

Academic Organizer (2017-18)
B.Sc Biochemistry, Semester-I
Paper I, Biomolecules-I

Lecturer: D.Rajani

Month and No of teaching days	Unit	Name of the topic
June 2	Unit I	Biomolecules I Syllabus dictation and discussion. Introduction to biomolecules.
July 17	Unit I Unit II	Origin of life and introduction to molecules of life. Structure and classification of prokaryotes. Structure and function of eukaryotic cell. Metabolic energy sources. Biological structures and metabolic processes in cell. Acid-base and electrolyte balance in the body. Water as a biological solvent and its role in biological processes. pH, Buffers, Henderson- Hasselbalch equation. Amino acids and peptides , classification and structures. Stereochemistry.
August 15	Unit II Unit III	Chemical reactions of amino acids due to carboxyl and amino groups. Titration curve of glycine and pK_a values. Unusual amino acids. Essential and non-essential amino acids. Peptide bond – nature, Types of conformations. Peptide bond – nature, Types of conformations. Biologically active peptides and polypeptides. Carbohydrates Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation. Reactions of carbohydrates (due to functional groups-hydroxyl, aldehyde and ketone).
September 15	Unit III Unit IV	Glycosides Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose). Structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and blood group substances. Lipids classification, saturated and unsaturated fatty acids. Structure and properties of fats and oils. Acid value, saponification and iodine values, rancidity. General properties and structures of phospholipids and sphingolipids. Cholesterol-structure and properties. Types and functions of lipoproteins.
October 11		Properties of lipid aggregates – micelles, bilayers and liposomes. Composition and architecture of membranes and their fundamental properties. Experimental proof for fluidity and dynamic properties of membranes.

D. Rajani
24/6/17

Academic Organizer (2017-18)
B.Sc Biochemistry, Semester-II
Paper II
Biomolecules-II

Lecturer: D.Rajani

Month and No of teaching days	Unit	Name of the topic
November 14	Unit I	Nucleic Acids: Nature of nucleic acids, Structure of purines, pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali and nucleases on DNA and RNA. Experiments showing DNA as store of genetic information. Structure of Nucleic acids - Watson-Crick DNA double helix. structure.Types of DNA/RNA. Structural variations of DNA/RNA. Palindromes, mirror repeats, hairpin and cruciform Introduction to circular DNA, super coiling. Helix to random coil transition. Denaturation and renaturation of nucleic acids. Hyperchromic effect, T _m values and their significance. Reassociation kinetics, cot curves and their significance.
December 15	Unit I Unit II	Additional functions of nucleotides as energy carriers, as components of enzyme cofactors. Proteins classification based on solubility, shape and functions. Determination of amino acid composition of proteins. General properties of proteins. Denaturation and renaturation of proteins. Denaturation and renaturation of proteins. Structural organization of proteins- primary structure, secondary structure, tertiary and quaternary structures hemoglobin and myoglobin. Strategies of protein sequencing.
January 13	Unit II Unit III	Forces stabilizing the structure of proteins. Bioenergetics I: Energy transformations in the living system. Enthalpy, entropy and Gibb's free energy. Reduction potentials. Free energy concept. exergonic and endergonic reactions. High energy compounds. Role of ATP in biological system. Inorganic phosphate- phosphate group. Phosphate group transfer potential. Substrate level phosphorylation. Cytochrome structure and types.
February 18	Unit IV	Bioenergetics II Biological oxidations: Definition, enzymes involved- oxidases, dehydrogenases and oxygenases. Redox reactions. Ultra structure of mitochondria. Electron transport chain and carriers involved. Coenzymes and proteins as electron carriers. Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell's chemiosmotic theory, F ₀ F ₁ - ATPase. Inhibitors of respiratory chain and oxidative phosphorylation, Uncouplers. Formation of reactive oxygen species and their disposal through enzymatic reactions.

A. Sai Dady

6/8/17

Academic Organizer
(2017-18)
B.SC II YEAR(CBCS)

