

8 Biochemistry

TRIMESTER WISE DISTRIBUTION OF COURSES

I TRIMESTER

		L	P
BIO 501	BASIC BIOCHEMISTRY	4	1
BIO 502	NUTRITIONAL BIOCHEMISTRY	3	1
BIO 601	NUCLEIC ACIDS	2	1
BIO 603	GENETIC ENGINEERING-PRINCIPLES AND METHODS	3	1
BIO 701	CURRENT TOPICS IN BIOCHEMISTRY	2	0
BIO 691	SEMINAR	1	0

II TRIMESTER

BIO 503	PLANT BIOCHEMISTRY	3	2
BIO 602	PROTEIN BIOSYNTHESIS	3	0
BIO 606	INTERMEDIARY METABOLISM	3	0
BIO 607	INORGANIC NITROGEN METABOLISM	3	1
BIO 608	BIOCHEMISTRY OF BIOTIC AND ABIOTIC STRESSES	3	0
BIO 691	SEMINAR	1	0

III TRIMESTER

BIO 504	TECHNIQUES IN BIOCHEMISTRY	2	2
BIO 604	GENE REGULATION	3	0
BIO 605	ENZYMOLGY	3	2
BIO 609	BIOCHEMISTRY OF PLANT CELL ORGANELLES	3	0
BIO 702	PROTEOMICS,METABOLOMICS AND IONOMICS	3	0
BIO 691	SEMINAR	1	0

Core Courses

M.Sc.: BIO 501, BIO 502, BIO 503, BIO 504, BIO 601, BIO 605, BIO 606 and BIO 607

MBB 501, PP 501

Ph.D.: BIO 701, BIO 702

BIOCHEMISTRY

Major Fields : Biochemsitry

Nutrition

Minor Fields : Ph.D. student shall take two minors (9 credits of course work in each) from any of the other fields outside his/her own.

M.Sc. student shall take one minor (9 credits of course work) from any of the other fields outside his/her own.

DESCRIPTION OF COURSES

BIO 501 BASIC BIOCHEMISTRY

(4L+1P) I

Objective

To provide basic knowledge/overview of structure and functional and metabolism of biomolecules.

Theory

UNIT I

Scope and importance of Biochemistry in Agriculture; Fundamental principles governing life; Structure and properties of water; Acid base concepts, pH and buffers; Intra- & inter-molecular forces in biomolecules; General introduction to physical techniques for determination of structure of biopolymers.

UNIT II

Classification, structure and function of carbohydrates, lipids, amino acids, proteins, nucleic acids and vitamins.

UNIT III

Fundamentals of thermodynamic principles applicable to biological process, bioenergetics; respiration and oxidative phosphorylation.

UNIT IV

Classification of enzymes and their mechanism of action, regulation and kinetics.

UNIT V

Plant and animal hormones; Metabolism of carbohydrates, lipids & proteins, DNA replication, transcription and translation.

Practicals

Preparation of reagents and buffers, Preparation of standard acids and alkali, Estimation of protein, free amino acids, estimation of amylyolytic activity, Assay of proteolytic activity, Estimation of total sugars, Reducing sugars, Non reducing sugars, starch, Extraction and estimation of oil, Iodine value, Acid value, Fatty acid by GLC, Estimation of Vitamin C, Estimation of DNA, RNA.

Suggested Readings

- Conn, E.E. and Stumpf, P.K. 1987. *Outlines of Biochemistry*. John Wiley.
- Metzler, D.E. 2006. *Biochemistry*. Vols. I, II. Wiley International.
- Nelson, D.L. and Cox, M.M. 2004. *Lehninger principles of Biochemistry*. 4th Ed. MacMillan.
- Voet, D., Voet, J.G. and Pratt, C.W. 2007. *Fundamentals of Biochemistry*. John Wiley.

BIO 502 NUTRITIONAL BIOCHEMISTRY

(3L+1P) I

Objective

To provide knowledge about the fundamentals of human nutrition and the significance of various nutrients, present in food and their role in preventing diseases.

Theory

UNIT I

Fundamentals of human nutrition; concept of balance diet; calorific value of foods, energy requirement, expenditure and basal metabolic rate.

UNIT II

Biochemical composition and utilization of carbohydrates, proteins and fats; Dietary requirements of carbohydrates, proteins and fats.

UNIT III

Nutritional significance of dietary minerals; Biochemical function and specific deficiency diseases associated with vitamins; Protein-energy malnutrition.

