



Mahatma Gandhi University, Nalgonda.
University College of Science, Department of Biochemistry
M.Sc. Biochemistry CBCS Syllabus (with effect from 2021-22 A.Y. admitted batch onwards)

	Sem-I	Sem-II	Sem-III	Sem-IV	Total		
SEMESTER-I							
PAPERS	Subject title with code		Teaching hrs/week	Workload/week	Credits	Internal exam marks	Final exam marks
1	BI 101T: Chemistry and Metabolism of Proteins, Lipids and Porphyrins (core)		4	4	4	20	80
2	BI 102T: Chemistry and Metabolism of Carbohydrates, Nucleic Acids and Vitamins (core)		4	4	4	20	80
3	BI 103T: Bioanalytical Techniques (core)		4	4	4	20	80
4	BI 104T: Bioenergetics and Cell Biology (core)		4	4	4	20	80
	Seminars		2	2	1	--	25
	Add on paper-I		2	2	2	10	40
5	BI 105P: Analysis of Biomolecules and Biochemical Preparations		9	6 (+6@)%	4	--	100
6	BI 106P: Bioanalytical Techniques		9	6 (+6@)%	4	--	100
	Total		38	32 (+12@)%	27	90	585
SEMESTER- II							
PAPERS	Subject title with code		Teaching hrs/week	Workload/week	Credits	Internal exam marks	Final exam marks
1	BI 201T: Enzymology (core)		4	4	4	20	80
2	BI 202T: Molecular Biology (core)		4	4	4	20	80
3	BI 203T: Biochemical Genetics and Model Organisms (core)		4	4	4	20	80
4	BI 204T: Endocrinology and Metabolic Disorders (core)		4	4	4	20	80
	Seminars		2	2	1	--	25
	Add on paper-II		2	2	2	10	40
5	BI 205P: Enzymology and Genetics		9	6 (+6@)%	4	--	100
6	BI 206P: Molecular Biology and Endocrinology		9	6 (+6@)%	4	--	100
	Total		38	32 (+12@)%	27	90	585
SEMESTER- III							
PAPERS	Subject title with code		Teaching hrs/week	Workload/week	credits	Internal exam marks	Final exam marks
1	BI 301T: Gene Regulation and Genetic Engineering (core)		4	4	4	20	80
2	BI 302T: Immunology and Immunotechnology (core)		4	4	4	20	80
3	BI303T: A-Clinical Biochemistry/BI303T:B-Nutrition (Elective)		4 (+4\$)	4 (+4\$)	4	20	80
4	BI304T: Human Physiology and Xenobiotics (core)		4	4	4	20	80
	Seminars		2	2	1	--	25
	#Inter Disciplinary paper-I (ID paper-I) Biomolecules, Nutrition and IPR		4	4	4	20	80
5	BI 305P: Recombinant DNA and Immunotechnology		9	6 (+6@)%	4	--	100
6	BI 306P: Nutrition and Clinical Biochemistry		9	6 (+6@)%	4	--	100
	Total		40 (+4\$)	34 (+4\$)(+12@)%	29	100	625
SEMESTER- IV							
PAPERS	Subject title with code		Teaching hrs/week	Workload/ week	Credits	Internal exam marks	Final exam marks
1	BI 401T: Biostatistics and Bioinformatics (core)		4	4	4	20	80
2	BI 402T: Cell-Cell Communication and Signal Transduction (core)		4	4	4	20	80
3	BI 403T: Microbiology (core)		4	4	4	20	80
4	BI 404T: Biotechnology (core)		4	4	4	20	80
	Seminars		2	2	1	--	25
	#ID paper-II: Health, Immunity and Epidemiology		4	4	4	20	80
5	BI 405P: Bioinformatics, Biostatistics and Biotechnology		9	6 (+6@)%	4	--	100
6	BI 406 P: Project		9	6 (+6@)%	4	--	100
	Total		40	34 (+12@)%	29	100	625
No. of credits	4+4+4+4+1+2+4+4=27	4+4+4+4+1+2+4+4=27	4+4+4+4+1+4+4+4=29	4+4+4+4+1+4+4+4=29	112		
Marks	675	675	725	725	2800		
Total work load of Sem-I & Sem-III						*56(+4\$)(+24@)%	
Total work load of Sem-II & Sem-IV						*56 (+24@)%	

Note: *work load without Add on papers, ID papers and Seminars; %= subject to modification, if each practical is considered as 3 hours workload; #ID papers I and II are offered by Dept. of Biochemistry and can be opted by other course students (not for M.Sc. Biochemistry course students); @ batches are made for practicals, when student number increases more than 15; \$=if two electives are opted by different students.

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Semester-I

Paper-I: BI 101T: Chemistry and Metabolism of Proteins, Lipids and Porphyrins (4 Credits; 100 Marks)

Unit-I: Chemistry of Amino acids & Proteins

1. Classification and structure of 20 amino acids, Essential, Non-essential, unusual/non-protein amino acids
2. General properties of Amino acids, acid-base titration of amino acids, pKa value.
3. Peptide bond-formation and stability, Primary structure.
4. Secondary structures and motifs: α -helix, β -sheet, 3_{10} -helix, Ramachandran plot
5. Leucine zipper, Zinc finger, Trans-membrane domain, bHLH
6. Tertiary & Quaternary structure (Myoglobin, Hemoglobin)
7. Protein-protein interactions (Actin, Tubulin)
8. Small peptides (Glutathione, Peptide Hormones), Cyclic peptides (Gramicidin)
9. Classification of proteins-Globular, Fibrous, Membrane, Metallo-proteins, SCOP, CATH
10. Denaturation (pH, Temperature, Chaotropic agents), Refolding. Role of chaperones in folding

Unit-II: Metabolism of Aminoacids & Proteins


1. Metabolic fate of dietary proteins and Aminoacids
2. Degradations to glucose and ketonebodies
3. Aminoacids degraded to Pyruvate, Oxaloacetate
4. Aminoacids degraded to Acetyl-CoA, Succinyl-CoA
5. Metabolism of branched chain aminoacids
6. Role of glutamate cycle in formation & circulation of ammonia
7. Glucose Alanine cycle, Urea cycle
8. Linking of Citric acid and Urea cycles, regulation of urea cycle
9. Genetic defects in metabolism of aminoacids (Albinism, Phenylketonuria, Maple syrup urine disease, Homocystinuria, Alkaptonuria, Methyl malonic Acidemia)
10. Genetic defects in metabolism of Urea (Argininemia, Arginosuccinic Acidemia, Carbamoyl Phosphate Synthetase-I deficiency)

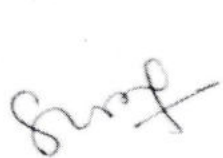
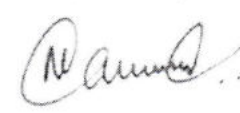
Unit-III: Chemistry of Lipids & Porphyrins

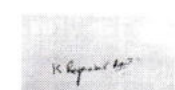

1. Classification & biological significance of lipids & fatty acids
2. Steroids, Sterols, relation to vitamin-D and steroid hormones
3. Bileacids and salts, Phospholipids
4. Oils, waxes, Isoprene units
5. Lipoproteins
6. Glycolipids, Sphinglipids
7. Structure & function of porphyrins (ex. Heme, Chlorophyll)
8. Cerebrosides, Gangliosides
9. Prostaglandins, Prostacyclins
10. Thromboxanes, Leukotrienes


Unit-IV: Metabolism of Lipids & Porphyrins

1. Fate of dietary lipids and Apolipoproteins
2. Fattyacid biosynthesis, Desaturation of fattyacids
3. Betaoxidation, breakdown of odd chain fattyacids, energy yields
4. Regulation of β -oxidation, ω -oxidation & α -oxidation
5. Metabolism of phospholipids & Sphingolipids
6. Regulation and Biosynthesis of cholesterol and other steroids
7. Fate of acetylCoA, formation of ketonebodies and ketosis
8. Biosynthesis of prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes
9. Role of HDL, LDL and Very-low-density lipoprotein (VLDL) and cholesterol levels in body
10. Catabolism of Porphyrins, Genetic defects in lipid metabolism, Medium chain Acyl coenzyme A dehydrogenase deficiency (MCAD), Long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) deficiency, Familial hyper cholesterolemia


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**Paper-II BI 102T:Chemistry and Metabolism of Carbohydrates, Nucleic Acids
and Vitamins.(4 Credits; 100 Marks)**

Unit-I: Chemistry of Carbohydrates

- 1 Classification, Monosaccharides (Aldoses & Ketoses)
- 2 Configuration and conformation of monosaccharides (pyranose & furanose, chair & boat)
- 3 Reducing and optical properties of sugars
- 4 Stability of Glycosidic bond, disaccharides, oligosaccharides
- 5 Structural polysaccharides-Cellulose,Hemicellulose,Pectin,Lignin,Chitin,Chitosan
- 6 Storage polysaccharides: Starch, Glycogen, Inulin
- 7 Steric factors in polysaccharides folding, sugar code and lectin
- 8 Glycosaminoglycans, Mucopolysaccharides, Hyaluronic acid
- 9 Chondroitin Sulfate, Keratin Sulfate, Dermatan Sulfate
- 10 Bacterial cell wall Proteoglycans and Peptidoglycans

