Cambridge University Press.
2. Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten. 2010. Molecular biotechnology: Principles and applications of recombinant DNA, 4th edition, By ASM press.
3. Joseph Sambrook, David William Russell. 2001. Molecular cloning: a laboratory manual, Volume 3, 3rd edition, By CSHL Press, New York.

BMB 506**PROTEOMICS****3 CREDITS****UNIT-I**

Proteomics Introduction: Human genome - Genomes to Proteomes - HUPO – 8 Lectures
Branches of proteomics - Protein extraction Methods: Subcellular fractionation, Density gradients, Ultrafiltration, - Protein fractionation - Affinity purification – Combined Fractional Diagonal Chromatography (COFRADIC) - Removal of interfering compounds, salts, DNA, lipids, Protein solubilization methods, chaotropes, detergents, etc - Preparation of Sample - Sample handling and storage - Protein detection and quantification methods – Stable Isotope Labeling with Aminoacids in Culture (SILAC) - Chemical tagging, fluorescence, negative staining, radio-labeling – Chemical modifications..

UNIT II

Structural Proteomics: Protein structure-function relationship – Disulfide bonds, 6 Lectures
Post translational modifications, Glycosylation, Phosphorylation, other modifications, Applications - methods for detection of protein-protein interactions - Yeast 1, 2 and 3 hybrid systems – Phage display – Surface Plasmon Resonance (SPR) - Fluorescence Resonance Energy Transfer (FRET) - Algorithms for proteomics –OMSSA - SEQUEST - MASCOT.

UNIT-III

Protein expression: Conjugation, Transformation, Transduction, Transfection - 8 Lectures
Expression Systems – Plasmids, E.Coli, Yeast, Pitchia pastoris, Bacculovirus - introduction, detection and purification of expressed transgenes - .antibody capture – antibody generation and Engineering – Protein/peptide chemical synthesis – Reconstitution of proteins in lipid vesicles, - Liposomes - Protein-polynucleotide interactions – Biotinylated reactions -Signaling complex.

UNIT-IV

Proteomic Techniques for Analysis: 2-D gel electrophoresis – Mass Spectrometry – 8 Lectures
Principles - MALDITOF - RP chromatography /Tandem mass spectrometry - Protein sequence analysis - N-terminal determination methods- Protein modification – Protein microarrays – Tissue microarray – Infra red Protein array with Quantitative Readout (IPAQ)- X-ray crystallography - Nuclear Magnetic Resonance - X-ray Tomography - Data Analysis algorithms - Sequence Analysis algorithms.

UNIT-V

Proteomic approach for Clinical studies: Protein Biomarker Discovery and 6 Lectures
Validation - Body fluid profiles, blood disease profiles, diabetes profiles, infectious diseases, stroke and myocardial infarction, nervous system, Alzheimer, low abundance and hydrophobic proteins. High through put techniques to identify protein molecules in sample - Emerging technologies: Proteomics in Biotechnology - Microfluidics.

Text Book

1. Twyman, R.M. Principles of Proteomics. BIOS Scientific Publisher, New York. 2004.
2. Liebler, D.C. Introduction to Proteomics: Tools for the New Biology. Human Press, Totowa NJ. 2002.

Suggested Reading:

1. Westermeier, R and T. Naven. Proteomics in Practice: A Laboratory Manual of Proteome Analysis. Weinheim: Wiley-VCH, 2002.

BMB 453

CELL BIOLOGY LAB

1 CREDIT

1. Observation of prokaryotic and eukaryotic cells with the help of light micrographs
2. Arrest and observation of chromosomes after colchicine treatment in onion roots.
3. Different stages of Meiosis.
4. Cell fractionation
5. Isolation of Goat RBC membrane and estimation of Na^+/K^+ ATPase.
6. Determination of osmotic fragility of RBC (Goat).
7. Isolation of peroxisomes and determination of catalase assay
8. Isolation of mitochondria and Determination of succinate dehydrogenase activity.

REFERENCE:

Becker WM Kleinsmit, LJ, Hardin J, and Bertoni GP, 2009. The World of the Cell, seventh edition. Pearson/Benjamin-Cummings, Boston, MA.

1. Preparation of lactalbumin from milk
2. Estimation of reducing sugar by DNSA (dinitrosalicylic acid) method
3. Estimation of glucose by Benedict's method
4. Estimation of urea by Diacetyl monoxime method
5. Estimation of uric acid
6. Estimation of creatinine in urine
7. Estimation of cholesterol by ZAK's method
8. Estimation of calcium by Clarke and Collip method
9. Estimation of pyruvate by DPNH (2,4-dinitrophenylhydrazine) method

REFERENCE:

Harold Varley, 1988, Practical Clinical Biochemistry, 6th edition, edited by H.Gowenlock with the assistance of Janet R. McMurray and Donald M..McLauchlan, Heinemann Medical in London

1. Introduction to sterilization techniques
2. Preparation of liquid and solid media
3. Isolation of Bacteria from soil –serial dilution technique
4. Bacterial Staining-differential staining-spore staining, Grams staining
5. Biochemical tests for bacteria
6. Measurement of bacterial population by turbidimetry and colony counting methods
7. Pure culture techniques-streak plate, spread plate techniques and pour plate
8. Bacterial growth curve
9. In vitro antibiotic sensitivity tests
10. Preservation of cultures: slant, water stock, glycerol stock and lyophilization.

REFERENCE:

Cappuccino Sherman. Microbiology A Laboratory Manual, 6th Edition. Pearson education, 2004.

1. Preparation of antigens from microbes
2. Analyses of Antigens: Double Immunodiffusion,
3. SRID
4. Immunoelectrophoresis (IEP).
5. Generation of polyclonal antibodies and determination of antibody titer
6. Purification of IgG from hyper immune serum
7. ELISA.
8. Separation of antigens by SDS PAGE
9. Identification of specific antigens by Western blotting
10. Isolation of lymphocytes from Blood (PBMC)

REFERENCE:

Gordon JR. A Practical Guide to Cellular and Molecular Research Methods in Immunology, Fifth edition, Saskatchewan 2004.

PLANT BIOCHEMISTRY AND BIOTECHNOLOGY LAB

1. Estimation of total chlorophyll, chlorophyll a and chlorophyll b pigments from the leaves.
2. Estimation of starch content by Anthrone reagent.
3. Spectrophotometric estimation of Indole acetic acid in plant tissues.
4. Determination of Gibberellic acid by half seed method.
5. Determination of peroxidase activity.
6. Determination of protein under abiotic stress.
7. Isolation of plant genomic DNA
8. Isolation of chloroplast DNA

REFERENCE:

Sadasivam, S, and Manickam, A., (2001), Biochemical Methods, 3rd edition, New Age International Publishers, New Delhi, 2001.