UNIT IV

Antinutritional factors; Role of diet and nutrition in the prevention and treatment of diseases. Antioxidants; Food allergy.

UNIT V

Biochemical composition, energy and food value of various food grains including cereals, pulses, oil seeds, fruits and vegetables. Biochemical changes during processing and storage of food grains, fruits and vegetables; Food additives and contaminants.

Practicals

Estimation of tryptophan; Estimation of starch; Estimation of amylose; Estimation of crude fiber; Estimation of oil content in oilseeds; Estimation of carotenoid pigments; Estimation of ascorbic acid (Vitamin C); Assessment of rancidity of oils and fats; Determination of phytin phosphorus; Estimation of Glucose; Protein Estimation.

Suggested Readings

- Barker, A.V. and Pilbeam, D.J. 2007. *Hand Book of Plant Nutrition*, CRC, Taylor and Francis Group.
- Bender, D.A. 2003. *Nutritional Biochemistry of the Vitamins*, 2nd Edition, Cambridge University Press, U.K.
- Insel *et al* 2007. *Nutrition* 3rd edition, Jones and Bartlet Publishers.
- Shibamoto, T. and Bjeldance, L.F. 2009. *Introduction to Food Toxicology* Academic Press, Elsevier.
- Shukla, Y.N. *et al* 2009. *Plant Secondary Metabolites*, New India Publishing Agency.

Objective

To provide insight into various biochemical and molecular processes in plants and their regulation

Theory

UNIT I

Structure and function of plant cell organelles; Photosynthesis in higher plants; Light and Dark reactions; C₃, C₄ & CAM pathways and their regulation.

UNIT II

Biosynthesis of structural carbohydrates, storage proteins and lipids; Sucrose-Starch interconversion; Photorespiration.

UNIT III

Proteins: post-translational modifications, folding, stability, transport and degradation.

UNIT IV

Cellular metabolism of oligosaccharides and polysaccharides; Secondary metabolites- isoprenoids, alkaloids and phenolics, cyanogenic glycosides and glucosinolates

UNIT V

Biochemistry of Plant hormones; signaling pathways; Phytochromes.

Practicals

Soluble Protein Estimation by Lowry's Method; Fractionation of Cell Organelles; Estimation of Starch; Assay of ADPG Pyrophosphorylase; Assay of Starch Synthase; Estimation of Amylolytic Activity; Assay of Isocitrate Lyase; Assay of Isocitrate Dehydrogenase; Assay of Ribulose-1,5-Bisphosphate Carboxylase; Assay of Phenylalanine Ammonia Lyase; Assay of Pectin Methyl Esterase; Assay of Superoxide Dismutase; Assay of Polyphenol Oxidase; Assay of Lipoxxygenase; Estimation of Proline; Estimation of Carotenoid Pigments; Determination of Polyphenols in Pulse Grains, Fractionations of storage proteins

Suggested Readings

Bousher *et al.* 2008. *Plant Biochemistry, Garland Science.*

Buchanan, B.B., Gruissem, W. and Jones, R.L. 2000. *Biochemistry and Molecular Biology of Plants.* 2nd Ed. John Wiley.

Dey, P.M. and Harborne, J.B. 1997. *Biochemistry.* Academic Press.

Heldt, H.S. and Heldt, F. 2005. *Plant Biochemistry* 3rd Edition, Elsevier.

Narwal, S.S. 2009. *Plant Biochemistry.* Studuim Press.

Objective

To impart theoretical and practical knowledge about various biochemical techniques used in biochemistry for isolation and characterization of cellular components.

Theory

UNIT I

Principles of enzyme assays and analysis of biomolecules; Centrifugation techniques-theory, types and applications.

UNIT II

Principles and applications of Spectrophotometry, Mass spectroscopy.

UNIT III

Chromatographic techniques-TLC, ion - exchange, gel - filtration, affinity, GLC and HPLC.

UNIT IV

Electrophoresis techniques – native and SDS-PAGE, Isoelectric focusing, capillary electrophoresis and agarose gel electrophoresis.

UNIT V

Concept of radioactivity, tracer techniques and their applications in biology, Scintillation counters, autoradiography, radiation hazards and safety measures.

UNIT VI

Polymerase Chain Reaction (PCR); Immunochemical techniques, MALDI-TOF.

UNIT VII

Ethical issues and professional responsibilities in research.

