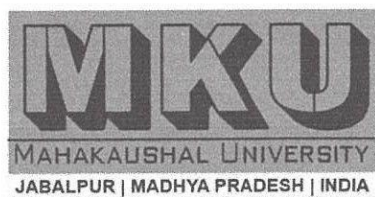


# **MAHAKAUSHAL UNIVERSITY JABALPUR**

**As per model syllabus of U.G.C. New Delhi, drafted by  
Central Board of Studies and Approved by Higher  
Education and the Governor of M.P.**



**Faculty of Science**

**Syllabus & Prescribed Books**

**Subject – Biochemistry**

**B.Sc. Yearly Examination**

**I, II & III Year**

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
**As Recommended by Central Board of Studies and approved by**  
**the Governor of M.P.**

Class	:B.Sc 1 <sup>st</sup> Year
Paper	: 1 <sup>st</sup> BBCHE101-T
Subject	: Biochemistry
Title of Subject Group	: Cell Biology
Compulsory	: Compulsory
Max. Marks	:40+10=50

## SYLLABUS

Unit I	Introduction to cell biology Prokaryotic (archaea and eubacteria) and eukaryotic cell (animal and plant cells), cells as experimental models. Tools of cell biology Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, FACS. Centrifugation for subcellular fractionation.
Unit II	Structure of different cell organelles Structure of nuclear envelope, nuclear pore complex. ER structure. Organization of Golgi. Lysosome. Structure and functions of mitochondria, chloroplasts and peroxisomes. Zellweger syndrome..
Unit III	Protein trafficking Selective transport of proteins to and from the nucleus. Targeting proteins to ER, Protein sorting and export from Golgi. Protein import and mitochondrial assembly, protein export from mitochondrial matrix. Import and sorting of chloroplast proteins.
Unit IV	Cytoskeletal proteins Structure and organization of actin filaments. Treadmilling and role of ATP in microfilament polymerization, organization of actin filaments. Non-muscle myosin. Intermediate filament proteins, assembly and intracellular organization. Assembly, organization and movement of cilia and flagella. Unit 6 Cell wall and extracellular matrix Prokaryotic and eukaryotic cell wall, cell matrix proteins. Cell-matrix interactions and cellcell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata
Unit V	Cell cycle, cell death and cell renewal Eukaryotic cell cycle, restriction point, and checkpoints. Cell division. Apoptosis and necrosis - brief outline. Saliene Chairman Board of e

## Suggested Books :

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893300-6. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell. J., W.H. Freeman & Company (New York), ISBN:13:9781-4641-0981-2 / ISBN:10: 1-4641-0981-8.
2. Molecular Biology of the Cell (2008) 5th ed., Alberts, B., Johnson, A., Lewis, J., and Enlarge, M., Garland Science (Princeton), ISBN:0-8153-1619-4 / ISBN:0-8153-1620-8

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
**As Recommended by Central Board of Studies and approved by**  
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Class	:B.Sc 1 <sup>st</sup> Year
Paper	:IInd BBCHE102-T
Subject	: Biochemistry
Title of Subject Group	: Biomolecules
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	The foundations of biochemistry Cellular and chemical foundations of life Water Unique properties, weak interactions in aqueous systems, ionization of water, buffers, water as a reactant and fitness of the aqueous environment.
Unit II	Carbohydrates and glycobiology Monosaccharides - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and nonreducing disaccharides. Polysaccharides – homo- and heteropolysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates
Unit III	Lipids Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes. Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Plant steroids. Lipids as signals, cofactors and pigments,
Unit IV	Amino acids Structure and classification, physical, chemical and optical properties of amino acids.
Unit V	Nucleic acids Nucleotides - structure and properties. Nucleic acid structure – Watson-Crick model of DNA. Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry - UV absorption, effect of acid and alkali on DNA. Other functions of nucleotides - source of energy, component of coenzymes, second messengers. Vitamins Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms hypervitaminosis

## Suggested Books :

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-42923414-8.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN:978-0-470-28173-4.

