

**Scheme of Examination for M.Sc. (Medical Lab Technology)**  
***A four-semester programme***

**SEMESTER I:**

<u>Code</u>	<u>Paper</u>	<u>Max. Marks</u>
MLT 501	Biomolecules	100 (80 + 20 Internal Assessment)
MLT 502	Cellular pathology	100 (80 + 20 Internal Assessment)
MLT 503	Metabolism	100 (80 + 20 Internal Assessment)
MLT 504	Human Physiology	100 (80 + 20 Internal Assessment)
MLT 505	Lab Course I	<u>100</u>
		<b>500</b>

**SEMESTER II:**

<u>Code</u>	<u>Paper</u>	<u>Max. Marks</u>
MLT 506	Enzymology	100 (80 + 20 Internal Assessment)
MLT 507	Clinical Molecular Biology	100 (80 + 20 Internal Assessment)
MLT 508	Clinical Immunology	100 (80 + 20 Internal Assessment)
MLT 509	Clinical pathology I	100 (80 + 20 Internal Assessment)
MLT 510	Lab Course II	<u>100</u>
		<b>500</b>

**SEMESTER III:**

<u>Code</u>	<u>Paper</u>	<u>Max. Marks</u>
MLT 511	Clinical Pathology II	100 (80 + 20 Internal Assessment)
MLT 512	Clinical Biochemistry	100 (80 + 20 Internal Assessment)
MLT 513	Medical Laboratory Techniques	100 (80 + 20 Internal Assessment)
MLT 514	Medical Microbiology	100 (80 + 20 Internal Assessment)
MLT 515	Lab Course III	<u>100</u>
		<b>500</b>

**SEMESTER IV:**

<u>Code</u>	<u>Paper</u>	<u>Max. Marks</u>
MLT 516	Hospital Training (21 Days)	100
MLT 518	Seminar based on dissertation	50
MLT 519	Seminar based on Hospital training	50
MLT 600	*Dissertation (Contd. from III <sup>rd</sup> Semester)	<u>300</u>
		<b>500</b>

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**Total Marks 2000**

**Hospital training** includes one week training each in Biochemistry, Microbiology and Pathology labs at self cost.

**Internal Assessment:** 5 (Attendance) + 15 (Internal Test)

\*In Semester III, 4 days will be for practical work and 2 days for dissertation work

4 periods of 60 minutes per paper × 4 papers = 16 hr/week

Lab course/ Practical (3 hr × 5 days) = 15 hr/week

Seminars = 1 hr/week

## ORDINANCE FOR M.Sc. MLT in Biochemistry

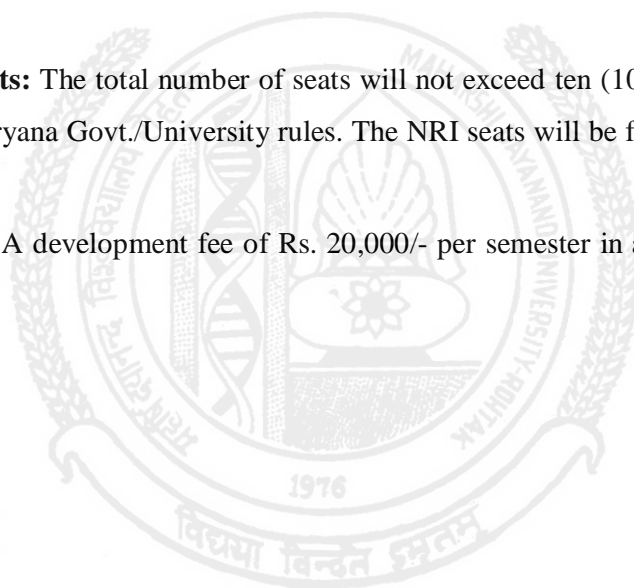
**Duration of course-** Years-2 (Minimum), Semesters-4

**Admission eligibility:** B.Sc. (with Zoology/Botany/Chemistry/Biochemistry) or B.Sc. (Hons.) in Biomedical Sciences/Biochemistry/Microbiology/Biotechnology/B.Sc.-MLT degree/B.Sc.-Instrumentation from a University/Institute recognized by UGC with at least 55% marks (50% marks for SC, ST).

**Admission criteria:** An objective type written test of 100 marks will be conducted by the university that will be common for M.Sc. General and M.Sc.-MLT. The merit will be made on the basis of marks scored by the candidate in the entrance test plus marks obtained in the qualifying degree examination and other weightage as per university rules.

**Number of seats:** The total number of seats will not exceed ten (10). Reservation will be as per Haryana Govt./University rules. The NRI seats will be filled as per University rules.

**Fee structure:** A development fee of Rs. 20,000/- per semester in addition to the normal fee.



## MLT 501: Biomolecules

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **UNIT 1**

Introduction: Introduction to Biochemistry, water as biological solvent, weak acids and bases, pH, buffers, Handerson-Hasselbalch equation, physiological buffers.

Carbohydrates: Classification, structure, occurrence and biological functions. Physicochemical properties of monosaccharides.

### **UNIT 2**

Lipids: Classification, structure, occurrence and biological functions of lipids. Nomenclature and properties of fatty acids and triglycerides, saponification number, acid number, Reichert-Meissel number, rancidity of fats. Composition and types of lipoproteins. Steroids and carotenoids of biological origin, liposomes.

### **UNIT 3**

Amino acids: Nomenclature, classification and chemical structure of amino acids. Physicochemical properties of amino acids with their titration curve, reaction with ninhydrin, amino acids as zwitterions and isoelectric point.