Practicals

pH and buffer preparation; Fractionation of cell organelles; Soluble protein estimation by Lowry's Method; Isolation, purification and distribution of polysomes; Gel Chromatography; polyacrylamide gel electrophoresis; Separation of proteins by iso-electric focusing. Isolation of plant DNA, Agarose gel electrophoresis; Estimation of fatty acids by gas-liquid chromatography, Radioisotope analysis by liquid scintillation counter, PCR.

Suggested Readings

Holtzhaver 2006. *Basic Methods for the Biochemical Lab*. Springer Lab Manual.

Pingoud, A., Urbanke, C., Hoggett, J. and Jeltsch 2002. *Biochemical methods*. Wiley-VCH

Sawhney, S.K. and Singh, R. 2000. *Introductory practical Biochemistry*. 2nd Ed. Narosa.

Simon, R. 2004. *Protein purification techniques*- 2nd Ed. Oxford Univ. Press

William, B.L. and Wilson, K. 1975. *Principles and Techniques of practical Biochemistry*. Edward Arnold.

Wilson, K., Walker, J. and Walker, J.M. 2005. *Principles and Techniques of Practical Biochemistry*: Cambridge Univ. Press.

Wilson, K. and Walker, J. (2006) *Principles and techniques of Biochemistry & Molecular biology*. 6th Ed. Cambridge Univ. Press.

BIO 601 NUCLEIC ACIDS

(2L+1P) I

Objective

To provide knowledge about structure and function of nucleic acids and the role of modification enzymes

Theory

UNIT I

History of nucleic acids; DNA as genetic material.

UNIT II

Chemistry of nucleic acids; Chromatin structure and function; Structure and conformation of DNA and RNAs.

UNIT III

DNA topoisomerases, nucleases, endonucleases and related enzymes.

UNIT IV

Biosynthesis of nitrogenous bases, nucleotides and their regulation.

Practicals

Isolation and purification of RNA and DNA from plant tissue; Spectrophotometric analysis and agarose gel electrophoresis; Restriction analysis of DNA; Isolation of total RNA and Ribosomal RNA; Spectrophotometric quantification; agarose gel electrophoresis; Isolation of messenger RNA.

Suggested Readings

Adams, R.L.P., Knowler, J.T. and Leader, D.P. 1992. *The Biochemistry of the Nucleic Acids*. 11th Ed. Chapman & Hall.

Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D. 2008. *Molecular Biology of the Cell*. 6th Ed. Garland Publ.

Blackburn, G.M. and Gait, M.J. (1996). *Nucleic Acids in Chemistry and Biology* 2nd Ed. Oxford University Press.

Freifelder, D. and Malacinski, G.M. 1996. *Essentials of Molecular Biology*, 3rd Ed. Panima.

BIO 602 PROTEIN BIOSYNTHESIS

(3L+0P) II

Objective

To impart knowledge about the various components and processes involved in protein biosynthesis its regulation and the significance of post-translational modifications.

Theory

UNIT I

RNA world; Diverse RNA functions in living cells and its significance.

UNIT II

Structure and function of tRNA, rRNA, mRNA; Pre mRNA splicing, tRNA processing, modification and transport.

UNIT III

Structure and function of amino acyl tRNA synthetases; tRNA identity; recognition and charging; proof reading mechanisms.

UNIT IV

Protein synthesis: structure and function of ribosomes; Genetic code: Elucidation, nature and properties; Initiation, elongation and termination cycles in prokaryotes and eukaryotes, Protein synthesis inhibitors and regulation.

UNIT V

Secretion and maturation of polypeptides: Signal sequences and secretion; Spontaneous and Chaperone mediated folding and transport to organelles like chloroplast, mitochondria and nucleus; Post translational modifications and their significance.

Suggested Readings

Alberts *et al.* 2006. *Molecular Biology of the Cell*. 6th Edition Garland Publ.

Freifelder, D. (Ed.) 1978. *Recombinant DNA* (Readings from Scientific American W.H. Freeman & Co. San Francisco).

Lewin, B. 2008. *Genes X*, Oxford Univ. Press.

Voet, D., Voet, J.D., Prats, C.W. 2007. *Fundamentals of Biochemistry*, John Wiley

Zubay GL. 1998. *Biochemistry*. 4th Ed. WCB London.

BIO 603 GENETIC ENGINEERING – PRINCIPLES AND METHODS

(3L +1P) I

Objective

To provide knowledge about the basics of recombinant DNA technology and its applications

Theory

UNIT I

Introduction and historical perspectives; Properties and applications of Restriction Enzymes; Characteristics of vectors; DNA cloning strategies.