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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Class	:B.Sc 1 <sup>st</sup> Year
Paper	: IIIrd BBCHE103-T
Subject	: Biochemistry
Title of Subject Group	: Biochemical Techniques -I
Compulsory	: Compulsory :
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Chromatographic and electrophoretic methods of separation, Principles and applications of Paper, Thin layer & HPTLC, Gas, Gas-liquid, Liquid chromatography, HPLC and FPLC; Paper and gel electrophoresis, Different variants of polyacrylamide gel electrophoresis (PAGE) like native and SDS-PAGE, 2D-PAGE, capillary electrophoresis.
Unit II	Spectrophotometry: Principles and applications, UV-VIS, Fluorescence, IR and FTIR, Raman, NMR and FTNMR, ESR and X-Ray spectroscopy.
Unit III	Hydrodynamic methods of separation of biomolecules such as viscosity and sedimentation- their principles, variants and applications.
Unit IV	Tracer techniques in biology: Concept of radioactivity, radioactivity counting methods with principles of different types of counters, concept of $\alpha$ , $\beta$ and $\gamma$ emitters, scintillation counters, $\gamma$ -ray spectrometers, autoradiography, applications of radioactive tracers in biology, principles and applications of phosphor imager
Unit V	Light microscope, Fluorescent microscopy, AFM, Phase Contrast microscopy, Confocal Microscopy, Electron microscopy, Radioisotopes and its half-life, specific activity, scintillator counter, proposal counter, Geiger Muller counter, Cerenkov counter and autoradiography, Application of PET, MRI and CT scan

## Suggested Books :

1. Lehninger's Biochemistry
2. Lubert Stryer
3. Book on Biomolecular Interactions

## Practicals (biochemical techniques lab-I) BBCHE103-P

1. Determination of absorption maxima of some important chemicals from their absorption spectra, estimation of biomolecule using spectrophotometer,
2. Separation of carbohydrates and amino acids by paper chromatography,
3. Separation of lipids by thin layer and column chromatography,
4. Separation of proteins by ion exchange and gel filtration chromatography,
5. Electrophoretic techniques to separate proteins and nucleic acids,
6. Centrifugation - Cell fractionation, Application of GLC, HPLC, FPLC in separation of biomolecules.
7. Use of radioisotopes in metabolic studies.

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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Class	: B.Sc 2 <sup>nd</sup> Year
Paper	: Ist BBCHE201-T
Subject	: Biochemistry
Title of Subject Group	: Biochemical Techniques-II
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Gel filtration chromatography, Ion exchange chromatography, affinity chromatography, HPLC, Electrophoresis, SDS-PAGE, AGE, PFGE, Capillary electrophoresis, Centrifugation and Ultracentrifugation, RCF/RPM, Sedimentation (s). Different hybridization methods, Southern blotting, Northern blotting, Western blotting, Southwestern blotting, EMSA, Foot printing, Yeast Two hybrid system, Chromatin immunoprecipitation Polymerase chain reaction, Thermostable polymerases and other component of PCR, Asymmetric PCR, methylation-specific PCR, Nested PCR, Inverse PCR, Anchored PCR, reverse transcriptase PCR, Real-time-PCR, efficiency of PCR
Unit II	Proteomics, Protein sequencing methods, Genomics, DNA sequencing methods, Next Generation Sequencing, Metagenomics. Species identification via r-RNA analysis, FAME analysis.
Unit III	Molecular Marker Analysis -RFLP maps, RAPD markers, AFLP markers, VNTR, SNP analysis, SCAR (sequence characterized amplified regions), SSCP (single strand conformational polymorphism).
Unit IV	Principle and significance of UV-Vis spectroscopy, Fluorescence spectroscopy, FRET, Luminescence, Circular Dichroism, Infra-Red spectroscopy, Raman spectroscopy, Nuclear Magnetic Resonance, X-ray diffraction, Mass spectrometry
Unit V	Immuno-electrophoresis, immune-precipitation, agglutination, RIA, ELISA, FACS, immunofluorescence microscopy, Immuno-electron microscopy, Fluorescence In-situ hybridization (FISH).