Unit-II:Metabolism of Carbohydrates

- 1 Reactions and energy balance in Glycolysis
- 2 Reactions and energy balance in Gluconeogenesis
- 3 Reactions and energy balance in TCA cycle
- 4 Pentose phosphate, Pasteur and Crabtree effect
- 5 Anaplerotic reactions
- 6 Glyoxylate cycle
- 7 Glucuronic acid cycle
- 8 Glycogen metabolism
- 9 Photosynthetic reactions for biosynthesis of Glucose
- 10 C3 and C4 cycle in plants

Unit-III:Chemistry and Metabolism of Nucleic Acids

- 1 Purines, Pyrimidines, Nucleosides, Nucleotides, unusual bases
- 2 Structure of DNA-Watson Crick Model, A and Z-forms
- 3 Supercoiling of DNA-negative and positive,linking number
- 4 Structure of RNA, tRNA, rRNA, siRNA/miRNA
- 5 Properties of NA-denaturation and renaturation
- 6 T_m (factors affecting T_m) and C_0t curves
- 7 Hetero duplex mapping-D loops and R loops
- 8 Biosynthesis of purines and pyrimidines
- 9 Degradation of purines and pyrimidines
- 10 Regulation: *denovo* and salvage pathways, nucleotide analogs

Unit-IV: Chemistry and Metabolism of Vitamins

- 1 Discovery of vitamins,classification, RDA
- 2 Vitamin A-source, biological role and deficiency
- 3 Vitamin B1-Thiamine-source,biological role and deficiency
- 4 Vitamin B2-Riboflavin-source,biological role and deficiency
- 5 Vitamin B3-Niacin and B5-Pantothenic acid-source, biological role and deficiency
- 6 Vitamin B6-Pyridoxamine and B7-Biotin-source,biological role and deficiency
- 7 Vitamin B9-Folic acid and B12-Cobalamine-source,biological role and deficiency
- 8 Vitamin C-Ascorbic acid-source, biological role and deficiency
- 9 Vitamin D-Calciferol-source, biological role and deficiency
- 10 Vitamin E, VitaminK-source, biological role and deficiency

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Paper -III BI 103T: Bioanalytical Techniques.(4 Credits;100 Marks)

Unit-I: Spectroscopy

- 1 Beer Lambert's Law, Molar extinction coefficient, Absorption maximum
- 2 UV-Vis Spectroscopy, Colorimetry – Principle, Instrumentation, Applications
- 3 Fluorescence Spectroscopy–Principle, Instrumentation, Applications
- 4 Atomic Absorption Spectrometry–Principle, Instrumentation, Applications
- 5 NMR–Principle, Instrumentation, Applications
- 6 ESR–Principle, Instrumentation, Applications
- 7 CD–Principle, Instrumentation, Applications
- 8 ORD–Principle, Instrumentation, Applications
- 9 Mass Spectroscopy - Principle, Instrumentation, Applications
- 10 X-ray crystallography

Unit-II: Chromatography

- 1 Partitioning and counter current distribution
- 2 PC–Principle, Instrumentation, Applications
- 3 TLC–Principle, Instrumentation, Applications
- 4 GC–Principle, Instrumentation, Applications
- 5 Ion–exchange–Principle, Instrumentation, Applications
- 6 Gel filtration (Gel exclusion chromatography)–Principle, Applications
- 7 Affinity chromatography–principle, Instrumentation, Applications; immune precipitation
- 8 HPLC and RP-HPLC–Principle, Instrumentation, Applications
- 9 FPLC, LC–Principle, Instrumentation, Applications
- 10 Peptide mapping and N-terminal sequencing of proteins

Unit-III: Centrifugation and Electrophoresis

- 1 Centrifugation RCF and types of rotors
- 2 Ultracentrifugation–principle,instrumentation,application
- 3 CsCl density gradient and sucrose gradient centrifugation–Principle & Applications
- 4 Electrophoresis–moving boundary and zonal electrophoresis
- 5 Native and SDS PAGE, IEF and 2D PAGE
- 6 Agarose Gel Electrophoresis, PFGE
- 7 Zymography, PAGE for DNA sequencing
- 8 DNase-I Hypersensitivity mapping
- 9 DNA-Foot-printing and Chromatin IP methods
- 10 Denaturing gels for RNA, Southern and Northern Blots

Unit-IV: Tracer Techniques

- 1 Stable and radioactive isotopes, Radioactivity theory, half life and emission spectra of
Half life of biologically useful isotopes- ^2H , ^3H , ^{14}C , ^{18}O , ^{32}P , ^{35}S , ^{125}I
- 2 Isotopes used for labeling of proteins(^3H , ^{14}C , ^{35}S , ^{125}I) and nucleic acids (^3H , ^{32}P)
- 3 Detection of radioactivity by Scintillation counting
- 4 Autoradiography, Fluorography, Phosphor-imaging, Applications
- 5 GM counter, gamma counter
- 6 Radiation hazards and safe disposal of radioactivity waste;
Luxometry and chemiluminescence as alternative to radioactivity
- 7 Isotope dilution method–pulse chase
- 8 Historic examples- ^{14}C and ^{18}O to study photosynthesis
- 9 Historic examples- ^{31}P and ^{32}S to study viral replication (Hershey-Chase experiment)
- 10 Historic examples- ^{14}N and ^{15}N in DNA replication (Meselson and Stahl experiment)

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Paper-IV: BI 104T: Bioenergetics and Cell Biology. (4 Credits; 100 Marks)

Unit-I: Bioenergetics

- 1 Elements of importance in Biochemistry (H.C.N.O.P.S), types and energy of bonds and interactions (ionic, covalent, coordinate, H-bonds, vanderwaals, hydrophobic interactions)
- 2 Laws of thermodynamics, Gibbs free energy, relevance of entropy and Enthalpy in biological systems and reactions; First and second-order reactions
- 3 Log and ln scales in biological processes (exponential growth curves, radioactive decay)
- 4 Biological oxidation, high energy compounds
- 5 High energy bonds, redox and phosphate potential
- 6 Structure of membrane, forces stabilizing membranes
- 7 Formation of ion gradients across a membrane (proton gradients in organelles), role of transporters and channels
- 8 ETC in Mitochondria and Chloroplasts, Uncouplers and inhibitors of energy transfer
- 9 Polarization of cell, Resting potential, Action potential, propagation of Impulse
- 10 Biological fluorescence (GFP and derivatives), Bioluminescence

Unit-II: Structure of Prokaryotic cells

- 1 Classification of prokaryotes (systems of classification)
- 2 Ultrastructure of Eubacteria, Cyanobacteria, Mycoplasma
- 3 Motility of bacteria, bacterial films, isolation of bacteria from natural sources
- 4 Sterilization of materials (Autoclaving, dry heat, filtration, chemical disinfection, irradiation) And commonly-used media (minimal, enriched, selective) for bacterial growth
- 5 Staining methods for bacteria; maintenance and preservation of bacterial cultures
- 6 Growth curve, Doubling time, Factors affecting growth-pH, Temperature, oxygen, agitation
- 7 Batch and continuous growth of bacteria, chemostat, synchronized cultures
- 8 Industrial (large-scale) growth of bacteria, fermenter design
- 9 Bacteria of industrial importance, development of commercially valuable strains
- 10 Discovery of Antibiotics, mode of action of various classes of antibiotics, antibiotic resistance

Unit-III: Structure of Eukaryotic cells

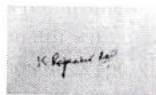
- 1 Ultra-structure of animal cells
- 2 Ultra-structure of plant cells
- 3 Composition of cytoskeleton-microfilaments, microtubules, intermediate filaments
- 4 Nuclear skeleton-lamina, scaffold
- 5 Vesicle trafficking (endocytosis, exocytosis), role of Rabs and Rab GTPases
- 6 Structure of chromatin and chromosomes (centromere, telomere, kinetochore)
- 7 Mitosis, Meiosis, and interaction of chromatin with cytoskeleton (attachment of spindle fibers).
- 8 Formation and structure of special chromosomes (polytene, lampbrush)
- 9 Cell cycle
- 10 Apoptosis

Unit-IV: Methods of Cell Study

- 1 Simple and compound microscope.
- 2 Phase contrast, dark field and polarization microscopy.
- 3 Electron microscopy, SEM, TEM; freeze fracture.
- 4 Fluorescence and Confocal microscopy; imaging live cells.
- 5 FRET and FRAP.
- 6 Atomic force microscopy.
- 7 Flow Cytometry and Fluorescence activated cell sorting (FACS).
- 8 Plant tissue culture.
- 9 Animal and insect tissue culture.
- 10 Methods of cell disruption and fractionation, isolation of organelles.