UNIT II

Methods of gene isolation, Construction and screening of genomic and cDNA libraries, PCR; Site directed mutagenesis; Gene silencing Methodologies:–Anti-sense RNA Technology, Ribozyme technology; DNA sequencing.

UNIT III

Plant transformation methods and transgene analysis, Potential applications of genetic engineering in agriculture; Transcriptional and post transcriptional gene silencing, gene targeting and gene therapy.

UNIT IV

Bioethics and biosafety issues and IPR in Recombinant DNA research.

Practicals

Isolation of Plant, plasmid and phage DNA and purification; Restriction of Plant DNA; Southern blotting; Elution of DNA from agarose gel; Radioactive labeling of DNA; Southern hybridization, autoradiography. Preparation of vector for cloning; Ligation of vector with insert DNA; Preparation of competent cells; Transformation of *E.coli* cells and selection of recombinants by antibiotic or blue/white selection; PCR, Preparation of plant RNA, RT-PCR.

Suggested Readings

- Ausbel, F.M., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A. and Struhl, K. 1999. *Short protocols in Molecular Biology*, 4th edition, John Wiley & Sons publishers.
- Glick, B.R. 2009. *Molecular Biology: Principles and Applications of Recombinant DNA Technology*. 4th Edition. ASM Press.
- Primrose, S.B. *et al* 1989. *Principles of Gene Manipulation and Genomics*; Wiley Blackwell Scientific Publ.
- Sambrook, J. and Russel, D.W. 2001. *Molecular Cloning: A Laboratory Manual*. Vol.I-III, Cold Spring Harbor.

BIO 604 GENE REGULATION

(3L+0P) III

Objective

To provide knowledge about the genome organization, gene expression and regulation in prokaryotes and eukaryotes.

Theory

UNIT I

Prokaryotic genome organization and gene clustering; Control of gene expression in Prokaryotes: Bacterial RNA polymerase, Promoters and their properties, Operon concept, *lac* operon, *trp* operon, *ara* operon, various controls of gene expression regulation: Autogenous regulation, Attenuation; Patterns of gene expression control in bacteriophage lambda.

UNIT II

Eukaryotic gene regulation: fundamentals and complexity, Chromatin structure and control of gene expression. Structural motifs in eukaryotic transcription factors.

UNIT III

RNA editing; RNA-interference; Signal transduction and gene regulation in plant development and stress responses.

UNIT IV

Epigenetic control of gene expression.

Suggested Readings:

- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. (2007) *Molecular biology of the cell*. 5th Edition. Garland Science publishers.
- Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. 2009. *Essential of cell biology*. 3rd Edition. Garland Science publishers.
- Becker *et al*. 2008. *The world of cell*. 7th Edition. Benjamin Cummings publishers.
- Lodish, H., Berk, A., Malsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, L. and Darnell, J. 2008. *Molecular cell biology*. 6th Edition. Freeman WH publishers.
- Voet, D., Voet, J. and Pratt, C.W. (2007). *Fundamentals of Biochemistry*. John Wiley.

Objective

To impart knowledge about the catalytic role of enzymes, their structure, Physico-chemical, kinetic and regulatory properties, mechanism of action and their importance in agriculture and allied sectors.

Theory

UNIT I

Enzymes: structure and conformation; classification, assay, isolation, purification and characterization.

UNIT II

Specificity, mechanism of action, steady state and pre-steady state kinetics; Active site mapping, regulation and enzyme activity.

UNIT III

Immobilized enzymes and their applications.

UNIT IV

Enzyme engineering in Agriculture and allied sectors.

Practicals

Soluble protein Estimation by Lowry's Method; Estimation of Urease activity in Soybean; Crystallization of Urease from soybean meal; Alternate method for Urease extraction; Determination of pH optima for Urease ; Determination of the optimum temperature Q_{10} value and activation energy of Urease ; Study the effect of substrate concentration on enzymatic activity of Urease and determination of K_m and V_{max} ; Study of the effect of inhibitor on the activity of Urease; Estimation of ADH and alkaline phosphatase activities; Purification of peroxidase from wheat seedlings.

Suggested Readings

Bergmeyer, H.U. 1983. *Methods of Enzymatic Analysis*. Verlag Chemie, Academic Press.

Dixon, M., Webb, E.C., Thorne, C.J.R. and Tipton, K.F. 1979. *Enzymes*. 3rd Ed. Longman.

Maragoni, A.G. 2003. *Enzyme Kinetics- A Modern Approach*. John Wiley.