Proteins: Classification, structure (primary, secondary, tertiary and quaternary; structure of peptide bond, Ramachandran Plot), properties and biological functions of proteins. Protein denaturation & renaturation. Methods to determine amino acid sequence- N- and C-terminal amino acid identification, amino acid sequencing of small peptides and overlapping. Chemical synthesis of polypeptides, salting in and salting out of proteins.

### **UNIT 4**

Nucleic acids: Nature of genetic material, properties of DNA in solution, evidence of DNA as genetic material and evidence for semi-conservative nature, Composition of RNA and DNA, generalized structure plan of nucleic acids, nomenclature in structure of nucleic acids, features of DNA double helix, denaturation and annealing of DNA. Structure and roles of different types of DNAs and RNAs. Genetic code, genome.

Porphyryns: Porphyrin nucleus and classification of porphyryns, important metal-porphyrins occurring in nature, Chemical nature and significance of bile pigments.

Suggested Readings: \_\_\_\_\_.

1. Lehninger Principles of Biochemistry 4<sup>th</sup> Ed **By** David L. Nelson and Michael M. Cox, WH Freeman and Company.
2. Chemistry of Biomolecules: an Introduction (Paperback) **By** Richard J. Simmonds. Publisher: Royal Society of Chemistry
3. Principles of Biochemistry (Hardcover) **By** Geoffrey Zubay. Publisher: McGraw Hill College.
4. Biochemistry **By** Lubert Stryer. WH Freeman and Co.
5. Biochemistry: The Molecular Basis of Life (Paperback) **By** Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.
6. Biochemistry and Molecular biology **By** William H. Elliott and Daphne C. Elliott. Oxford University Press.
7. Biochemistry (Hardcover) 3<sup>rd</sup> Ed. **By** Donald J. Voet and Judith G. Voet. John Wiley and Sons.
8. Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 (Hardcover) **By** D Voet. John Wiley and Sons.
9. Fundamentals of Biochemistry: Life at the Molecular Level [Import] (Hardcover) **By** Donald Voet, Judith G. Voet and Charlotte W. Pratt. Publisher: Wiley.
10. Principles of Biochemistry (Paperback) **By** Robert Horton, Laurence A Moran, Gray Scrimgeour, Marc Perry and David Rawn. Pearson Education.
11. Biochemistry **By** U. S. Satyanarayana
12. Outlines of Biochemistry **By** Eric C Conn, PK Stumpf, G Bruening and Ray H. Doi. John Wiley & Sons.

## **MLT 502: Cellular Pathology**

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### ***UNIT 1***

Variations in structure and functions of eukaryotic cells, The ultra structure and functions of nucleus, mitochondria (organization of ETC), endoplasmic reticulum, Golgi apparatus, lysosomes and peroxisomes. Ultrastructure of cell membrane. Basic structure of Blood cells. The epithelial apices- glycocalyx and microvilli. The basement membrane - structural features and characteristics. The extracellular matrix - collagen, elastin, fibrillin, fibronectin, laminin and proteoglycans.

Development of blood cells, classification of blood cells, Cytochemical staining of leucocytes

### ***UNIT 2***

Hemorrhage, hemolytic anemia. Sickle cell anemia, Thalassemia, Polycythemia, Non Neoplastic Disorders of white blood cells, Neoplastic proliferation of white cells, Plasma cell disorders, Thrombocytopenia, Coagulation disorders, Splenomegaly, disorders of thymus,

### ***UNIT 3***

Neoplasia, Types of cancer, Differentiation and anaplasia, cancer epidemiology, Molecular basis of cancer, basis of multi-step carcinogenesis, Etiology of cancer, Carcinogens, classification of carcinogens, mode of action of carcinogens, laboratory diagnosis of cancer, molecular profiling of cancer

### ***Unit 4***

Cellular adaptation, overview of cell injury, mechanisms of cellular injury, cellular adaptation to cellular injury, Pathologic calcification, Programmed cell death, cell apoptosis, cellular regeneration, control on cell growth, cellular differentiation, repair of connective tissue, fibrosis. Growth factors in cell regeneration and fibrosis, wound healing,

Suggested Readings:

1. Molecular Cell Biology 4<sup>th</sup> Ed **By** James E. Darnell, Harvey Lodish, Arnold Berk, and Lawrence Zipursky, W.H. Freeman and Co.
2. Molecular Biology of the Cell 4<sup>th</sup> Ed **By** Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter. Garland Publishers.
3. Robbins and Cotran pathologic basis of disease, Volume 1, **By** Vinay Kumar, Nelson Fausto and Abul Abbas. Publisher: Elsevier Science.
4. Harrison's principles of internal medicine, Volume 2, **By** Tinsley Randolph Harrison and Maxwell Myer Wintrobe
5. The molecular basis of human cancer **By** William B. Coleman and Gregory J. Tsongalis. Publisher: Humana Press.
6. Introduction to the cellular and molecular biology of cancer **By** Leonard Maurice Franks, L. M. Franks, Natalie M. Teich and N. M. Teich.
7. Principles of Regenerative Medicine **By** Anthony Atala and Robert Lanza. Publisher: Academic Publishers.



## MLT 503: Metabolism

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **UNIT 1**

Introduction: Concept of metabolism, experimental approaches to study metabolism- use of intact organisms, bacterial mutants, tissue slices and radioisotopes.