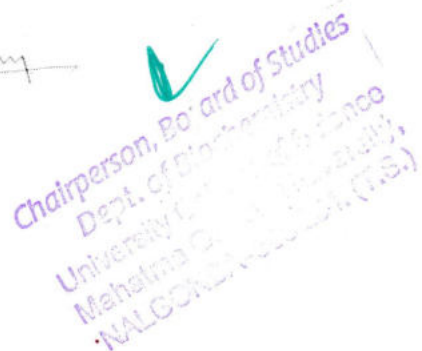












Semester-I: Practicals

Paper-V:BI 105P: Analysis of Biomolecules and Biochemical Preparations	Paper-VI:BI 106P: Bioanalytical Techniques
<ol style="list-style-type: none"> 1 Lab safety, GLP, calculations and preparation of standard solutions 2 Preparation of buffers, use of balance and pH meter 3. Qualitative analysis of amino acids 4. Qualitative analysis of carbohydrates 5. Qualitative analysis of lipids 6. Determination of pK and pI of an amino acid 7. Estimation of amino acids by Ninhydrin method 8. Quantification of Glycine by formal titration 9 Estimation of Tryptophan by Spies and Chambers method 10. Saponification value of fats 11. Iodine number of oil 12. Peroxide value of fats 13. Acid value of fats 14. Estimation of protein by Biuret method/ Lowry method 15. Purification of casein from milk, calculate yield 16. Purification of Albumin from Egg, calculate yield & Fractionation of BSA by salt precipitation 17 Isolation of Starch from potato 18 Isolation of Glycogen from liver 19 Isolation of Lecithin and Cholesterol from Egg yolk 	<ol style="list-style-type: none"> 1. Absorption spectrum of Tyrosine 2. Estimation of inorganic phosphate by Fiske-Subbarow method 3. Estimation of DNA by DPA Method 4. Estimation of RNA by Orcinol Method 5. Estimation of Fructose by Roe's method 6 Titration of calcium in milk 7 Titration of vitamin C 8 Estimation of total sugars by phenol sulfuric acid method 9 Estimation of reducing sugars DNS method 10. Separation of amino acids by Ion-exchange chromatography 11. Separation of Purines and Pyrimidines by paper chromatography 12. 1-D PC of amino acids 13. 2-D PC of amino acids 14. PC of plant pigments 15. TLC of plant pigments 16. TLC of lipids 17. Desalting proteins by Dialysis 18. Gel filtration (size exclusion) 19. SDS PAGE for proteins

Project ideas:

- 1 Compare pigments in different plant parts, different flowers, plants and algae
- 2 Compare unsaturation of various oils and fats
- 3 Determine sugar /vitamin C content in various fruits and soft drinks, calcium content in various milk brands

References:

1. An Introduction to Practical Biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Biochemical Calculations—Segel, I.H. John Wiley & sons
3. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
4. Experiments and Techniques in Biochemistry: by Sheel Sharma, Galgotia publications.

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Semester II

Paper-I: BI 201T:Enzymology. (4 Credits; 100 Marks)

Unit-I:Enzymes, Coenzymes and catalysis

- 1 Thermodynamics of catalysis, Energy of activation, Relation of ΔG and K_{eq}
- 2 Coupled reactions (endergonic and exergonic) in biochemical pathways
- 3 Methods to isolate and purify enzymes, Assays, Activity Units, Specific activity
- 4 Nomenclature and classification of enzymes:EC,SCOP,CATH
- 5 Metalcofactors,and co-enzyme requirements
- 6 Vitamin cofactors: TPP, FMN/FAD, NAD/NADP, Pantothenic acid
- 7 Vitamin cofactors: PLP, Biotin, Folate, Cobalamine, Phylloquinone
- 8 Factors affecting catalysis (pH, temperature, pressure, enzyme and substrate concentration)
- 9 Chemicals to identify active site residues: Arg, Cys, Lys, His
- 10 Site-directed mutagenesis to identify active site residues: Triose Phosphate Isomerase

Unit-II: Enzyme Kinetics

1. Single substrate assumptions, Briggs-Haldane equation.
2. Steady state, Michaelis-Menten kinetics (derive equation and transformations)
3. Transformation of Michaelis-Menten equation.
4. Bi substrate reactions: ordered, random, sequential, Ping-Pong
5. Distinction between ordered and random addition of substrates and products release.
6. Inhibitors (competitive, uncompetitive, noncompetitive, suicide), effect on kinetic constants
7. Enzyme inhibitors as drugs:RT and Protease inhibitors as anti-HIV drugs
8. Cooperativity in binding (oxygen binding to hemoglobin)
9. Multiple sites; Cooperativity: MWC model, KNF model
10. Slow transition and Hysteretic behavior in enzymes

Unit-III: Catalytic Mechanisms

- 1 Types of catalysis:acid-base,transition state,covalent intermediates
- 2 Reversible and irreversible activation of enzymes (pro-enzymes,phosphorylation)
- 3 Enzymes activation by ligand binding and dimerization(protein tyrosine kinase receptors)
- 4 Catalytic mechanism of RNase
- 5 Catalytic mechanism of Chymotrypsin, Trypsin
- 6 Catalytic mechanism of Lysozyme
- 7 Catalytic mechanism of Carboxy peptidase, Subtilisin
- 8 Allosteric regulation of Aspartate Transcarbamylase
- 9 Regulation of Glutamine Synthetase
- 10 Multi-enzyme Complex: Fatty acid synthase

Unit-IV:Enzymes in Physiology and Biotechnology

- 1 Regulatory enzymes in carbohydrate metabolism (Glycolysis, TCA cycle)
- 2 Regulatory enzymes in nucleotide metabolism
- 3 Enzyme cascades (blood clotting, complement activation)
- 4 Enzyme cascades (cell division and Apoptosis)
- 5 Convergent and divergent evolution of enzymes
- 6 Reporter enzymes for gene expression (β -gal, β -glucuronidases, CAT);
Restriction enzymes and ligases in recombinant DNA technology
- 7 Enzymes in dairy (Rennin, Lipases, Lactases), brewing (Amylases, Proteases, Glucanases),
Food processing technology (Invertase, Pectinases, Papain)
- 8 Enzymes in detergent (lipases, cellulases, proteases), paper (Cellulases) and tanning
- 9 Enzymes in bioremediation, biofuel industry (cellulases)
- 10 Enzyme engineering: Catalytic RNA and antibodies; Designing High-Through put enzyme assays

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Paper-II: BI202T:Molecular Biology.(4 Credits;100 Marks)

Unit-I: DNA Replication

- 1 Models of Replication—random, conservative, semi-conservative
- 2 Prokaryotic and Eukaryotic DNA polymerases, Helicases, Ligases, Topoisomerases
- 3 Initiation—primosome, ori-sequences, accessory proteins
- 4 Elongation—Replisome, leading and lagging strands, Okazaki fragments
- 5 Termination, Inhibitors of replication
- 6 Replication of circular chromosomes by theta model- ϕ X174,*E. coli*
- 7 Replication of circular chromosomes by rolling circle (λ phage) and Strand displacement model (mtDNA)
- 8 Replication of linear chromosomes, telomeres, telomerase
- 9 Amplification—Polytene and double minute chromosomes
- 10 *In vitro* replication (PCR)

Unit-II:DNARepair

- 1 Types of damage—oxidation,deamination,alkylation,adducts,breaks
- 2 Direct repair—MGMT, photo-reactivation, AlkB
- 3 Base Excision Repair (Short and Long Patch)
- 4 Nucleotide Excision Repair
- 5 Mismatch Repair
- 6 Repair of DSBs by NHEJ and Homologous recombination
- 7 Holliday junctions and repair of collapsed forks
- 8 SOS and bypass repair
- 9 Diseases due to defects in DNA repair
- 10 Roles of ATM, BRCA in DNArepair

Unit-III:Transcription and Translation

1. Prokaryotic and eukaryotic RNA polymerases
- 2 Initiation—prokaryotic and eukaryotic promoter sequences
- 3 Elongation, Termination—Rho dependent and independent
- 4 Post-transcriptional modifications-capping, Poly A addition
- 5 Splicing, RNA editing; Inhibitors of transcription
- 6 Structure of ribosome, nature of genetic code
- 7 Initiation of translation (role of cap, IRES IFs)
- 8 Elongation of translation (role of EFs)
- 9 Termination of translation (role of RFs)
- 10 Inhibitors of protein synthesis

Unit-IV:Protein Sorting/Targeting and Degradation

- 1 Post translational modifications of proteins, role in targeting (isoprenylation)
- 2 Signal peptide (ERLS),role of SRP in translation of secreted proteins
- 3 NLS, Mitochondrial & chloroplast LS
- 4 Chaperones, HSPs in protein folding
- 5 Lysosomal pathways (endocytosis, crinophagy, macroautophagy, Micro autophagy,direct translocation from cytosol)
- 6 Lysosomal storage diseases
- 7 Ubiquitin-proteasome pathway, N-end rule
- 8 Immuno-proteasomes
- 9 PEST sequences and proteolysis
- 10 Misfolded proteins in Neurodegenerative diseases