Palmer, T. 2001. *Enzymes: Biochemistry, Biotechnology and Clinical Chemistry*, 5th Ed. Harwood Publ.

Price, N.C. and Stevens, L. 2003. *Fundamentals of Enzymology*. Oxford University Press.

Wilson, K. and Walker, J. (Eds.) 2000. *Principles of Techniques of Practical Biochemistry*. 5th Ed. Cambridge Univ. Press.

Objective

To provide knowledge about various metabolic pathways, their regulation and engineering

Theory

UNIT I

Intermediary metabolism of carbohydrates and its regulation.

UNIT II

Bioenergetics; Electron transfer and oxidative phosphorylation; Mechanism of oxidative phosphorylation.

UNIT III

Lipid metabolism – degradation and biosynthesis of fatty acids, sterol biosynthesis, metabolic regulation.

UNIT IV

Amino acid metabolism – general reactions, degradation and biosynthesis of amino acids.

UNIT V

Metabolism of nucleic acids – degradation and biosynthesis of purines and pyrimidines.

UNIT VI

Metabolic pathway engineering.

Suggested Readings

Berg, J.M, Tymoczko, J.L., Stryer, L. and Clarke, N.D. 2000. *Biochemistry*. 5th Ed. WH Freeman & Co.

Metzler, D.E. 2006. *Biochemistry*. Vols. I, II. John Wiley.

Voet, D., Voet, J.G. and Pratt, C.W. 2007. *Fundamentals of Biochemistry*. John Wiley.

Zubey, G.L. 1998. *Biochemistry*. 4th Ed. WCB London.

BIO 607 INORGANIC NITROGEN METABOLISM

(3L+1P)

Objective

To impart knowledge of biochemistry and molecular mechanism of biological nitrogen fixation mechanism and regulation of nitrate assimilation and denitrification processes.

Theory

UNIT I

Biochemistry of nitrogen cycle. Biological nitrogen fixation; Structure, function and regulation of nitrogenase; Structure, function and regulation of *nif* genes in *Klebsiella pneumoniae* and *Clostridium*.

UNIT II

Biochemical basis of legume-Rhizobium symbiosis; Genes involved in symbiosis. Different types of hydrogenases and role of uptake hydrogenase in N₂- fixation; Chemoautotrophy in rhizobia. Biochemistry of ferredoxin and other non-haem iron proteins.

UNIT III

Biochemistry of nitrate assimilation and mechanism of its regulation; GS/GOGAT and GDH pathways; Ureides and amides as nitrogen transport compounds.

UNIT IV

Biochemistry of denitrification process and phosphorylation in denitrifying bacteria. Path of carbon assimilation in nitrifying bacteria.

Practicals

Estimation of nitrate content by hydrazine sulphate reduction method; Estimation of protein by Lowry's Method; *In vivo* assay of nitrate reductase activity; *In vitro* assay of nitrite reductase activity; *In vitro* assay of glutamine synthetase activity; *In vitro* assay of glutamate synthase activity; *In vitro* assay of glutamate dehydrogenase activity; Assay of nitrogenase activity by acetylene reduction method; Estimation of hydrogen evolved by legume nodules.

Suggested Readings

Dilworth *et al.* 2008. *Nitrogen fixing leguminous symbiosis*. Springer Publication.

Morot, J.F. 2007. *Nitrogen assimilation by plants –Physiological, Biochemical and Molecular aspects*. Science Publications.

Rafel, Palacios and William E. Newton 2005. *Genomes and Genomics of Nitrogen fixing organisms*. Springer Publication.

Sara Anancio and Inche Stulen 2004. *Nitrogen Acquisition and Assimilation in higher Plants*. Springer Publication.

Smith *et al.* 2004. *Catalysts for Nitrogen-Nitrogenases, Relevant Chemical models and commercial processes*. Springer Publication.

BIO 608 BIOCHEMISTRY OF BIOTIC AND ABIOTIC STRESSES

(3L+0P) II

Objective

To provide knowledge about the biochemical basis of biotic and abiotic stresses in plants.

Theory

UNIT I

Plant- pathogen interaction and disease development, changes in metabolism of cell wall composition and vascular transport in diseased plants, Expression, structure and activity of gene products caused by genetic mutation, epigenetic phenomena and environmental agents leading to diseases.

UNIT II

Plant defense response, antimicrobial molecules, hypersensitive response and cell death, systemic and acquired resistance, pathogen derived resistance, antipathogenic principles.