### **Suggested Readings :-**

- Christian, G. D., Analytical Chemistry, John Wiley & Sons (Asia) Pvt. Ltd., 2004.
- Wilson, K. and Walker, J., Principles and Techniques of Practical Biochemistry and Molecular Biology, 7th Edition, Cambridge Univ. Press, 2010.
- David Freifelder, Physical Biochemistry, 2nd edition, John Wiley and Sons 2005.

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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Class	:B.Sc 2 <sup>nd</sup> Year
Paper	: IInd BBCHE202-T
Subject	: Biochemistry
Title of Subject Group	: Enzyme & Intermediary Metabolism
Compulsory	: Compulsory :
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	<p>Introduction to enzymes Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. Factors affecting the rate of chemical reactions, collision theory, Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.</p> <p>Enzyme kinetics Concepts of rate, rate constant, order and molecularity of a reaction, rate determining step, zero and fractional orders, rate expressions for complex reactions, Steady-State approximation. Concept of Collision theory and Transition State theory of reaction rate. Catalytic reactions: Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant - monosubstrate reactions. Michaelis-Menten equation, Lineweaver- Burk plot, Eadie-Hofstee and Hanes plot. <math>K_m</math> and <math>V_{max}</math>, <math>K_{cat}</math> and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme</p>
Unit II	<p>Enzyme inhibition Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors - antibiotics as inhibitors Mechanism of action of enzymes General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues.</p> <p>Regulation of enzyme activity Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition, allosteric regulation (aspartate transcarbamoylase), reversible covalent modification phosphorylation</p>

Unit III	<p>Separation and Characterization of Proteins/enzymes Solubilization, grinding methods, homogenization, ultrasonication, centrifugation. fractionation, dialysis and lyophilisation.</p> <p>Principles of chromatography: Types of chromatography and their applications, Determination of purity, molecular weight, extinction coefficient and sedimentation coefficient, IEF, SDS-PAGE and 2-D electrophoresis</p>
Unit IV	<p>Glycolysis, Gluconeogenesis, pentose phosphate pathway and Glycogen metabolism.</p> <p>Citric acid cycle, anaplerotic reactions, amphibolic role, regulation of citric acid cycle, glyoxalate pathway, coordinated regulation of glyoxalate and citric acid pathways.</p> <p>Fatty acid oxidation Digestion, mobilisation and transport of cholesterol and triacyl glycerols, fatty acid transport to mitochondria, <math>\beta</math> oxidation of saturated, unsaturated, odd and even numbered and branched chain fatty acids, regulation of fatty acid oxidation, peroxisomal oxidation, <math>\omega</math> oxidation, ketone body's metabolism, ketoacidosis</p>
Unit V	<p>Membrane lipids Precursor, regulation, functions and physiological importance of membrane phospholipids in prokaryotes and eukaryotes, respiratory distress syndrome, Precursor, regulation, functions and physiological importance of triacylglycerol, plasmalogens, sphingolipids and glycolipids, lipid storage diseases</p>

### Suggested Books :

- Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN: 13: 978-1-4641-0962-1 / ISBN: 10:1-4292- 3414-8.
- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt.Ltd. (New Jersey), ISBN: 978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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**the Governor of M.P.**