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Paper-III: BI 203T: Biochemical Genetics and Model Organisms.
(4 Credits; 100 Marks)

Unit-I: Mendelian Genetics

- 1 Mendel's Laws, Importance of Meiosis in heredity
- 2 Non-Mendelian Inheritance—Maternal effect, Maternal influence, Cytoplasmic inheritance
- 3 Gene interactions—Epistasis, Expressivity, Penetrance
- 4 Sex linked, sex limited and sex influenced genes; Polygenic inheritance and Polyploidy
- 5 Mutations (spontaneous/induced, somatic/germinal, forward/reverse, transition/transversions)
- 6 Mutations (Silent, Missense, Nonsense and Frame shift mutations, conditional, leaky)
- 7 Detection, selection & isolation of microbial mutants, Estimation of mutation rates
- 8 Reversion and suppression of mutations
- 9 Mutagens—physical, chemical
- 10 Transposon mutagenesis, Site-directed mutagenesis

Unit-II: Linkage and Mapping

- 1 Discovery of linkage, Morgan's experiments
- 2 Cytological proof of crossing over
- 3 2- and 3-point crosses
- 4 Recombination, Interference
- 5 Tetrad analysis
- 6 Mapping human genes by pedigree analysis; Fundamentals of population genetics (HW Law)
- 7 Pedigrees of AR, AD, XR and XD inherited traits
- 8 Mobile genetic elements—Zea Ac, Ds and Spm elements
- 9 *Drosophila copia*, Yeast Ty elements
- 10 Using recombination to make knockout cells/organisms

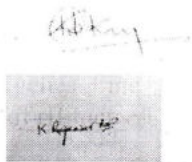
Unit-III: Bacterial Genetics

- 1 Discovery of conjugation
- 2 Mapping bacterial genes by conjugation
- 3 Discovery of transformation
- 4 Mapping bacterial genes by transformation
- 5 Discovery of transduction
- 6 Mapping Bacterial genes by transduction
- 7 Discovery of transposition
- 8 Structure of transposons, replicative and conservative transposition, use as mutagens
- 9 Mapping phage genes—Fine structure of rII locus: Complementation analysis
- 10 Fine structure of rII locus: Deletion mapping

Unit-IV: Model Organisms

- 1 *Dictyostelium* to study cell-cell communication and differentiation.
- 2 *Saccharomyces* to study homologous recombination in mating type switch; site of formation of buds
- 3 *Neurospora* to study one gene—one enzyme hypothesis
- 4 *Drosophila* to study embryonic development (homeotic mutations)
- 5 *C.elegans* to study development and nervous system
- 6 *Danio* to study vertebrate development, GLOfish
- 7 *Xenopus* to study embryogenesis
- 8 *Mus* in bred and knockout strains, NOD and nude mice
- 9 *Zea* to demonstrate cytological proof of crossing over
- 10 *Arabidopsis* to study flower development



















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Paper-IV: BI 204T: Endocrinology and Metabolic Disorders.(4 Credits; 100 Marks)

Unit-I:Hormones and Endocrine glands

- 1 History of endocrinology
- 2 Organization and classification of hormones, endocrine systems and disorders
- 3 Basic mechanism of action of peptide hormones and receptors
- 4 Basic mechanism of action of steroid hormones and receptors
- 5 Chemistry, physiology of Hypothalamus-Pituitary axis
- 6 Chemistry, physiology of thyroid and parathyroid glands
- 7 Glycoprotein hormones (LSH, FSH,TH, hCG, POMC)
- 8 Growth hormone family (GH, hCS, Prolactin)
- 9 Adrenal hormones
- 10 Gonadal hormones

Unit-II:Endocrine regulation

- 1 Regulatory pathways (positive, negative, feedback loops), Regulation of biosynthesis of steroid hormones by peptide hormones (LH, FSH, ACTH)
- 2 Endocrine regulation of growth
- 3 Endocrine regulation of stress
- 4 Endocrinology of Ca homeostasis
- 5 Endocrinology of blood sugar, hunger, digestion and obesity
- 6 Endocrine regulation of renal function
- 7 Endocrine regulation of cardio vascular system (Angiotensin, BNP, ET1)
8. Endocrinology of fertility (changes in menstruation, pregnancy and menopause)
9. Medical uses of steroid hormones (contraception, hydrocortisone, anabolic steroids);
- 10 Erythropoietin, Adipo-cytokines, Orexins, HRT

Unit-III:Disorders of Amino Acid and Carbohydrate Metabolism

- 1 Hyper phenyl alaninemia
- 2 Disorders of proline and hydroxyl proline metabolism
- 3 Alkaptonuria
- 4 Disorders of lysine metabolism
5. Disorders of tyrosine metabolism
6. Hemoglobinopathies;Thalassemia
- 7 Disorders of glycogen storage
- 8 Disorders of fructose metabolism
- 9 Disorders of Galactose metabolism
- 10 Pentosuria, Diabetes

Unit-IV:Disorders of Lipids and Nucleic Acids Metabolism

1. Disorders of acid Lipase deficiency
2. Farber's disease
- 3 Neimann Pick disease
- 4 Goucher's disease
5. Krabbe disease
6. Sulphatide-lipidosis disease
7. Fabry disease
8. Downs and Turner's syndrome
9. Hyperuricemia and Gout
- 10 Hereditary Xanthinurea and Lesch-Nyhan syndrome

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Semester II: Practicals

Paper-V:BI205P:Enzymology and Genetics	Paper-VI:BI206P:Molecular biology and Endocrinology
<ol style="list-style-type: none"> 1 Assay of urease (horse gram / any source) 2 Assay of catalase (Liver / any source) 3 Assay of α amylase (saliva) 4 Assay of β amylase (sweet potato) 5 Effect of enzyme concentration on enzyme activity (salivary amylase) 6 Effect of Time course on enzyme activity (salivary amylase) 7 Effect of pH on enzyme activity 8 Effect of temperature on enzyme activity 9 Effect of Substrate concentration, determine K_m and V_{max} 10. Monohybrid ratio 11. Dihybrid ratio 12. Linkage analysis 13. Pedigree analysis and mapping 14. Tetrad analysis 	<ol style="list-style-type: none"> 1. Isolate DNA (onion/thymus/other source), 2. Absorption spectrum to assess purity (A260/A280 ratio) of DNA 3. A260/A280 ratio of RNA to assess its purity 4. Determine T_m of DNA 5. Prepare RNA (yeast/other source) 6. Agarose Gel Electrophoresis for RNA/ DNA 7. Absorption spectrum, Molar Extinction Coefficient of purine/pyrimidine 8. Estimation of FSH 9. Estimation of LH 10. Estimation of T3 11. Estimation of T4 12. Estimation of TSH 13. Pregnancy Test (strip method) 14. Determine blood glucose 15. Determine urinary glucose

Project ideas:

- 1 Compare abundance of an enzyme in various sources
- 2 Compare sensitivity and/or specificity of different assays for the same enzyme
- 3 Find the effect of some treatment (drug) on your model organism
- 4 Screen natural sources for biodiversity (bacteria, phage, algae, antibiotic-resistant bacteria)

References:

1. Enzyme assays-A Practical Approach, Eisenthal, R and Dawson,MJ, IRL press
2. Practical Biochemistry-Rameshwar.A,Kalyani Publisher
3. Principles of Genetics by Eldon John Gardner,Michael J.Simmons,D.PeterSnustad;JohnWiley
4. Modern Genetic Analysis Anthony JF Griffiths,William M Gelbart,Jeffrey H Miller and Richard C Lewontin.Pub.W.H.Freeman;
5. Statistics,Basic Concepts and Methodology for the Health Sciences DanielWW, Pub Wiley India
6. Lehninger Principles of Biochemistry, DavidL.Nelson,MichaelM.CoxPublisher:W.H.Freeman.

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101T References:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman.
2. Biochemistry-Jeremy M Berg, John L Tymoczko, and Lubert Stryer.: WH Freeman
3. Biochemistry, 4th Edition-Donald Voet, Judith G. Voet.-Publisher John Wiley & Sons.