ETC and Oxidative phosphorylation: Sequence of electron carriers, sites of ATP production, inhibitors of ETC, mechanism and regulation of mitochondrial oxidative phosphorylation, ATP synthase, uncouplers of oxidative phosphorylation, transport of reducing potential and ions across mitochondrial membrane, phosphorylation potential, reversed and microsomal electron transfers, generation of superoxides in mitochondria.

### **UNIT 2**

Carbohydrate Metabolism: Reactions and energetics of glycolysis. Alcoholic and lactic fermentations, entry of fructose, mannose and galactose. Reactions and energetics of TCA cycle, gluconeogenesis, glycogenesis and glycogenolysis. Reactions and physiological significance of HMP pathway, regulation of glycolysis and gluconeogenesis, cataplerosis and anaplerosis, biosynthesis of starch and oligosaccharides, regulation of blood glucose. Uronic acid pathway and glyoxylate cycle.

Lipid metabolism: Transport and mobilization of lipids, oxidation of saturated fatty acids ( $\beta$ -,  $\alpha$ -,  $\omega$ -), oxidation of unsaturated and odd-chain fatty acids, role of carnitine in transport of fatty acid, energetics of  $\beta$ -oxidation scheme, metabolism of ketone bodies and its biological significance.

### **UNIT 3**

Lipid metabolism (contd.): Biosynthesis of saturated and unsaturated fatty acids. Biosynthesis of triglycerides, phospholipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism. Metabolism of lipoproteins. Biosynthesis of prostaglandins.

Amino acid metabolism: General reactions of amino acid metabolism- transamination, deamination and oxidative decarboxylation. Biosynthesis and degradation of amino acids and their regulation. Feedback regulation of amino acid biosynthesis. Urea cycle and its regulation.

### **UNIT 4**

Nucleic acid Metabolism: Sources of atoms in purine and pyrimidine molecules, biosynthesis and degradation of purines and pyrimidines, regulation of purine and pyrimidine biosynthesis, structure and regulation of ribonucleotide reductase. Biosynthesis of ribonucleotides, deoxyribonucleotides and polynucleotides. Inhibitors of nucleic acid biosynthesis. Porphyrin Metabolism: Biosynthesis and degradation of porphyrins, production of bile pigments.

### Suggested Readings:

1. Lehninger Principles of Biochemistry 4<sup>th</sup> Ed **By** David L. Nelson and Michael M. Cox, WH Freeman and Company.
2. Principles of Biochemistry (Hardcover) **By** Geoffrey Zubay. Publisher: McGraw Hill College.
3. 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.
4. Bioenergetics **By** David G. Nicholls and Stuart J. Ferguson. Academic Press.
5. Bioenergetics at a Glance: An Illustrated Introduction (At a Glance) (Paperback) **By** D. A. Harris. Publisher: Wiley Blackwell
6. Bioenergetics: 0 (Paperback) **By** Lars Garby and Poul S. Larsen. Cambridge University Press.
7. Fundamentals of Biochemistry: Life at the Molecular Level [Import] (Hardcover) **By** Donald Voet, Judith G. Voet and Charlotte W. Pratt. Publisher: Wiley.
8. Biochemistry (Hardcover) 3<sup>rd</sup> Ed. **By** Donald J. Voet and Judith G. Voet. John Wiley and Sons.
9. Biochemistry of Lipids, Lipoproteins and Membranes (4<sup>th</sup> Ed.) D.E. Vance and J.E. Vance. Pub: Elsevier Science B.V
10. Medical Biochemistry 4<sup>th</sup> Ed. by NV Bhagavan. Pub: Elsevier India Pvt. Ltd.
11. Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 (Hardcover) **By** D Voet. John Wiley and Sons.
12. Biochemistry **By** Lubert Stryer. WH Freeman and Co.
13. Principles of Biochemistry (Paperback) **By** Robert Horton, Laurence A Moran, Gray Scrimgeour, Marc Perry and David Rawn. Pearson Education.
14. Harper's Biochemistry **By** RK Murray, DK Granner, PA Mayes and VW Rodwell. Appelton and Lange, Stanford.
15. Biochemistry **By** U. S. Satyanarayana
16. Outlines of Biochemistry **By** Eric C Conn, PK Stumpf, G Bruening and Ray H. Doi. John Wiley & Sons.



## **MLT 504: Human Physiology**

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### ***UNIT 1***

Blood- Composition and functions of plasma, hemopoiesis, erythrocytes including Hb, leukocytes and thrombocytes, plasma proteins and their role. Blood coagulation - mechanism and regulation, Fibrinolysis, Blood groups and Rh factor. Transfers of blood gases - oxygen and carbon dioxide. Role of 2, 3-BPG, Bohr effect and chloride shift. Regulation of respiration. Pulmonary circulation

Digestive system- Composition, functions and regulation of salivary, gastric, pancreatic, intestinal and bile secretions. Digestion and absorption of carbohydrates, lipids, proteins, nucleic acids, minerals and vitamins. Role of peristalsis and large intestine in digestion.

### ***UNIT 2***

Resting potentials and action potentials of excitable cells, contraction of skeletal, cardiac and smooth muscles.

Neurophysiology: Types of neurons and synapses and transmission of nerve impulse across them, Neurochemistry of vision, gustation, olfaction and hearing. Sensory receptors in skin and muscles.

Endocrinology- Secretion, mechanisms of action and effects of hormones of hypothalamus, pituitary, thyroid, adrenal gland and pancreas. Synthesis and functions of testosterone and ovarian hormones.

### ***UNIT 3***

Rhythmical excitation of heart, basic theory of circulatory function, blood flow and resistance, function of arterial and venous systems

Microcirculation and lymphatic system, control of blood flow, regulation of arterial pressure, cardiac output.

Spinal cord and motor functions, role of brain stems in controlling motor functions, functions of cerebellum, functions of cortical areas, the limbic system and cerebrospinal fluid system.

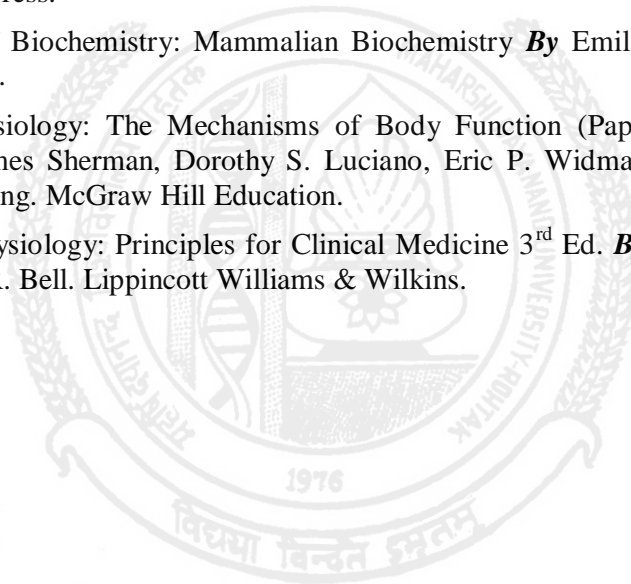
### ***UNIT 4***

Excretory system- Structure of nephron, formation of urine (glomerular filtration, tubular reabsorption of glucose, water and electrolytes), tubular secretion, role of kidneys regulation of blood pressure.

Control of body temperature, effect of low oxygen pressure on body, effects of acceleratory forces on body, effects of high partial pressures of gases on body

Suggested Readings:

1. Textbook of Medical Physiology 10<sup>th</sup> Ed **By** Arthur C. Guyton and John E. Hall, Harcourt Asia Pte Ltd.
2. Essential Medical Physiology 3<sup>rd</sup> Ed **By** Leonard R. Johnson, Elsevier Academic Press.
3. Endocrinology: An Integrated Approach **By** SS Nussey and SA Whitehead. BIOS Scientific Publishers
4. Physiology 3<sup>rd</sup> Ed, **By** Linda Costanzo, Saunders Publishers.
5. Principles of Anatomy and Physiology 10<sup>th</sup> Edition **By** Gerard J. Tortora and Sandra Grabowski. Publisher: John Wiley and Sons.
6. Principles of Human Physiology (Paperback) **By** Cindy L. Stanfield and William J. Germann. Publisher: Pearson Education.
7. Samson Wright's Applied Physiology 13<sup>th</sup> Ed. CA Keele, E Neil & N Joels. Oxford University Press.
8. Principles of Biochemistry: Mammalian Biochemistry **By** Emil Smith. McGraw Hill Publications.
9. Human Physiology: The Mechanisms of Body Function (Paperback) **By** Arthur J. Vander, James Sherman, Dorothy S. Luciano, Eric P. Widmaier, Hershel Raff and Hershhal Strang. McGraw Hill Education.
10. Medical Physiology: Principles for Clinical Medicine 3<sup>rd</sup> Ed. **By** Rodney R. Rhoades and David R. Bell. Lippincott Williams & Wilkins.



## MLT 510-- Lab Course I

**Max Marks :100**

**Total Time Duration: 3 hours**

### Unit -1

Preparation of Buffers and various biochemical reagents, Calculations of Normality and molarity of the reagents, pH estimations, Weighing of reagents, Preparation of distilled water, Autoclaving, cleaning and sterilization of reagents.

### Unit-II

Preparation of glucose standard curve, Estimation of glucose in biological fluids using various biochemical methods, Estimation of other carbohydrates,

### Unit –III

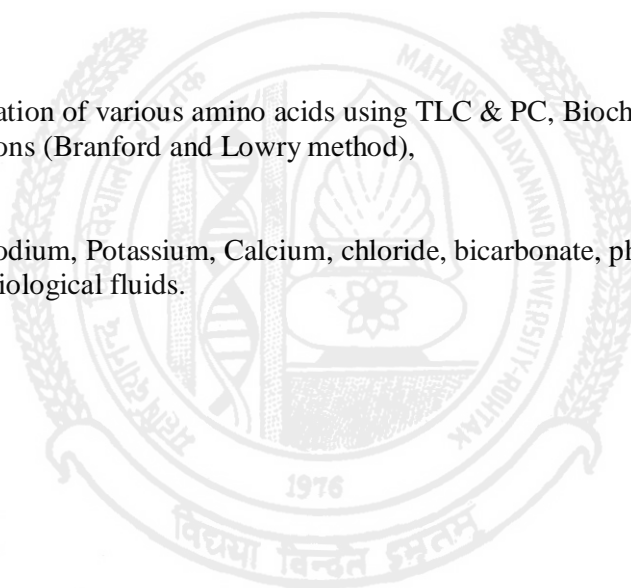
Isolation of lipids from various samples, Biochemical assays for identification of lipids, separation of lipids using Thin layer chromatography (TLC) and paper chromatography (PC).

### Unit –IV

Rf Value calculation of various amino acids using TLC & PC, Biochemical assay for protein estimations (Branford and Lowry method),

### Unit-V

Estimation of Sodium, Potassium, Calcium, chloride, bicarbonate, phosphorus and magnesium in biological fluids.



## MLT 506: Enzymology

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### *Unit 1*

Introduction: History, general characteristics, nomenclature, IUB classification, definitions with examples of holoenzyme, apoenzyme, coenzymes, prosthetic groups, cofactors, activators, inhibitors, active site, metalloenzymes, isozymes, monomeric enzymes, oligomeric enzymes and multienzyme complexes. Units of enzyme activity (definition of IU, Katal), specific activity of enzyme, measurement of enzyme activity, enzyme turnover. Ribozymes and abzymes.

Enzyme Catalysis: Role of enzymes in energy of activation, factors of affecting action of enzymes- proximity and orientation, strain and distortion, acid base catalysis and covalent catalysis. Determination of active site. Mechanism of action of chymotrypsin, ribonuclease, carboxypeptidase and lysozyme.

### *Unit 2*

Enzyme kinetics: Factors affecting enzyme activity- pH, temperature, time of incubation, enzyme concentration and substrate concentration. Derivation of Michaelis-Menten equation for unisubstrate reaction,  $K_{cat}/K_m$  and its significance, Lineweaver-Burk plot and its limitations; Eadie-Hofstee Plot, Eadie Plot, Hanes plot and Eisenthal-Cornish-Bowden plot. Significance and calculation of energy of activation from Arrhenius plot. Reversible and irreversible inhibition; competitive, non-competitive and uncompetitive inhibitions with determination of  $K_m$  and  $V_{max}$  in presence of reversible inhibitor. Derivation of  $K_i$  and Dixon plot, Kinetics of multisubstrate reactions, introduction to sequential and ping-pong mechanisms and their classifications & double reciprocal plots with examples.

### *Unit 3*

Protein-ligand binding, cooperativity phenomenon, Hill and Scatchard plots. Allosteric enzymes: Sigmoidal kinetics and their physiological importance, symmetric and sequential modes for action of allosteric enzymes and their significance. Immobilization of enzymes: Introduction, classification, various methods of immobilization, kinetics of immobilized enzymes and its significance, applications of immobilized enzymes in analysis of biological materials, food industry and medicine.

### *Unit 4*

Enzyme Regulation: Reversible and irreversible covalent modification, feedback inhibition, control of enzyme by products, substrates and adenylate energy charge, monocyclic and multicyclic cascade systems. Enzyme activation, induction and repression. Coenzymes: Structure and biological functions of NAD, NADP, FAD, FMN, TPP, THF, biotin, Coenzyme Q, ascorbic acid, lipoic acid and PLP.

## Suggested Readings:

1. Fundamentals of Enzymology: Cell and Molecular Biology of Catalytic Proteins (Paperback) **By** Nicholas C. Price and Lewis Stevens. Oxford University Press.
2. Advances in Enzymology: v. 47 (Hardcover) **By** Alton Meister. John Wiley and Sons Inc.
3. Lehninger Principles of Biochemistry 4<sup>th</sup> Ed **By** David L. Nelson and Michael M. Cox, WH Freeman and Company.
4. Principles of Biochemistry (Hardcover) **By** Geoffrey Zubay. Publisher: McGraw Hill College.
5. Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 (Hardcover) **By** D Voet. John Wiley and Sons.
6. Basic Biochemical Laboratory Procedures and Computing **By** R. Cecil Jack, Oxford University Press.
6. Enzyme Kinetics: Principles and Methods (Hardcover) **By** Hans Bisswanger. Publisher: Wiley VCH.
7. Enzymatic Reaction Mechanisms (Hardcover) **By** Perry A. Frey and Adrian D. Hegeman. Oxford University Press.
8. Comprehensive Enzyme Kinetics (Hardcover) **By** Vladimir Leskovac. Publisher: Kluwer Academic / Plenum Publishers.
9. Enzyme Kinetics: A Modern Approach (Hardcover) **By** Alejandro G. Marangoni. Publisher: WileyBlackwell.
10. Enzyme Kinetics and Mechanisms (Hardcover) **By** Kenneth B. Taylor. Kluwer Academic Publishers.
11. Nature of Enzymology **By** RL Foster
12. A textbook of enzyme biotechnology **By** Alan Wiseman.
13. Enzymes: Biochemistry, Biotechnology and Clinical Chemistry **By** Trevor Palmer.
14. Enzymes **By** M Dixon and EC Webb. EC Longmans, London.
15. The chemical kinetics of enzyme action **By** KJ Laidler and PS Bunting. Oxford University Press, London.

## **MLT 507: Clinical Molecular Biology**

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **UNIT 1:**

Secondary and tertiary Structure of DNA and RNA, Locked nucleic acids, role of locked nucleic acid in therapeutics, siRNA, Micro RNA, Role of micro RNA in gene regulation, Isolation of nucleic acids, Qualitative and quantitative estimation of nucleic acids, Recombinant DNA Technology, Applications of recombinant DNA, Polymerase chain reaction, application of PCR in Diagnostics of pathogens identification, Site directed mutagenesis, RAPD, RFLP & DNA finger printing, DNA Foot Printing, Mobility shift assay, Promoter & Reporter assay, Yeast Two hybrid systems, antisense-RNA technology, chromosomal walking, gene therapy and recombinant vaccines.

### **UNIT 2: Nucleic Acid analysis,**

Extraction, purification and analysis of mRNA from eukaryotic cells, methods for synthesis of double strand cDNA, Expression profiling, Transcriptome analysis, RT PCR and Real Time PCR,

Rapid DNA sequencing techniques like Sanger's dideoxynucleotide, partial ribonucleotide substitution, Maxam and Gilbert's method, pyrosequencing and single molecule sequencing, Genome, Genome sequencing, DNA Sequence Characterization (Open reading frames, promoters, coding frames)

### **UNIT 3:**

Molecular diagnostics, Viral load monitoring, window period, Role of molecular diagnostics in present diagnostic area, Benefits of molecular diagnostics over serological diagnostics tests, Ethical issues related to molecular diagnostics, role of Molecular diagnostics in Blood banking, Basic techniques used in molecular diagnostics, future of molecular diagnostics,

### **UNIT 4:**

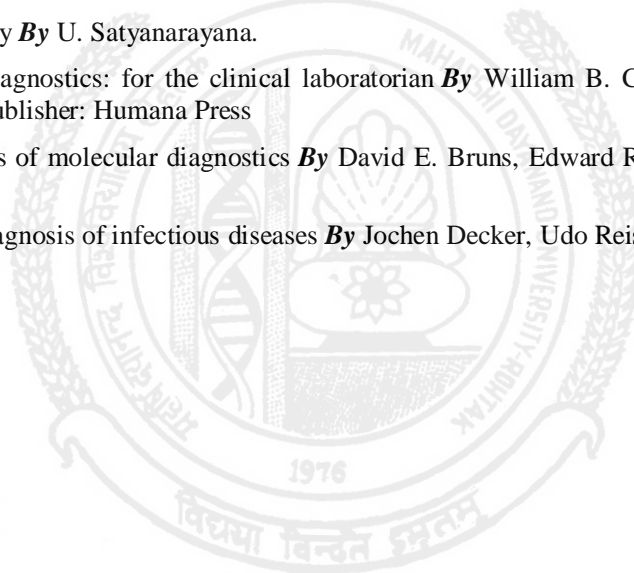
Molecular diagnostic of various viral diseases: HIV type -1, HIV type -II, HPV, Various hepatitis strains, Influenza (H1N1) , sample preparation, various steps required for viral infection analysis and Viral load monitoring,

Molecular diagnostics of bacterial infections; Mycobacterium tuberculosis, Shwenella typhus, Pathogenic E Coli, sample preparation and pathogen detection.

Prenatal diagnostics of various genetic disorders.

### Suggested Readings:

1. Basic Biotechnology (Paperback) **By** Colin Ratledge and Bjorn Kristiansen. Cambridge University Press.
2. Introduction to Biotechnology (Paperback) **By** William J. Thieman and Michael A. Palladino. Benjamin Cummings; US Ed edition.
4. Recombinant DNA Principles and Methodologies **By** James Joseph Greene, CRC Press.
5. Molecular Biotechnology: Principles and Applications of Recombinant DNA (Paper-back) **By** Bernard J Glick and Jack J Pasternak. Publisher: American Society for Microbiology.
6. Laboratory Techniques in Biochemistry and Molecular Biology; DNA sequencing (Vol 10). **By** J Hindley. Elsevier Biomedical.
7. Methods of DNA and RNA sequencing. **By** Sherman M. Weissman. Pub: Praeger
8. RNA isolation and analysis **By** P. Jones, J Qiu and D. Rickwood. Bios Scientific Publishers.
9. Biotechnology: Expanding Horizons **By** B. D. Singh, Kalyani Publishers.
10. Textbook of Biotechnology **By** PK Gupta, Rastogi Publications.
11. Biotechnology **By** U. Satyanarayana.
12. Molecular diagnostics: for the clinical laboratorian **By** William B. Coleman and Gregory J. Tsongalis. Publisher: Humana Press
13. Fundamentals of molecular diagnostics **By** David E. Bruns, Edward R. Ashwood and Carl A. Burtis
14. Molecular diagnosis of infectious diseases **By** Jochen Decker, Udo Reischl. Publisher: Humana Press



## MLT 508: Clinical Immunology

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### *UNIT 1*

Introduction to Immune System: Memory, specificity, diversity, innate and acquired immunity, self vs non-self discrimination. Structure and functions of primary and secondary lymphoid organs. Cells Involved in Immune Responses: Phagocytic cells and their killing mechanisms; T and B lymphocytes; Differentiation of stem cells and idiotypic variations. Nature of Antigen and Antibody: Antigen vs Immunogen, Haptens; Structure and functions of immunoglobulins; Isotypic, allotypic and idiotypic variations.

### *UNIT 2*

Generation of Diversity in Immune System: Clonal selection theory - concept of antigen specific receptor. Organization and expression of immunoglobulin genes: generation of antibody diversity. T cell receptor diversity. Humoral and Cell Mediated Immune Responses: Kinetics of primary and secondary immune response. Complement activation and its biological consequences. Antigen processing and presentation. Cytokines and costimulatory molecules: Role in immune responses. T and B cell interactions. Major Histocompatibility Complex (MHC) Genes and Products: Role of MHC antigens in immune responses. MHC antigens in transplantation.

### *UNIT 3*

Development, Regulation and Evolution of the Immune System: Measurement of Antigen-Antibody Interaction. Production of polyclonal and monoclonal antibodies: Principles, techniques and applications. Agglutination and precipitation techniques. Radio immunoassay, ELISA, immunofluorescence assays: Fluorescence activated cell sorter (FACS) technique. Tolerance vs Activation of Immune System: Immunotolerance, Immunosuppression, Hypersensitivity (Types I, II, III and IV).

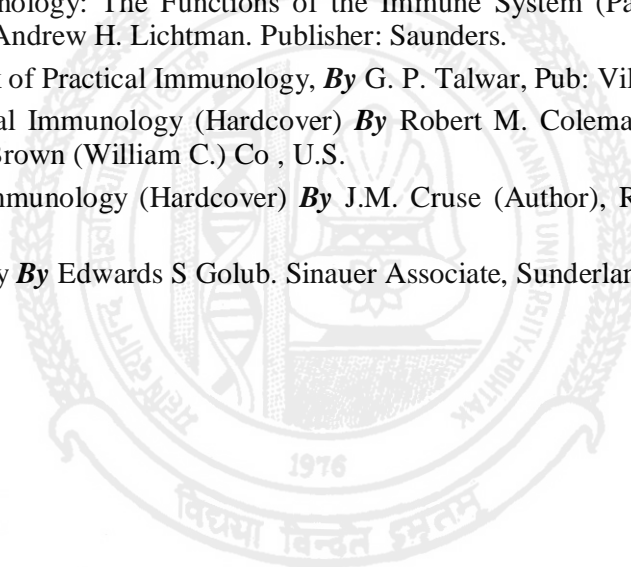
### *UNIT 4*

Immune Responses in Diseases: Immune responses to infectious diseases: viral, bacterial and protozoal. Cancer and immune system. Immunodeficiency disorders. Autoimmunity. Immunization: Active immunization (immunoprophylaxis), Passive immunization (Immunotherapy) and role of vaccines in the prevention of diseases.



Suggested Readings: .

1. Fundamental Immunology (Hardcover) **By** William E. Paul. Publisher: Lippincott Williams and Wilkins.
2. Immunology: International Edition (Paperback) **By** Janis Kuby, Thomas J. Kindt, Barbara A. Osborne and Richard A. Goldsby. WH Freeman and Co. Ltd.
3. Immunology (Paperback) **By** Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne and Janis Kuby. WH Freeman and Co. Ltd.
4. Immunology (Paperback) **By** Ivan M. Roitt, Jonathan Brostoff and David Male. Publisher: Mosby.
5. Introduction to Medical Immunology **By** Gabriel Virella, Marcel Dekker Inc.
6. Roitt's Essential Immunology **By** Ivan M. Roitt and Peter J. Delves, Blackwell Publishing
7. Understanding Immunology (Cell and Molecular Biology in Action) (Paperback) **By** Peter Wood. Publisher: Prentice hall.
8. Basic Immunology: The Functions of the Immune System (Paperback) **By** Abul K. Abbas and Andrew H. Lichtman. Publisher: Saunders.
9. A Handbook of Practical Immunology, **By** G. P. Talwar, Pub: Vikas Publishing House.
10. Fundamental Immunology (Hardcover) **By** Robert M. Coleman and M.F. Lombard. Publisher: Brown (William C.) Co , U.S.
11. Atlas of Immunology (Hardcover) **By** J.M. Cruse (Author), Robert E. Lewis. CRC Press Inc.
12. Immunology **By** Edwards S Golub. Sinauer Associate, Sunderland.



## MLT 509: Clinical Pathology part -I

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

**Unit I:** Genetic disorders, Mutations, types of mutation, Molecular repair mechanisms, Diseases due to defected repair mechanisms, Mendelian Disorders, Transmission pattern of single gene disorders, Autosomal disorders, sex chromosome related disorders, Diseases caused by change in structural proteins: Marfan Syndrome, Ehlers Syndrome, Dalos syndrome, Diseases caused by mutation in receptor proteins: familial hypercholesterolemia. Diabetes, Protein energy malnutrition's.

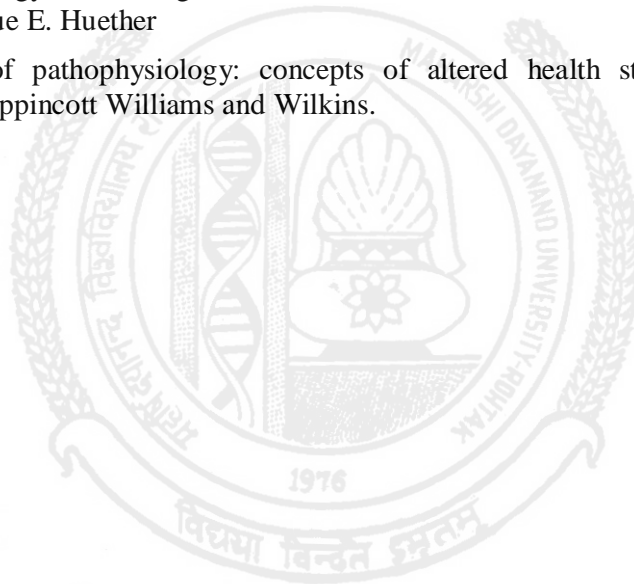
**Unit II:** Cytogenic disorders, Trisomy of 21<sup>st</sup> chromosome, Down syndrome, Klienfelter syndrome, Turner syndrome, Fragile X Syndrome, Pediatric diseases, congenital anomalies, prenatal infections, Premature and intrauterine growth retardation, Respiratory distress syndrome of new born, Necrotizing enterocolitis, sudden death syndrome, cystic fibrosis, Fluorescent in-situ hybridization for identification of chromosomal abnormalities,

**Unit-III:** Hemodynamic Disorders, Hyperemia and congestion, Hemorrhage, Hemostasis, and thrombosis, Endothelium platelets, Coagulation cascades, DIC embolism, Pulmonary Thromboembolism, systemic thromboembolism, Fat Embolism, Air Embolism, Amniotic Fluid Embolism, Infraction.

**Unit IV:** Environmental pollution, air pollution, water pollution and soil pollution, injury by chemical agents, injury by therapeutic agents, Exogenous estrogen and oral contraceptive pills side effects, injury by non therapeutic agents, : lead, Carbon monoxide, alcohol and drug abuse, Injury by physical agents.

Suggested Readings:

1. Histology and cell biology: an introduction to pathology **By** Abraham L. Kierszenbaum. Publisher: Mosby
2. The Interface of Neurology & Internal Medicine **By** José Biller. Publisher: Lippincott Williams and Wilkins
3. Robbins and Cotran pathologic basis of disease, Volume 1, **By** Vinay Kumar, Nelson Fausto and Abul Abbas. Publisher: Elsevier Science.
4. High-yield pathology **By** Ivan Damjanov. Publisher: Lippincott Williams and Wilkins.
5. Reproductive endocrinology: physiology, pathophysiology, and clinical management **By** Samuel S. C. Yen, Robert B. Jaffe
6. Cecil textbook of medicine, Volume 2, **By** Russell La Fayette Cecil, J. Claude Bennett, Fred Plum
7. Pathophysiology: the biologic basis for disease in adults and children **By** Kathryn L. McCance, Sue E. Huether
8. Essentials of pathophysiology: concepts of altered health states **By** Carol Porth. Publisher: Lippincott Williams and Wilkins.



## **MLT 510 Lab Course II**

**Max Marks :100**

**Total Time Duration: 3 hours**

### **Unit-1**

Lab management, Handling of spectrophotometer, water baths, pipettes, Preparation and handling of reagents for enzyme assay, Enzyme assay and calculation of optimum pH, Temperature, time of incubation for alkaline phosphatase, AST and ALT, Polyacrylamide gel electrophoresis (PAGE) and SDS- PAGE),

### **Unit II**

Qualitative and quantitative determination of RNA and DNA, Standard curve preparation of DNA & RNA, Isolation of DNA, Agarose gel electrophoresis, Polymerase chain reaction.

### **Unit-III**

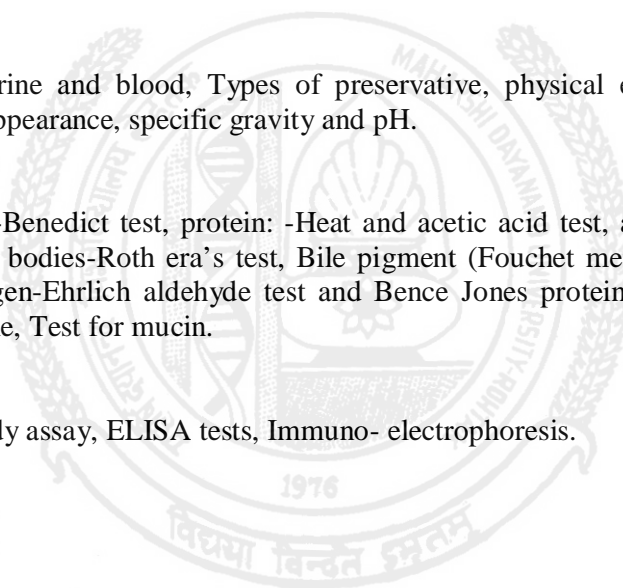
Collection of urine and blood, Types of preservative, physical examination; Volume, colour, odour, appearance, specific gravity and pH.

### **Unit-IV**

Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Roth era's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test, Renal clearance test-urea, creatine, Test for mucin.

### **Unit-V**

Antigen Antibody assay, ELISA tests, Immuno- electrophoresis.



## MLT 511: Clinical Pathology part-II

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **Unit I: Fetal and neonatal physiology and pediatric diseases:**

Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problems in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndrome of the newborn, immune hydrops, tumors and tumor like lesions of infancy and childhood. The role of fetal factors in programming adult-onset diseases.

### **Unit II: Pathology:**

Gynaecological malignancies- ovarian cancer, uterine cancer, cervical cancer, gestational trophoblastic neoplasia. Sexually transmitted diseases- syphilis, gonorrhoea, trichomoniasis, human papilloma virus infection. Diseases during pregnancy-placental inflammations and infections, ectopic pregnancy, gestational trophoblastic diseases, eclampsia.

### **Unit III. Blood and Inflammatory Disorders**

Haemostasis – disorders and regulation – Types of Anaemia, deficiency of iron, B12 and folic acid, hemolytic, aplastic and genetic disorders), Bleeding disorders of man. General inflammatory marks and specific therapeutic bioindicators. CRP (C reactive protein), RA (Rheumatoid Arthritis), ASO (Anti Streptolysin O),

Acute inflammation : Vascular changes. Cellular vents, Chemical mediators, inflammation induced cell injury; Chronic inflammation: Chronic inflammatory cells and mediators. Lymphatics and lymph nodes in inflammation, systemic effect of inflammation.

### **Unit IV: General and Systemic Toxicology**

General toxicology: Mechanism of toxic effect, toxicokinetics - chemical carcinogens and teratogens, treatment of intoxication. Response of respiratory system, reproductive system, liver, kidney to toxic agents. