

**Academic Organizer (2016-17)**  
**B.Sc Biochemistry, Semester-I**  
**Paper- I, Biomolecules –I**

**Lecturer: D.Rajani**

Month and No of teaching days	Unit	Name of the topic
June 8	Unit I	<b>Introduction to molecules of life</b> Origin of life and introduction to molecules of life. Structure and classification of prokaryotes. Structure and function of eukaryotic cell. Metabolic energy sources employed by prokaryotes Biological structures and metabolic processes in cell.
July 16	Unit I  Unit II	Acid-base and electrolyte balance in the body. Water as a biological solvent and its role in biological processes. pH, Buffers, Henderson- Hasselbalch equation. <b>Amino acids and peptides</b> Classification, structure, stereochemistry. Chemical reactions of amino acids due to carboxyl and amino groups.
August 16	Unit II  Unit III	Titration curve of glycine and pKa values. Essential and non-essential amino acids, Unusual amino acids. Peptide bond – nature, Types of conformations. Biologically active peptides and polypeptides. <b>Carbohydrates:</b> 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). Amino sugars, Glycosides Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose).
September 15	Unit III  Unit IV	Structural polysaccharides (cellulose, chitin, pectin) and storage lysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and blood group substances. <b>Lipids</b> 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. Lipoproteins: Types and functions.
October 5	Unit IV	Properties of lipid aggregates – micelles, bilayers. Liposomes Composition and architecture of membranes. Fundamental properties of biological membranes . Experimental proof for fluidity and dynamic properties.

- A. Sai Padal  
6/5/16

**Academic Organizer (2016-17)**  
**B.Sc Biochemistry, Semester-II**  
**Paper- II, Biomolecules –II**

**Lecturer: D.Rajani**

Month and No of teaching days	Unit	Name of the topic
November 13	Unit I	<b>Nucleic Acids</b> 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 and RNA - Palindromes, mirror repeats, hairpin and cruciform. Introduction to circular DNA, super coiling. Helix to random coil transition. Denaturation and renaturation of nucleic acids.
December 17	Unit I Unit II	Hyperchromic effect, $T_m$ values and their significance. Reassociation kinetics, cot curves and their significance. Additional functions of nucleotides – energy carriers, as components of enzyme cofactors. <b>Proteins</b> Proteins classification based on solubility, shape and functions. Determination of amino acid composition of proteins. General properties of proteins. Denaturation and renaturation of proteins. Structural organization of proteins- primary structure, secondary structure, tertiary and quaternary structures (hemoglobin and myoglobin).
January 16	Unit II Unit III	Forces stabilizing the structure of proteins. Strategies of protein sequencing. <b>Bioenergetics - I</b> 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.
February 14	Unit III Unit IV	Cytochromes - structure, types and their functions. <b>Bioenergetics- II</b> 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 Vade*  
6/6/16

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**B.SC II YEAR**

**Semester III: Paper III: Enzymology & metabolism of carbohydrates and lipids**  
Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
June 14 (1 extra)	Unit I Enzymes	Introduction to biocatalysis, differences between biological & chemical catalysis, nomenclature & classification of enzymes, enzyme specificity, active site, principles of energy of activation, definitions, units, factors affecting, MM equation and significance of Vmax & Km and enzyme inhibition.
July 12 (3 extra)	Unit I Enzymes  Unit II Enzyme catalysis	Fundamentals of enzyme assay.  Mechanism of enzyme action- covalent, acid-base, electrostatic , metal ion. Allosterism and co operativity, covalent modification, zymogens, multi enzyme complex, ribozyme, isoenzymes, immobilized enzymes, abzymes.
August 15 (3 extra)	Unit III Carbohydrate metabolism	Concept of anabolism & catabolism, glycolysis- energy, fate of pyruvate,, Pasteur effect, TCA cycle, anaplerotic reactions, gluconeogenesis, glycogenesis & glycogenolysis, HMP, photosynthesis- light & dark reactions. Lipid metabolism: Ketogenesis
September 10 (2 extra)	Unit IV Lipid metabolism	Catabolism of fatty acids- $\beta$ oxidation of even and odd chain, <i>denovo</i> biosynthesis of fatty acids, elongation in microsomes and mitochondria, biosynthesis and degradation of tri acyl glycerol, lecithin & cholesterol, role of LDL, VLDL, HDL and chylomicrons in our body.

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B.SC II YEAR**

**Semester IV: Paper IV: Biochemical techniques & metabolism of nitrogenous compounds**

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 11 (3 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.
January 15 (1 extra)	Unit II Metabolism of nucleotides  Unit III Biochemical techniques I	Degradation of heme and porphyrins.  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 15	Unit III 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, $\beta$ & $\gamma$ emitters, application of isotopes in biology.