102T References:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman.
2. Biochemistry-Jeremy M Berg, John L Tymoczko, and Lubert Stryer.: WH Freeman
3. Biochemistry, 4th Edition-Donald Voet, Judith G. Voet-Publisher John Wiley & Sons
4. Principles of Biochemistry: Mammalian Biochemistry: Smith EL, Hill RL, White A, McGraw Hill

103T References:

1. Principles and Techniques of Practical Biochemistry Wilson, K. And Walker, J. Pub: Cambridge Press
2. Physical Biochemistry-Friefelder, Publisher D. W. H. Freeman Press
3. Biophysical Chemistry: Principles and Techniques, 2nd edition by A. Upadhyay, K. Upadhyay and N. Nath. Himalaya Publishing House, Delhi.
4. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman
5. The Tools of Biochemistry, Cooper TG, John Wiley and Sons

104T References:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman
2. Molecular Biology of the Cell, 3rd edition. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts and James D Watson. Publisher New York: Garland Science;
3. The Cell: A Molecular Approach, Fifth Edition by Geoffrey M. Cooper and Robert E. Hausman, published by ASM Press

201T References:

1. Fundamentals of Enzymology, Price, N.C. And Stevens, L., Oxford University Press
2. Enzymes-Biochemistry, Biotechnology, Clinical Chemistry-Palmer, T., Affiliated East-West press
3. Fundamentals of Enzyme Kinetics, Segel IH; Wiley Inter science.
4. Biochemical calculations, 2nd Edition By Irwin H. Segel. John Wiley & Sons.
5. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman

202T References:

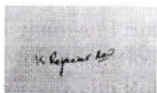
1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W.H. Freeman.
2. Molecular Biology of the Cell, 3rd edition. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts and James D Watson. Publisher New York: Garland Science;
3. Biochemistry, 4th Edition-Donald Voet, Judith G. Voet-Publisher John Wiley & Sons
4. The Cell: A Molecular Approach by Geoffrey M. Cooper and Robert E. Hausman, pub. ASM Press

203T References:

1. Microbiology-Prescott LM, Harley JP, & Klein DA, Mc Graw-Hill
2. Principles of Genetics by Eldon John Gardner, Michael J. Simmons, D. Peter Snustad; John Wiley
3. Modern Genetic Analysis Anthony JF Griffiths, William M Gilbert, Jeffrey H Miller and Richard Lewontin. Pub. W.H. Freeman

204T References:

1. Williams Textbook of Endocrinology Larsen, R.P. Korenberg, H.N. Melmed, S. and Polensky, K.S. Saunders.
2. Human Physiology-Chatterjee, C.C. Medical Allied Agency
3. Principles of Biochemistry: Mammalian Biochemistry: Smith EL, Hill RL, White A, McGraw Hill
4. The metabolic basis of Inherited diseases (Voll & II) Scriver CR., Valle D. Pub McGraw Hill



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Paper-I: BI 301T: Gene Regulation and Genetic Engineering (Core 4 Credits; 100 Marks)

Unit – I: Gene Regulation in Prokaryotes and Viruses

- 1 Operon concept for gene regulation
- 2 Positive (+ve) & Negative (-ve) control – Lac operon
- 3 Attenuation – Trp operon
- 4 Dual promoters – gal operon: Dual function of repressor – ara operon
- 5 Phase variation in *Salmonella* flagellar protein synthesis
- 6 Sporulation gene expression in *Bacillus*
- 7 Riboswitch
- 8 Anti – termination in lambda phage
- 9 Lytic / lysogenic switch in lambda phage
- 10 Control of plasmid copy number

Unit – II: Gene Regulation in Eukaryotes

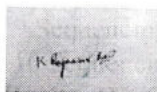
- 1 Chromatin structure in active and inactive regions – DNA Methylation.
- 2 Histone Acetylation, H2AX foci, Histone code
- 3 Transcriptional control – Cell specific expression – Promoters, Enhancers, Transcription factors
- 4 Post transcriptional control – alternative splicing, RNA editing.
- 5 RNA transport and stability.
- 6 Translational feedback.
- 7 Gene silencing – Inactivation of mammalian X chromosome.
- 8 Regulation by siRNA
- 9 Gal operon of yeast.
- 10 MAT locus and mating type switch in yeast, Antigenic variation in *Trypanosoma*

Unit – III: Genetic Engineering-I

- 1 Enzymes in rDNA technology: Restriction Endonucleases (discovery, properties)
- 2 Enzymes in rDNA technology: DNA polymerases, Nucleases
- 3 Enzymes in rDNA technology: Kinases, Phosphatases and Ligases
- 4 Prokaryotic and Eukaryotic vectors (plasmids, cosmids, phagemid, BAC, YAC)
- 5 Shuttle vectors, Expression vectors
- 6 Construction of cDNA and genomic DNA libraries
- 7 Screening a library (+ve) & (-ve) selection strategies, Preparation of probes
- 8 Creating KO cells, Cre – Lox systems.
- 9 Sequencing DNA by Maxam-Gilbert and Sangar method.
- 10 Sequencing DNA by Pyrosequencing.

Unit – IV: Genetic Engineering-II

- 1 Yeast 2 hybrid
- 2 Phage display
- 3 Reporter genes – GFP, beta – gal, luciferase
- 4 Expression in heterologous systems – bacteria
- 5 Expression in heterologous system – yeast cells
- 6 Expression in heterologous system – insect cells
- 7 Expression in heterologous system – mammalian cells
- 8 Molecular markers – RFLP, AFLP
- 9 Random amplification of polymorphic DNA (RAPD), Short Tandem Repeat, Single Nucleotide Polymorphism (SNP), Ribotyping
- 10 Synthetic Biology: Introduction and Applications (Plant meat, Kymriah - a treatment for leukemia, PROVEN-Nitrogen fertilizer)



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Paper-II: BI 302T: Immunology and Immunotechnology (Core 4 Credits; 100 Marks)

Unit – I: Components of the Immune System

- 1 History of Immunology
- 2 Natural & Acquired immunity, Specific & non-specific immune response.
- 3 Cells & organs of immune system
- 4 Antigenic determinants, Epitopes, Haptens, Properties of strong antigens
- 5 Adjuvants – types, mode of action, and applications.
- 6 Classification, structure and biological properties of Immunoglobulins
- 7 Isotypes, Allotype, Idiotype.
- 8 Theories of antibody formation, Generation of antibody diversity
- 9 Genomic rearrangements of light and heavy – chain loci in B-cells
- 10 Genomic rearrangements in T-cell receptor, structure of CD3, CD4, CD8.

Unit – II: Events in Immune Response

- 1 Humoral & cell-mediated immune response
- 2 Activation of T cells & B cells
- 3 Kinetics and regulation of primary and secondary immune response
- 4 MHC proteins structure & functions
- 5 Antigen processing & presentation
- 6 Transplantation immunology; Graft Versus Host Disease
- 7 Complement fixation: pathways and biological consequences
- 8 Discovery and action of Interferons
- 9 Cytokines; Inflammation; Role in obesity, cancer
- 10 Tumor immunology

Unit – III: Immune Disorders

- 1 Hypersensitivity; Coombs classification
- 2 Type I-V hypersensitivity
- 3 Tests for diagnosis of hypersensitivity (Coombs), Tuberculin test.
- 4 Auto immune diseases; classification
- 5 Study of selected auto – immune disorders of types I – V
- 6 Immuno deficiency disorders – primary and secondary deficiencies
- 7 Gene therapy for ADA deficiency
- 8 Immunology of AIDS
- 9 Immunosuppressive drugs/agents & their mechanism of action
- 10 Immune evasion by bacteria and viruses

Unit – IV: Immunotechnology

- 1 Production of polyclonal antibodies; Animals models for production of antibodies
- 2 Methods of antibody purification: Salt precipitation, Affinity chromatography
- 3 Antigen-antibody binding (Equilibrium dialysis, Surface Plasmon Resonance); Affinity, Avidity
- 4 Immunoprecipitation methods - gel diffusion (Ouchterlony; Mancini); Immune-electrophoresis (Rocket, counter-, 2-D)
- 5 Agglutination tests (Direct and indirect), Inhibition of Agglutination, Complement fixation test, Inhibition of complement fixation
- 6 ELISA, RIA Western Blots; use of antibody staining for FACS
- 7 Hybridoma technology – production of monoclonal antibodies; applications in research and immunotherapy; antibody engineering
- 8 History and types of Vaccines; Conventional vaccines - killed, attenuated, and subunit vaccines
- 9 Modern vaccines; peptide, DNA, recombinant / vector, and anti-idiotypic vaccines
- 10 Schedules of common vaccination, Benefits and adverse consequences of vaccination

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Paper-III: BI 303T: A- Clinical Biochemistry (Elective –A)
(4 Credits; 100 Marks)

Unit – I: Clinical Biochemistry-I

- 1 Free radical metabolism, ROS in disease
- 2 Neuro-endocrine regulation
3. Endocrine regulation of growth
- 4 Endocrine regulation of salt, electrolyte and water, Acid base balance and imbalance
- 5 Endocrine regulation of calcium & phosphate
- 6 Specimen collection. Automation and QA in clinical laboratories
- 7 Examination of Urine & Blood
- 8 Examination of Sputum & CSF
- 9 Pregnancy test, prenatal diagnosis & genetic counseling
- 10 Clinical importance of Enzymes and isoenzymes

Unit – II: Clinical Biochemistry-II

- 1 Physiological Interrelationship between cardiovascular, respiratory and renal systems
- 2 Normal values for different blood tests and clinical implications
- 3 Diagnosis of Anemia, Thalassemia
- 4 Hyper cholesterolemia, Atherosclerosis.
- 5 Diagnostic enzymes: Principles of diagnostic enzymology.
- 6 Clinical significance of Aspartate amino transferase, Alanine amino transferase, Creatine kinase
- 7 Clinical significance of Aldolase and Lactate dehydrogenase.
- 8 Enzyme tests in determination of myocardial infarction
- 9 Biochemical tests for the diagnosis of heart diseases- HDL/LDL cholesterol, SGOT, LDH, CK, C-reactive protein, cardiac troponins.
- 10 Diagnostic and therapeutic uses of radioisotopes

Unit – III: liver and Renal function tests

- 1 Structure and functions of the Liver.
- 2 Liver diseases: Jaundice, Hepatitis, Cirrhosis, Fatty liver
- 3 Liver function tests: conjugated and total bilirubin in serum, albumin: globulin ratio, hippuric acid and bromsulphthalein tests.
- 4 Serum enzymes in liver diseases: SGPT, GGT and Alkaline Phosphatase.
- 5 Kidneys-structure of Nephron, urine formation
- 6 Normal and abnormal constituents of urine.
- 7 Normal values for different urine tests and clinical implications
- 8 Biological buffers.
- 9 Role of kidneys in maintaining acid-base and electrolyte balance in the body.
- 10 Renal function tests- Creatinine and Urea clearance tests, phenol red test.