Class	: B.Sc 2 <sup>nd</sup> Year
Paper	: IIIrd BBCHE203-T
Subject	: Biochemistry
Title of Subject Group/	: Genetics & Molecular Biology
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Mendelian Genetics: Mendel's laws of inheritance, monohybrid and dihybrid crosses, extensions of Mendelian genetics. Gene Interactions: Epistasis, dominance relationships, multiple alleles, and gene interactions. Sex-linked Inheritance: Sex chromosomes, sex-linked traits, and sex-influenced traits. Linkage and Recombination: Linkage analysis, crossing over, and genetic mapping. Mutations: Types of mutations, mechanisms of mutation, and the effects of mutations on gene expression. Quantitative Genetics: Continuous and discontinuous variation, polygenic inheritance, and heritability.
Unit II	Basic Concepts of genome and its organization: Nucleic acid as the genetic material (Griffith's experiment, Avery, MacLeod and McCarty's experiment, Hershey-Chase experiment), Importance of Molecular Biology, Central Dogma of Molecular Biology, Model organisms for studying Molecular Biology. Structure and functions of Nucleic acids: Nucleosides & Nucleotides, purines and pyrimidines. Biologically important nucleotides, Watson and Crick model of DNA structure, A, B & Z forms of DNA, Supercoiled and relaxed DNA, denaturation and renaturation of DNA, melting temperature (T <sub>m</sub> ), hyperchromic effect.
Unit III	Genome and its organisation : ( idea about gene, coding sequence, regulatory sequence, intron, exon, Nucleosome structure and packaging of DNA into higher order structures, brief idea of chloroplast DNA and Mitochondrial DNA) Replication of DNA in prokaryotes . Features of DNA Replication, Proof of semiconservative nature of DNA replication, Features of bidirectional DNA replication. Mechanism of bidirectional DNA replication. Gene expression. t
Unit IV	RNA structure and types of RNA, Transcription in prokaryotes with E. Coli as model system: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains, Genetic code, properties of genetic code, Wobble hypothesis. Components of Protein synthesis machinery : Messenger RNA, tRNA structure and function, Charging of tRNA, aminoacyl tRNA synthetases, ribosome structure and assembly , Mechanism of protein synthesis in prokaryotes - initiation, elongation and termination. Principles of gene regulation, negative and positive regulation, concept of operons, Regulation of gene expression in bacteria - lac operon

Unit V	Damage, Repair and Mutation Causes (spontaneous, chemical agent, radiation) and types of DNA damage Mechanism of DNA repair: Direct repair, base excision repair, nucleotide excision repair, mismatch repair, recombination repair. Molecular basis of mutation, types of mutation (missense mutation, nonsense mutation, silent mutation, point mutation, frameshift mutation).
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### Suggested Readings :-

1. Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
2. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962-1.
3. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons Asia, ISBN:978-0 470-39842-5

### PRACTICAL LIST (ENZYME & INTERMEDIARY METABOLISM) BBCHE203-P

1. Assay of enzyme activity and specific activity of Alkanine Phosphatases.
2. Effect of pH on the enzyme activity
3. Determination of  $K_m$  and  $V_{max}$  using Lineweaver-Burk graph.
4. Enzyme inhibition - calculation of  $K_i$  for competitive inhibition.
5. Assay of amylase by Kit method.
6. Estimation of cholesterol from known source (Mustard oil)
7. Isolation of serum LDH by kit method.
8. Estimation of pure glucose by Nelson-Somogyi method

**Department of Higher Education Govt. of M.P.  
Syllabus for Under Graduate Classes  
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Class	:B.Sc 3 <sup>rd</sup> Year
Paper	: Ist BBCHE301-T
Subject	: Biochemistry
Title of Subject Group	: Human physiology and Nutritional Biochemistry (BBCH301)
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Homeostasis, control system and their components. molecular mechanism of blood coagulation, role of vitamin K in coagulation, Anemias, polycythemia, haemophilia and thrombosis. Anatomy of heart. Physiology of the cardiac muscle, relationship between cardiac cycle, heart sound, ventricular volumes and the ECG, control of cardiac function and output. The arterial system, venous system. Portal circulations. Arterial pressure and its regulation. Hypertension, congestive heart disease, atherosclerosis and myocardial infarction. Respiration Organization of the pulmonary system. Mechanism of respiration, pulmonary ventilation and related volumes, pulmonary circulation. Principles of gas exchange and transport. Regulation of respiration. Pulmonary oedema and regulation of pleural fluid. Hypoxia, hypercapnea, pulmonary distress, emphesema, ARDS.
Unit II	Renal physiology-Anatomy. Physiology of glomerular filtration and GFR. Tubular processing of the glomerular filtrate. Micturition reflex and voluntary control of micturition. Regulation of ECF electrolyte and water content, blood volume and long term blood pressure.. Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis and diuretics. Gastrointestinal and hepatic physiology. Histology of the gastrointestinal tract. Propulsion and motility of food and digested material., secretory functions of the gastrointestinal tract, digestion and absorption of macro and micronutrients. Peptic ulcer, Sprue, celiac disease, IBD, regurgitation, diarrhoea and constipation. Anatomy of the hepatic lobule and blood flow into the liver. Formation and secretion of bile. metabolic importance of liver. Jaundice, liver cirrhosis and fatty liver.

	<p>Musculoskeletal system Physiology of muscle contraction in striated and non-striated muscle. Reproductive physiology Female and male. Spermatogenesis, Ovarian function and its control. Uterine changes, fertilization and implantation. Placenta as a feto- maternal unit, gestation and parturition.</p> <p>.Neurochemistry and neurophysiology Central Nervous system. Peripheral Nervous system. Blood brain barrier and CSF. Membrane potentials. Synaptic transmission. Neurotransmitters. EEG, sleep, coma, learning and memory.</p>
Unit III	<p>Introduction to Nutrition and Energy Metabolism- Defining Nutrition, role of nutrients. Unit of energy, Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances for different age groups. Dietary carbohydrates and health Review functions of carbohydrates. Digestion, absorption ,utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions.</p>
Unit IV	<p>Dietary lipid and health Review of classification, sources, functions, digestion, absorption, utilization and storage. Essential Fatty Acids; Functions of EFA, RDA, Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the different fatty acids.</p> <p>Dietary Proteins and health their functions in the body, Digestion and absorption. Essential and Nonessential amino acids. Their Availability Antagonism, Toxicity and Imbalance, Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value , Nitrogen balance. PEM and Kwashiorkor.</p>
Unit V	<p>Fat and water soluble Vitamins Vitamin A, C, E, K and D Dietary sources, RDA, Adsorption, Distribution, Metabolism and excretion (ADME), Deficiency. Role of Vitamin A ,D, E C, K B6 and B12 in human body. Hypervitaminosis. Role in metabolism, Biochemical basis for deficiency symptoms. Dietary source, RDA, absorption, metabolic role Biochemical basis for deficiency symptoms.</p> <p>Minerals- Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization , Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources</p>

## Suggested Books :

1. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T., McGraw Hill International Publications (New York), ISBN: 978-0-07-128366-3
2. Harper's Biochemistry (2012) 29th ed., Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
3. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.
4. Fundamental of Anatomy and Physiology (2009), 8th ed., Martini, F.H. and Nath, J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-032153910-David, L.N. and Michael, M.C. 2000.
5. Leheniger's Principle of Biochemistry, Macmillan worth pub. New York, U.S.A. Gengulee, H.C. Das, Datta, C. and sen, S. 2007. College Botany Voll. I, New Central Book Agency (P) Ltd. Kolkata. 700009, Hopkins, W.G. 1995,
6. Introduction of plant physiology pub. John Wiley and sons, New York. Taiz & Zeiger, E, 1998. Plant Physiology. Sinauer associates, Inc. Pub. Massachudetts, U.S.A. Salisbury & Ross-Plant Physiology. Devlin –
7. Plant Physiology. Verma, S.K. & Verma, M.A. 1995. Text Book of Plant Physiology & Biotechnology, S. Chand & Company. Verma, V. 1995, Plant Physiology, Emkey Pub.