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B.Sc Biochemistry

Paper - III Physiology and Clinical Biochemistry

Lecturer: D. Rajani

Month and No of teaching days	Unit	Name of the topic
June 11	Unit I	<b>Endocrinology</b> 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 Hormones. Outlines of chemistry, physiological role and disorders of thyroid and parathyroid hormones hormones of gonads and placenta.
July 10	Unit I  Unit III	Chemistry, physiological role and disorders of pancreatic and adrenal hormones. Gastrointestinal hormones. Digestion and absorption of carbohydrates, lipids and proteins. Composition of blood. Hemoglobin and transport of gases in blood. Structure of the heart, cardiac cycle, cardiac factors controlling blood pressure. Muscle - kinds of muscles, structure of myofibril, and mechanism of muscle contraction. Nervous system - structure of neuron, nerve impulse, synapse, synaptic transmission, excitatory and inhibitory neurotransmitters. Physiology of vision pigments and visual cycle. <b>Clinical Biochemistry:</b> Introduction to clinical biochemistry.
August 11	Unit III	<b>Clinical Biochemistry</b> Plasma proteins in health and disease. Composition of blood and coagulation of blood. Disorders of blood coagulation. Types of anemias, Haemoglobinopathies-sickle cell anemia and thalassemias. KFTs, LFTs and cardiac markers.
September 10	Unit III  Unit II	Disorders of lipid metabolism- plasma lipoproteins, lipoproteinemias, fatty liver hypercholesterolemia, atherosclerosis <b>Nutrition:</b> Introduction to nutrition, RDA values of different foods, balanced diet.
October 2	Unit II	Dietary principles, BMR, SDA, physical activity, nutraceuticals and functional foods.
November 12	Unit II	Energy requirements, BV of proteins, Obesity and starvation, bulk and trace elements, kwashiorkor and marasmus. Fat soluble and water soluble vitamins.
December 13	Unit IV	<b>Immunology:</b> 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.
January 6	Unit IV	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.

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B.SC III YEAR**

**Biochemistry paper IV: Microbiology and Molecular biology**

Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
June 11	Unit II Replication	Organization of prokaryotic and eukaryotic genome. Experiment to prove DNA as genetic material, 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
July 10 (1 extra)	Unit II Replication & Transcription	Initiation, elongation & termination of DNA replication, leading & lagging strand synthesis, bidirectional model, okazaki fragments, inhibitors of DNA replication. Introduction to transcription, central dogma, initiation, elongation & termination of transcription, RNA polymerase, promoters, RNA pol I,II & III, eukaryotic transcription. Processing of mRNA, splicing, capping & tailing. Inhibitors of transcription
	Unit III	Introduction to translation, genetic code
August 13	Unit III Protein synthesis and regulation of gene expression	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- signal hypothesis, inhibitors of translation. Regulation of gene expression, introduction to induction and repression.
September 9	Unit III Protein synthesis and regulation of gene expression	lac operon- catabolite repression, Trp operon- attenuation.
	Unit IV rDNA technology	Outline of cloning strategy, Enzymes- REN, ligase, DNA modifying enzymes, S1 nuclease.
October 2	Unit IV rDNA technology	DNA sequencing, , host – <i>E.coli</i> , <i>Saccharomyces cerevisiae</i> , <i>Agrobacterium tumefaciens</i>

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November 12	Unit IV rDNA technology	Vectors , Construction of cDNA and genomic libraries, isolation & sequencing of cloned gene- colony, nucleic acid hybridization, HRT, HART using $\beta$ galactosidase, green fluorescent protein.
December 9 (2 extra)	Unit IV rDNA technology  Unit I Microbiology	PCR- principle and applications, blotting techniques and applications of rDNA technology ( Bt cotton, insulin), (Edible vaccines). Bioinformatics-databases, definition of genomics and proteomics, sequence alignment using BLAST & FASTA  Introduction, classification of prokaryotic & eukaryotic organism, isolation and cultivation of bacteria, selective and enriched media, bacterial growth curve and kinetics, batch, continuous and synchronous culture, gram staining, motility and sporulation.
January 10	Unit I Microbiology	Industrial uses of <i>spirulina</i> , <i>yeast</i> , <i>Aspergillus</i> . Structure and composition of viruses, Isolation and cultivation of viruses, one step growth and plaque assay, life cycle of lambda phage, TMV, retro viruses – HIV, prions and mycoplasma.

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