Unit – IV: Clinical aspects of disorders of Lipid metabolism and Gastric, Thyroid function tests

1. Physiology of lipids/lipoproteins. 2. Lipidosis. 3. Lipoproteins and Apolipoproteins.
4. Disorders of lipid metabolism: Lipoproteinemias 5. Clinical inter relationships of lipids (sphingo-lipidosis and Multiple Sclerosis) 6. Diagnostic tests for HDL-cholesterol, LDL-cholesterol and triglyceride disorders. 7. Fractional gastric analysis: Achylia gastric, Stimulation tests, Tube less gastric analysis 8. Tests based on primary function of Thyroid, Tests measuring blood levels of thyroid hormones 9. Tests based on metabolic effects of thyroid hormones 10. Thyroid scanning, Immunological tests for thyroid function

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Paper-III: BI 303T: B - Nutrition (Elective –B) (4 Credits; 100 Marks)

Unit – I: Nutrition

- 1 Balanced diet
2. Calorific values of foods and their determination by Bomb Calorimeter.
- 3 Specific Dynamic Action of foods
- 4 Nutritional assessment by clinical testing; Anthropometric and Biochemical testing
- 5 BMR and RDA for infants, children, adults and expectant / nursing mothers; Food fortification; Probiotics.
- 6 Organs of digestive system; Enzymes (Amylases, Proteases, Lipases)
- 7 Hormones in digestion (stomach, pancreas; gastrin, secretin, CCK);
- 8 Role of bile acids
9. Absorption; Control of food intake (Leptin, Ghrelin, Peptide YY)
- 10 Cholesterol, Sodium and Blood Pressure

Unit – II: Dietetics

- 1 Protein factor in Nutrition
2. Role of carbohydrates in diet
3. Role of lipids in the diet
- 4 Malnutrition (PEM, Marasmus, Kwashiorkor), Obesity (BMI and other metrics)
- 5 Eating disorders; Anorexia and bulimia; Obesity and starvation.
- 6 Diet and longevity, ageing.
- 7 Diet in pregnancy and lactation (first 1000 days)
- 8 Composition and nutritive value of common foodstuffs
- 9 Electrolyte content of fluid compartments, Functions of electrolyte, Sodium, Potassium and Chloride, Absorption, Transport and balance
- 10 Factors effecting electrolyte balance and hydrogen ion balance.

Unit – III: Macrominerals and Microminerals

- 1 Macrominerals
- 2 Calcium Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Source, RDA
- 3 Regulation of Calcium concentration, Calcium interaction with other nutrients.
- 4 Phosphorus Distribution, Concentration in the body, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Sources, Calcium: Phosphorus ratio.
- 5 Disorders of mineral metabolism: Hypercalcaemia, Hypocalcaemia, Normocalcaemia, Hypophosphataemia and Hyperphosphataemia
- 6 Iron Distribution, Concentration in the body, Digestion, Absorption, Utilization, Transport, Storage, Excretion, Sources
- 7 RDA, interaction with other nutrients
- 8 Role of iron in prevention of Anaemia.
- 9 Microminerals: Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Sources, distribution in the human body
- 10 Physiology, function, deficiency and toxicity of microminerals

Unit – IV: Food Microbiology

- 1 General principles underlying spoilage of food
- 2 Fitness and unfitness of food for consumption, contamination and spoilage of non perishable and perishable foods.
- 3 Food born diseases, food infection, intoxication
- 4 Microbial toxins types, bacterial poisoning
- 5 Causative agents and sources, symptoms and prevention of *Staphylococcal* food poisoning, Botulism, *Salmonella*, *Bacillus* infection, *E.coli*,
- 6 Food poisoning of fungal origin Ergotism, Aflatoxin.
- 7 Control of Microorganisms
- 8 Principles of preservation, Preservation by high and low temperature.
- 9 Chemical preservatives, salt, sugar as preservative
- 10 New trends in preservation.



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Paper-IV: BI 304T: Human Physiology and Xenobiotics (Core, 4 Credits; 100 Marks)

Unit – I: Neurophysiology

- 1 Types of neuronal cells – Neuroglia, Microglia, Astrocytes, Oligodendrocytes, Schwann, Satellite and Epididymal cells
- 2 Nerves: regeneration of nerve fibers, generation of nerve impulse, all or none principle.
- 3 Mechanism of Synaptic Transmission, Transmission of Nerve Impulse.
- 4 Types of neurotransmitters and their receptors, mode of signaling
- 5 Electrical synapse and giant neurons
- 6 Division of vertebrate nervous system: CNS, PNS, ANS, regions of the brain
- 7 Sensory organs – Eye, Ear, Skin, Tongue
- 8 Vision: visual system, Rhodopsin and classical GPCR mechanism, termination of visual signal
- 9 Cone cells, specialization in color vision, physiology of colour blindness
- 10 Similarity between vision, olfaction and gestation

Unit – II: Structure and Physiology of Muscle

- 1 Structure of various types of muscle: striated, cardiac, smooth, fast twitch, slow twitch
- 2 Mechanism of muscle contraction, regulation of contraction
- 3 Role of Actin and Myosin in non-muscle cells.
- 4 Cytochalasins and cytokinesis.
- 5 Muscle gene expression, regulation at transcriptional and posttranscriptional level.
- 6 Role of muscle proteins in cell locomotion
- 7 Neuro-muscular transmission
- 8 Electromyography, Sherrington starling Kymograph (recording drum)
- 9 Disorders of muscle (dystrophy, myopathy, monocytosis, myotonia, paralysis, Myasthenia gravis)
- 10 Detection and treatment of muscle disorders

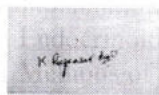
Unit – III: Human Reproductive Biology

- 1 Female Reproductive system: Anatomy and Endocrinology
- 2 Causes of female infertility (acquired and genetic, PCOD) treatments
- 3 Male reproductive system: anatomy and endocrinology
- 4 Causes of male infertility (environmental and genetic), treatments
- 5 Puberty, reproductive aging (menopause and andropause)
- 6 Gametogenesis and fertilization (natural and assisted (*in vitro*)),
- 7 Implantation and placenta
8. Endocrinology of Pregnancy and parturition
9. Methods of Birth control
- 10 Placenta as source of stem cells, cord banking

Unit – IV: Liver and Xenobiotics

- 1 Liver functions, pharmacopeia drug deposition and mechanisms of drug detoxification
- 2 Cytochrome P450 enzymes, molecular biology, catalytic cycle, Isozymes, Inhibitors
- 3 Dose response relationship, drug-receptors interactions
- 4 Pharmacodynamics; pharmacokinetics
- 5 Phase I reactions - modifications
- 6 Phase II reactions - conjugation
- 7 Phase III reactions - modifications and elimination,
- 8 Environmental factors influencing drug metabolism
- 9 Effects and metabolism of model toxins: Aflatoxins, Bacterial Exotoxins (types I, II and III)
- 10 Nutrient drug interactions – I and II

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Semester III: Practicals

Paper-V: BI 305P: Recombinant DNA and Immunotechnology

- 1 Restriction digestion of DNA
- 2 Preparation of competent cells
- 3 Transformation of competent cells
- 4 Gene cloning (demonstration)
- 5 Blue-white screening/ α -complementation
- 6 Expression of heterologous protein in *E. coli*
- 7 Purification of IgG by Gel Filtration technique
- 8 Purification of IgG by Affinity Chromatography
- 9 SDS PAGE of Ig fractions
- 10 Agglutination: ABO and D Ag typing
- 11 Radial Immuno diffusion
- 12 Ochterlony double diffusion
- 13 Rocket Immunoelectrophoresis
- 14 Dot ELISA
- 15 Sandwich ELISA

References:

1. Molecular Cloning (Lab manual) by Maniatis T, Fritsch EF, Sambrook J, Volume –I, CSH
2. Lab Manual in Biochemistry, Immunology and Biotechnology – Arti Nigam and Archana Ayyagari –Tata McGraw-Hill New Delhi