Semester III: Biochemistry paper III: Enzymology & Metabolism and carbohydrates & lipids
Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
June 12	Unit I Enzymes	Introduction to enzymes, difference between chemical and biological catalyst, active site, enzyme specificity, definitions of holoenzyme, cofactor, coenzyme, apoenzyme, enzyme units, fundamentals of enzyme assay, factors affecting enzyme activity, MM equation, Line weaver Burke plot, significance of Km and Vmax.
July 16 (1 extra)	Unit I Enzymes Unit II Enzyme catalysis	Enzyme inhibition- reversible & irreversible, competitive, non competitive, uncompetitive. Mechanism of enzyme action- covalent, electrostatic, metal ion and acid base catalysis, allosterim and co operativity, covalent modification, zymogens, catalytic antibodies, isoenzyme, multienzyme complex.
August 17	Unit III Carbohydrate Metabolism Unit IV Lipid metabolism	Concepts of anabolism and catabolism, glycolysis –energy, fate of pyruvate- formation of lactate, ethanol, Pasteur effect, TCA cycle- energy and regulation, amhipathic role, gluconeogenesis, glycogen metabolism- synthesis and degradation, HMP pathway and its significance. Photosynthesis- light and dark reactions, C4 pathway. Catabolism of fatty acids (β -oxidation), with even & odd chain
September 11 (1 extra)	Unit III Lipid metabolism	Ketogenesis, <i>denovo</i> synthesis of fatty acids, elongation in microsomes & mitochondria, synthesis & degradation of TAG, lecithin and cholesterol. Role of LDL, HDL, VLDL and chylomicrons in body.
October 2	Unit III Lipid metabolism	Biosynthesis & regulation of cholesterol.

A. Sai Sudh
13/6/17

**Academic Organizer
(2017-18)
B.SC II YEAR (CBCS)**

Semester IV: Biochemistry paper IV: Biochemical Techniques & Metabolism of Amino acids and Nucleotides

Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
November 13 (2 extra)	Unit I Metabolism of amino acids	General reactions of amino acids- transamination, deamination & decarboxylation, urea cycle and its regulation, metabolism of glycine, serine, aspartic acid, methionine, phenyl alanine and leucine, biosynthesis of creatine, nitrogen cycle and biological nitrogen fixation, inborn errors of aromatic and branched chain amino acids.
December 14 (1 extra)	Unit II Metabolism of nucleotides	Metabolism and regulation of purines & pyrimidines (<i>denovo</i> and salvage pathway), ATCase, ribonucleotide reductase, thymidylate synthase & its significance, biosynthesis of heme. Degradation of heme and porphyrins.
January 14 (1 extra)	Unit III Biochemical techniques I	Methods of tissue homogenization, centrifugation- differential, density gradient and ultracentrifugation, principle and applications of paper, TLC, gel filtration, ion exchange, affinity chromatography, peptide sequencing.
February 12 (3 extra)	Unit IV Biochemical techniques II	Principle and applications of paper, agarose and SDS PAGE. Principle of isoelectric focusing, principle and application of colorimeter & spectrophotometer, introduction to fluorimeter, tracer techniques: half - life, β & γ emitters, application of isotopes in biology.

Dr. Sai Jada
6/11/17

Academic Organizer (2017-18)
B.Sc Biochemistry, Semester-V
Paper - V
Physiology and Clinical Biochemistry

Lecturer: D.Rajani

Month and No of teaching days	Unit	Name of the topic
June 10	Unit I	Endocrinology Organization of endocrine system. Classification of hormones. Mechanism of hormonal action - signal transduction pathways for adrenalin, glucocorticoids and insulin. Outlines of chemistry, physiological role and disorders of pituitary and hypothalamic, thyroid and parathyroid, gonads, placental and adrenal hormones.
July 12	Unit I Unit II	Pancreatic hormone and GI hormones. Physiology Digestion and absorption of carbohydrates, lipids and proteins. Composition of blood. Hemoglobin and transport of gases in blood (oxygen and CO ₂). Heart structure of the heart, cardiac cycle, cardiac factors controlling blood pressure. Muscle - kinds of muscles, structure of myofibril, organization of contractile proteins and mechanism of muscle contraction. Nervous system - structure of neuron, resting potential, action potential, propagation of nerve impulse, synapse, synaptic transmission, excitatory and inhibitory neurotransmitters.
August 10	Unit II Unit III	Physiology of vision pigments and visual cycle. Clinical Biochemistry Plasma proteins in health and disease. Coagulation of blood. Disorders of blood coagulation (haemophilia). Types of anemias, Haemoglobinopathies-sickle cell anemia and thalassemias. Disorders of carbohydrate metabolism.
September 10	Unit III Unit IV	Disorders of lipid metabolism- plasma lipoproteins, lipoproteinemias, fatty liver hypercholesterolemia, atherosclerosis. Organs & Functional tests Structure and functions of the liver. Liver function tests. Serum enzymes in liver diseases- SGPT, GGT and ALP. Kidneys - structure of nephron, urine formation, normal and abnormal constituents of urine. Biological buffers. Role of kidneys in maintaining acid-base and electrolyte balance in the body. Renal function tests - creatinine and urea clearance tests, phenol red test. Biochemical tests for the diagnosis of heart diseases - HDL/LDL cholesterol, SGOT, LDH, CK, C-reactive protein, cardiac troponins.
October 3		Liver diseases - jaundice, hepatitis, cirrhosis.

D. Rajani
13/6/17

**Academic organizer
(2017-18)
B.SC III YEAR (NonCBCS)**

Semester V: Biochemistry paper VI: Microbiology, genetics and rDNA technology

Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
June 7 (1 extra)	Unit II Genetics	Genetics: Basic concepts of mendelian inheritance, Mendel's work, monohybrid & dihybrid cross. Non mendelian inheritance : extra chromosomal inheritance, maternal inheritance, importance of meiosis in heredity, sex linked inheritance, x-linked recessive inheritance
July 12 (1 extra)	Unit II Genetics Unit III rDNA technology I	Polygenic inheritance (Introduction to quantitative traits). Mutations: types & mutagens. Outlines of cloning strategies, DNA sequencing, tools of rDNA technology-enzymes, cloning vectors, restriction mapping, construction of cDNA & genomic libraries.
August 11 (1 extra)	Unit III rDNA technology I Unit III rDNA technology II	Host cells- <i>E.coli</i> , <i>Agrobacterium tumefaciens</i> . Isolation & sequencing of cloned genes,-colony & nucleic acid hybridization, HRT,HART,PCR- principles & applications, outlines of blotting techniques-northern, southern, western, applications of rDNA technology-production of insulin, growth hormone, edible vaccines, Bt cotton. Introduction to bioinformatics, sequence alignment
September 9 (1 extra)	Unit I Microbiology	Classification of microorganism, isolation & cultivation of bacteria, selective & enriched media, bacterial growth curve and its kinetics, batch, continuous & synchronous culture, gram's staining, motility , sporulation. Structure and composition of viruses, isolation & cultivation of bacte plaques, life cycle of TMV,HIV.
October 2	Unit I Microbiology	Lytic & lysogenic life cycle of λ phage.

A. Sai Jadh
13/6/17

Academic Organizer
(2017-18)
B.SC III YEAR (Non- CBCS)

Semester VI: Biochemistry paper VII: Molecular Biology
Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
November 9 (1 extra)	Unit I Replication	Organization of prokaryotic and eukaryotic genome. Models of DNA replication, Meselson and Stahl experiment, Nature and structure of a gene, enzymology of DNA replication, helicases, topoisomerase, ligase, primase, DNA pol I,II & III, Initiation, elongation & termination of DNA replication, leading & lagging strand synthesis, bidirectional model, okazaki fragments,
December 10 (2 extra)	Unit I Replication Unit II Transcription	Inhibitors of DNA replication. Introduction to transcription, central dogma, initiation, elongation & termination of transcription, RNA polymerase of prokaryotes and promoters, RNA pol I,II & III, eukaryotic transcription. Processing of mRNA, splicing, capping & tailing. Inhibitors of transcription
January 11 (1 extra)	Unit III Protein synthesis	Introduction to translation, genetic code, Deciphering genetic code- Nirenberg's and Khorana experiment, structure of tRNA & ribosomes, Activation of amino acids – aminoacyl tRNA synthetases. Initiation, elongation & termination of translation, post translational modifications- Glycosylation & phosphorylation, signal hypothesis, inhibitors of translation.
February 10 (1 extra)	Unit IV Regulation of gene expression	Operon concept, Negative and positive regulation, lac operon- catabolite repression, Trp operon- attenuation. Arabinose operon – Dual role of repressor, Galactose operon – Eukaryotic gene regulation in yeast, Definition of epigenetics, DNA methylation, Trinucleotide repeat expansion.

U. Sri Jada
6/11/17

Academic Organizer (2017-18)
B.Sc Biochemistry, Semester-VI
Paper VIII
Immunology and Nutrition

Lecturer: D.Rajani

Month and No of teaching days	Unit	Name of the topic
November 11	Unit III	Nutrition: Introduction to nutrition, CV and RDA values of different foods, balanced diet. SDA, complete and incomplete proteins, BV of proteins, EFA, PEM and PCM, obesity and metabolic disorders. Shelf life and nutritive value of foods.
December 11	Unit IV	Vitamins and Nutrients: Fat and water soluble vitamins, nutraceuticals and functional foods, probiotics, micro and macro nutrients.
January 12	Unit I	Immunology: Organization of immune system, Organs and cells of immune system. Innate and acquired immunity. Cell mediated & humoral immunity, activation of T& B - cells. Classification and structure of immunoglobulins. Structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Theories of antibody formation- clonal selection theory. Monoclonal antibodies and their applications.
February 11	Unit II	Blood group antigens, RIA, ELISA. antigen- antibody reactions, Modern vaccines - recombinant and peptide vaccine. Outlines of hypersensitivity reactions and autoimmune diseases. Fundamentals of graft rejection and MHC proteins.

D. Rajani
6/11/12