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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Class	:B.Sc 3 <sup>rd</sup> Year
Paper	:IInd BBCHE302-T
Subject	: Biochemistry
Title of Subject Group	: Clinical Biochemistry
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Clinical Biochemistry Introduction Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations. Exercises a. Collection of blood and storage. b. Separation and storage of serum. c. Analysis of Cell Morphology.
Unit II	Evaluation of biochemical changes in diseases Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile. Assessment of glucose metabolism in blood Clinical significance of variations in blood glucose. Diabetes mellitus. Exercise: Estimation of blood glucose by glucose oxidase peroxidase method
Unit III	Lipid profile Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein. Exercise: Estimation of triglycerides.
Unit IV	Renal function tests and urine analysis Use of urine strip / dipstick method for urine analysis. Exercise: Quantitative determination of serum creatinine and urea.
Unit V	Tests for cardiovascular diseases Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin. Exercise: Assessment of hypertension by blood pressure measurement,

## Suggested Books :

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I (2010), Mukherjee, K.L., Tata Mc Graw–Hill Publishing Company Limited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631
2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. II (2010), Mukherjee, K.L., Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.
3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. And Dominiczak, M.H., ElsevierMosby Ltd. (Philadelphia), ISBN: 0-7234-3341-0.
4. Experimental Biochemistry: A Student Companion (2005) Rao, B.S. and Deshpande, V., IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8
5. Hawk's book

**Department of Higher Education Govt. of M.P.**  
**Syllabus for Under Graduate Classes**  
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Class	:B.Sc 3 <sup>rd</sup> Year
Paper	: IIIrd BBCHE303-T
Subject	: Biochemistry
Title of Subject Group	: Biotechnology
Compulsory	: Compulsory
Max. Marks	: 40+10=50

## SYLLABUS

Unit I	Introduction to recombinant DNA technology Overview of recombinant DNA technology. Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules (DNA polymerases, RNA Polymerases, Reverse Transcriptase, Ligases, Taq polymerase, Kinases), separation of DNA by gel electrophoresis. Extraction and purification of plasmid and bacteriophage DNA.
Unit II	Cloning vectors for prokaryotes and eukaryotes Plasmids, classification, copy number and its regulation, incompatibility and curing, Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on E. coli plasmids, pBR322, pUC8, pGEM3Z. Cloning vectors based on M13 and $\lambda$ bacteriophage. The problem of selection, direct selection, marker rescue. Gene libraries, identification of a clone from gene library, colony and plaque hybridization probing, methods based on detection of the translation product of the cloned gene. Ligation of DNA molecules. DNA ligase, sticky ends, blunt ends, linkers and adapters. Synthetic oligonucleotides, synthesis and use.
Unit III	Introduction of DNA into cells and selection for recombinant clones Uptake of DNA by cells, preparation of competent cells. Selection for transformed cells. Identification for recombinants, Sequence dependent and independent screening, southern-western, colony and plaque hybridization - insertional inactivation, blue-white selection. Introduction of phage DNA into bacterial cells. Identification of recombinant phages
Unit IV	Expression of cloned genes Vectors for expression of foreign genes in E. coli, cassettes and gene fusions. Challenges in producing recombinant protein in E. coli. Polymerase chain reaction Fundamentals of polymerase chain reaction, designing primers for PCR. Studying PCR products. Cloning PCR products. Quantitative PCR.

Unit V	DNA sequencing DNA sequencing by Sanger's method, modifications based on Sanger's method. Automated DNA sequencing. Applications of genetic engineering in Biotechnology Applications in medicine, production of recombinant pharmaceuticals such as insulin. Recombinant vaccines. Gene therapy. Applications in agriculture - plant genetic engineering, herbicide resistant crops, problems with genetically modified plants, safety concerns.
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## Suggested Books :

1. Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley Blackwell publishing (Oxford, UK), ISBN: 978-1-4051-8173-0.
2. Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) ISBN: 978-1 4051-3544-3.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC), ISBN: 978-1-55581-498-4 (HC).
4. Recombinant DNA Technology by Watson

## PRACTICAL (Biotech lab) BBCHE303-P

1. Isolation of plasmid DNA from E. coli cells.
2. Digestion of plasmid DNA with restriction enzymes and size estimation of fragments by gel electrophoresis.
3. Preparation of competent cells, transformation and estimation of transformation efficiency.



# MAHAKAUSHAL UNIVERSITY JABALPUR