UNIT III

Plant viruses, host virus interactions, disease induction, virus movement and host range determination; viroids.

UNIT IV

Biochemical basis of abiotic stresses namely: drought, salinity, temperature, heavy metals, and water pollutants, synthesis and function of proline and glycine betaine, stress tolerance, stress adaptation, interaction between biotic and abiotic stresses.

UNIT V

Reactive oxygen species, antioxidants, enzymes of defense system. Molecular strategies for imparting tolerance against biotic and abiotic stresses.

Suggested Readings

- Basra, A.S. 1997. *Stress Induced Gene Expression in Plants*. Harwood Academic Publ.
- Chessin, M., DeBorde, D. and Zipf, A. 1995. *Antiviral Proteins in Higher Plants*. CRC Press.
- Crute, I.R., Burdon, J.J. and Holub, E.B. (Eds.). 1997. *Gene-for-Gene Relationship in Host Parasite Interactions*. CABI.

BIO 609 BIOCHEMISTRY OF PLANT CELL ORGANELLES

(3L+0P)

Objective

To impart knowledge about structure and function of plant cell organelles and various signaling pathways.

Theory

UNIT I

Cell wall - structure, biogenesis and expansion; Cell membrane - structure and functions, membrane trafficking; Cytoskeleton - Microtubules, microfilaments, and intermediate filaments.

UNIT II

Structure, functions and biogenesis of cell organelles- Endoplasmic reticulum, Golgi Body Complex, Mitochondria, Chloroplast, Ribosome, Lysosome, Peroxisomes, Nucleus (Nuclear envelope with nuclear pore complex, nucleolus, nucleoplasm & chromatin), vacuoles and protein bodies.

UNIT III

Cell division- mitosis, meiosis; cell cycle and its regulation; Cell senescence and programmed cell death; Organization, expression and manipulation of organellar genomes, and their cross-talk with nuclear genome.

UNIT IV

Cell-cell and inter-organellar signaling- Role of plasmodesmata in intercellular transport; intracellular trafficking; signal transduction pathways.

Suggested Readings

- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. (2007) *Molecular Biology of the Cell*. 5th Edition. Garland Science publishers.
- Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. 2009 *Essentials of Cell Biology*. 3rd Edition. Garland Science publishers.
- Becker *et al.* 2008. *The World of Cell*. 7th Edition. Benjamin Cummings publishers.
- Lodish, H., Berk, A., Malsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, L. and Darnell, J. 2008. *Molecular Cell Biology*. 6th Edition. Freeman WH publishers.

BIO 701 CURRENT TOPICS IN BIOCHEMISTRY

(2L+0P) I

Objective

To acquaint the students with recent advances in various fields of Biochemistry and to inculcate the habit of searching and reading the topics of current importance.

Theory

UNIT I

Advanced topics related to nutrition and metabolism.

UNIT II

Advanced topics related to enzymology and industrial biochemistry

UNIT III

Advanced topics related to molecular biochemistry

UNIT IV

Advanced topics related to metabolic engineering and bioprospecting.

Suggested Readings

Selected research articles from most recently published journals.

BIO 702 PROTEOMICS, METABOLOMICS AND IONOMICS

(3L+0P) III

Objective

To impart knowledge in the upcoming areas like Proteomics, Metabolomics and Ionomics and their applications.

Theory

UNIT I

Protein sequencing technologies.

UNIT II

Protein profiling and proteome analysis: Proteome technology, 2D PAGE, MSMS. MALDI-TOF, Protein microarray, comparative and structural proteomics.

UNIT III

Quantitative PCR, SAGE, MPSS, Micro array.

UNIT IV

Metabolomics: Elucidation of metabolic pathways, metabolic pathway engineering. Specific examples of pathway engineering.

UNIT V

Ionomics: Concept of ionome and ionomics. Analytical technology required for ionomics. Applications of ionomics in functional genomics and assessment of physiological status of plants. Role of bioinformatics in ionomics.

Suggested Readings

Baxevanis, A.D. and Owelotte, B.F.F. 2004. *Bioinformatics – A Practical guide to the Analysis of Genes and Proteins*. 3rd Ed. Wiley Intersci.

Dale, J.W. and Schantz, M.V. 2002. *From Genes to Genomics*. John Wiley.

Lieber, D.C. 2002. *Introduction to Proteomics – Tools for New Biology*. Hermana Press.

Suhai, S. 2002. *Genomics and Proteomics – Functional and Computational Aspects*. Eluwer.