Paper-VI: BI 306P: Nutrition and Clinical Biochemistry

1. Determination of total protein content in a food item
2. Determination of total carbohydrate content in a food item
3. Determination of lipid content in a food item
4. Qualitative analysis of abnormal constituents in urine
5. Determination of PCV and ESR
6. Differential count
7. Determination of osmotic fragility of RBC
8. Laboratory test to measure coagulation
9. Determination of Urinary Creatinine
10. Determination of Blood Haemoglobin
11. Determination of Blood Urea
12. Assay of serum Alkaline Phosphatase
13. Assay of serum ALT (SGPT)
14. Assay of serum AST (SGOT)
15. Assay of serum LDH

References:

1. Practical Clinical Biochemistry –Varley, H. CBS Publications
2. Practical Clinical Biochemistry-Methods and Interpretations – Ranjna Chawla- Jaypee
3. Manipal Manual of Clinical Biochemistry: For Medical Laboratory and MSc Students By S. Nayak, Shivnanda Nayak B, JAPEE Brother Medical Publications, New Delhi

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Paper-I: BI 401T: Biostatistics and Bioinformatics (Core, 4 Credits: 100 Marks)

Unit – I: Concepts in Biostatistics

- 1 Biostatistics fundamentals (sample, population, variable); Types of variables, Measurement and measurement scales
- 2 Measures of central tendency (Mean, Median, Mode)
- 3 Measurement of dispersion (Range, Variance, Standard Distribution)
- 4 Study of bivariate data: correlation and regression; Regression to calculate concentration of DNA/protein, molecular weight of DNA/protein
- 5 Graphical methods to depict data (Histograms, Bar-plots, Pie charts, Line graphs)
- 6 Probability in biology, Laws of Probability
- 7 Bayesian probability
- 8 Normal distribution.
- 9 Binominal distribution.
- 10 Poisson distribution

Unit – II: Applications of Biostatistics

- 1 Design of experiments: factorial experiments
- 2 Student's t – test
- 3 F – test
- 4 Chi – square test; Contingency tests
- 5 CRD: Completely Randomized Design; 1-way ANOVA
- 6 RCBD: Randomized Complete Block Design; 2-way ANOVA
- 7 Non parametric tests: sign test
- 8 Wilcoxon signed rank test, Mann-Whitney test
- 9 Kruskal-Wallis test, and Friedman tests
- 10 Quality control in biochemistry

Unit – III: Genomics

- 1 Genomics and branches of genomics (Why study a genome?)
2. Basics of Bioinformatics: BLAST, FASTA, PAM and BLOSUM matrices
3. DNA sequence databases, Use of databases; data mining
4. Comparing DNA sequences, Pairwise local and Global alignment
5. Multiple sequence alignments (Phylogenetic trees, Clustal-W, COBALT)
6. HGP and Strategies for sequencing genomes (shotgun and hierarchical sequencing)
7. 1st generation sequencing methods (Maxam and Gilbert Method; Sanger's method)
8. 2nd and 3rd Generation DNA sequencing methods (Next Generation Sequencing)
9. Genetic and Physical maps of the Genome, EST, STS
10. Epigenomics and Metagenomics

Unit – IV: Transcriptomics and Proteomics

- 1 Relation of transcriptome to genome and proteome (Why study a transcriptome?)
- 2 Tools of transcriptomics: Northern blots, RNase protection assays, RT-PCR and Q-PCR
- 3 HT tools of transcriptomics: Microarrays for expression profiling, alternate sequencing
- 4 HT RNA sequencing: SAGE, MPSS, RNA-Seq, GIGA
- 5 Identifying expressed sequences by ChIP-seq, DNase-seq
- 6 Transcriptome databases (ESTs, Transcriptome Shotgun Assembly, Array Express)
- 7 Methods for sequencing proteins: Edman degradation
- 8 MS – MALDI, LC-MS, Tandem MS (MS-MS)
- 9 Micro-arrays for proteins, 2D gels and peptide maps
- 10 Proteins structure databases; Peptide sequence and MS profiles databases, Comparing protein sequences, alignment

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**Paper-II: 402T: Cell-Cell Communication and Signal Transduction
(Core, 4Credits:100 Marks)**

Unit – I: Extra Cellular Matrix (ECM) and Cell Surface

1. Molecules in the ECM in plant and animals.
2. Transport across cell membrane, Ficks Law.
3. Types of transport- simple, passive, facilitated.
4. Active transport, primary and secondary active transport system.
5. Ionophores, gated channels (Voltage and Ligand).
6. Cell communication and type of signaling molecules.
7. Types of receptors and their structure.
8. GPCR, inhibitory and stimulatory and type of down steam effectors and signal termination.
9. Monomeric G-proteins their role.
10. Drugs targeting signaling molecules

Unit – II: Cell Signaling

1. Cell division and differentiation.
2. Autocrine, paracrine & endocrine systems
3. Growth factors – EGF, PDGF
4. VEGF, IGF
5. Second messengers – Ca, calmodulin, inositol, NO, cAMP, cGMP
6. Receptors tyrosine kinases (Insulin signaling)
7. MAPK pathway, role in signaling.
8. Role of post-translational modification of proteins in signaling – phosphorylation.
9. Acylation, glycosylation, ADP ribosylation, myristoylation.
10. Signal cascades, Inhibitors of signal cascades.

Unit – III: Signal Transduction and Cancer

1. Discovery of oncogenes, proto-oncogenes
2. Modes of action of oncogenes – G proteins – Ras
3. Growth factors – Erb, Sis
4. Transcription factors – Fos, Jun, AP1, V-erbA
5. Discovery of tumor suppressor genes
6. RB and retinoblastoma, APC and colon cancer.
7. Modes of action of TS genes – p110, p16, p21, Phosphatase and tensin homolog (pTEN)
8. p53 and cancer risk
9. Selected examples – c-Myc and leukemia
10. BRCA and breast cancer

Unit – IV: Signal Transduction in Bacteria and Plants

1. Introduction of signaling components in bacteria
2. Chemotaxis
3. Protein kinases in bacteria
4. His-kinases: structure and role
5. Plant signaling system an over view
6. Stress signaling in plants (biotic)
7. Stress signaling in plants (abiotic)
8. Plants hormones and their mechanism of action
9. Signaling in yeast
10. STAT pathway in yeast

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Paper-III: BI 403T: Microbiology (Core, 4Credits:100 Marks)

Unit I: Bacteriology

1. Classification of prokaryotes,
2. Staining methods,
3. Common culture methods (minimal, enriched, selective).
4. Structure of bacterial cell,
5. Motility of bacteria, bacterial films,
6. Sterilization methods (Autoclaving, dry heat, filtration, chemical disinfectants, irradiation),
7. Maintenance and preservation of microbial cultures.
8. Bacterial culture growth conditions, growth curve, doubling time.
9. Factors affecting growth –pH, temperature, oxygen and agitation.
10. Chemostat, continuous and synchronous cultures

Unit II: Mycology

1. Classification: classification of Fungi (Ainsworth, 1973) upto sub-division with diagnostic characters and examples.
2. Hyphal forms,
3. Fungal spore forms and mode of liberation,
4. Sexual reproduction and degeneration of sex,
5. Homothallism and Heterothallism, life cycle patterns,
6. Anamorphic fungi and parasexuality 3.
7. Life history of synchytrium,
8. Life history of *Rhizopus*, *Ascobolus*,
9. Life history of *Agaricus*, Micorrhiza types with salient features,
10. Role in agriculture and forestry.

Unit III: Prokaryotic viruses

1. Discovery of Bacteriophages
2. Structure and composition of Bacteriophages; classification
3. Genome diversity and host-specific interactions
4. Isolation and purification by filtration, Ultracentrifugation and Affinity chromatography
5. Plaque assay and other assay methods
6. One step growth, single burst and eclipse experiments
7. Life cycle of model Bacteriophages infecting *E.coli* – lambda phage (lytic and lysogenic)
8. Φ x174, Q β , M13
9. T4, T7
10. Phages in therapy

Unit-IV: Eukaryotic viruses

1. Classification of Animal viruses, Virioids and virusoids
2. Structure of naked and enveloped viruses
3. Host-virus interactions, permissive/non-permissive hosts; cytopathic effects
4. Isolation and purification of viruses
5. Assay methods-Pock assay, hemagglutination assay, transformation assay
6. Cultivation of viruses in animals and tissue culture
7. Life cycle of animal viruses – SV40
8. Adenovirus, Poliovirus
9. Retroviruses – RSV/HIV
10. Plant viruses – TMV, CaMV

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Semester IV: Practicals

Paper-V: BI 405P: Bioinformatics, Biostatistics and Biotechnology

1. OMIM database and human genetic disorders
2. Retrieve DNA, protein sequence from database (NCBI)
3. Retrieve protein structure from database (PDB)
4. KEGG database for pathways
5. Local, Global alignment of DNA, protein
6. Multiple sequence alignments
7. Descriptive statistics (Mean, Median, Mode, Range, Variance, Standard Deviation)
8. Correlation and regression
9. Binomial, Poisson and Normal distribution
10. Z, T, F and Chi-square tests
11. Polymerase Chain Reaction
12. Isolation of plasmid DNA
13. Production of alcohol by *Saccharomyces cerevisiacea*
14. Production of any microbial enzyme
15. Plant tissue culture: Callus induction
16. Immobilization of yeast cells

References:

1. Bioinformatics (Sequence and Genome Analysis) Mount David W, Press CSH
2. Biostatistics by con and conum
3. Biostatistics -Arora & Malhan, Himalaya Publishing House
4. Methods In Biotechnology, edited by Hans-Peter Schmauder. Taylor & Francis

Paper-VI: BI 406P: Project

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301T References:

1. Genes VIII, Lewin, B, Publish Oxford University Press
2. Principles of Gene Manipulation: An introduction to GE – Old, R. and Primrose, S.B. Blackwell Sci. Pub
3. Molecular Biotechnology Glick, BR and Paternak, JJ. Publish ASM Press
4. Molecular Biology of the Gene by Watson JD, Losick R. Pub Pearson Education

302T References:

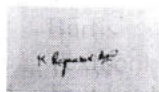
1. Kuby Immunology – Edited Thomas J. Kindt, Richard A Goldsby, Publisher WH Freeman & Co
2. Roitt's Essential Immunology, Tenth Edition, Ivan Roitt, Peter Delves
3. Veterinary Immunology: Ian R. Tizard, I.R. Thomson press
4. The Immune System. By Peter Parham Publisher Garland publishing

303T E1- Clinical Biochemistry References:

1. Text book of Biochemistry and Human Biology –Talwar , G.P. and Srivastava. L.M., Printice Hall of india
2. Human Physiology –Chatterjee.C.C, Medical Allied Agency
3. Textbook of Medical Biochemistry By MN Chatterjea and Rana Shinde, Jaypee Brothers.
4. Lehninger Principles of Biochemistry 5thEdByDavid L. Nelson and MichaelM. Cox,WH Freeman and Company.
5. Clinical Biochemistry: An Illustrated Colour Text (Paperback) 3rdEd
By Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd. Publisher: Churchill Livingstone.
6. Harper's Biochemistry (Lange Medical Books) (Paperback) by Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell. Publisher: Appelton and Lange.
7. Clinical Biochemistry by Richard Luxton. Scion Publishing Ltd.

303T E2- Nutrition References:

1. Essentials of Food and Nutrition –Swaminathan M. Bangalore Press
2. Tietz textbook of clinical chemistry and molecular diagnostics edited by Carl. A. Burtis
3. Textbook of Medical physiology by Guyton and Hall
4. Text book of medical biochemistry by MN Chatterjea and Rana Shinde
5. Food microbiology -Adams, M.R. and Moss M.O.
6. Foundations in Microbiology -Kathleen Talaro and Arthur Talaro
7. Industrial Microbiology -Patel, H.P.
8. Industrial Microbiology –Casida
9. Industrial Microbiology -Prescott and Dunn
10. Microbiology -Concepts and Applications -Paul A. Ketchum
11. Microbiology Concepts and Applications -McKane and Kandel
12. Bergeys Manual of Determinative Bacteriology
IX edition
13. Elements of Biotechnology - Gupta
14. Elements of Biotechnology - Singh
15. Food Technology Latest Issues



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304 T References:

1. Human Physiology by Guyton and Hall Press Pub Saunders
2. Biochemistry, 4th Edition - Donald Voet, Judith G. Voet – Publisher John Wiley & Sons.
3. Human reproductive Biology by Jones and Lopez Pub
4. Principles of Biochemistry: Mammalian Biochemistry: Smith EL, Hill RL, White A, McGraw Hill

401T References:

1. Statistics, Basic Concepts and Methodology for the Health Sciences Daniel WW, Pub Wiley India
2. Biochemical Calculations –Segel, I.H. John Wiley & Sons.
3. Math's from Scratch for Biologists Alan J, Cann, John Wiley & Sons
4. Calculus for Biology and Medicine, Claudida Neuhauser (third edition) Publications Prentice Hall
5. Biostatistics –Arora & Malhan, Himalaya Publishing House
6. Introduction to Bioinformatics- Attwood T K and parry –smith, D.J. Pearson Education
7. Bioinformatics (Sequence and Genome Analysis) Mount David W, Press CSH
8. Discovering Genomics, Proteomics and Bioinformatics – Campell & Heyer, Benjamin / Cummings pub

402T References:

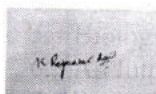
1. The Biochemistry of Cell Signaling, Helmreich JM, Oxford Press
2. Cell signaling – John T Hancock, Oxford University press
3. Cell biology. Second edition: Edited by C A Smith and E J Wood. Chapman & Hall publ
4. Molecular Cell Biology, 4th edition. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore and James Darnell. New York: W. H Freeman

403T References:

1. The Fundamentals of Bacteriology by Charles Bradfield Morrey
2. Bacteriology Textbook by Charles P. Davis, Gail Woods and David Niese
3. Basic Bacteriology by C.C. Chen, Ph.D., D.D.S
4. Fungi Their Nature and Uses by Mordecai Cubitt Cooke
5. Biology of Fungi by Chet Cooper
6. An Introduction To The Study of Fungi by E. F. Legner
7. Basic Virology by Elliott J. Blumenthal by Elliott J. Blumenthal
8. Veterinary Virology by Dr. M. A. Oyekunle, Dr O. E. Ojo and Dr. M. Agbaje
9. Molecular Virology by Moses P. Adoga
10. Viruses of Prokaryotes by Hans-Wolfgang Ackermann, Michael S. Dubow
11. Viruses of Fungi and Simple Eukaryotes by Y. Koltin

404T References:

1. Introduction to Biotechnology, William J. Thieman, Michael A. Palladino, Benjamin Cummings Publ
2. Biotechnology- Arora, Himalaya pub. House
3. Principles of Gene Manipulation, by R.W. Old, S.B. Primrose, Wiley-Blackwell Publications



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Department of Biochemistry, UCS, MGU, Nalgonda
Semester – III, Interdisciplinary paper-I (C.B.C.S)
w.e.f. 2021-22 A.Y admitted batch onwards

Subject: Biomolecules, Nutrition and IPR

Unit-I: Biomolecules

Introduction and scope of Biochemistry, importance of Biomolecules, outlines of classification and physiological importance of carbohydrates, proteins, lipids and nucleic acids.

Unit-II: Food and Nutrition

Introduction and importance of Nutrition, Nutritive values of food, classification of foods, Balanced diet and RDA, Nutraceuticals and functional foods, calorific values of foods, PEM/PCM; Food born diseases; food safety. Importance of microminerals, deficiency and toxicity of microminerals.

Unit-III: Clinical Biochemistry

Tests to assess liver, kidney and cardiac functions, Eating disorders: Anorexia and bulimia; Obesity and weight management, Diabetes, Fatty liver, Atherosclerosis, Nephrosis and Nephritis; Role of iron in prevention of anaemia. Electrolyte balance and hydrogen ion balance.

Unit-IV: IPR and GMOs

Introduction and importance of IPR. Classification of Intellectual property rights: Copyright, Patent, Industrial design, Trademark, Trade secrets, geographical indications. Protection of plant variety and farmers right act - importance and filing.

Ecological aspects of GMOs and their impact on Biodiversity, Benefits of transgenics to human health, society and the environment.

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Department of Biochemistry, UCS, MGU, Nalgonda
Semester – IV, Interdisciplinary paper-II (C.B.C.S)
w.e.f. 2021-22 A.Y admitted batch onwards

Health, Immunity and Epidemiology

Unit-I: Health –I

Physical and Mental health, Determinants of health, Maintaining health, Role of public health, Self-care strategies, Occupational health, Normal values for different blood tests and clinical implications, Clinical diagnosis of human diseases: Anaemia, Thalassemia, Hyper cholesterolemia, Clinical importance of Enzymes and isoenzymes. Pregnancy test.

Unit-I: Health –II

Liver diseases: Jaundice, Hepatitis.
Outlines of tests to assess Kidney, Liver and Cardiac function. Water balance.
Drug over dosage, Substance abuse and addiction (alcohol and narcotics) - counselling and treatment. Depression, sleep disorders.

Unit-III: Immune System

History of Immunology, Natural & Acquired immunity, Humoral and cell-mediated Immunity, Specific & non-specific immune response. Cells & Organs of immune system. Types of Immunoglobulins, Blood grouping, Hypersensitivity, Autoimmune Diseases. Vaccines, Clinical trials in pharmaceuticals. Immunotechniques: Agglutination, ELISA and RIA.

Unit-IV: Epidemiology

Communicable and Non communicable diseases; Pandemics: Covid-19, Preventive measures and strategies; Government plans: Role of ICMR, WHO and PHC. Epidemiologic methods, Geriatric epidemiology.

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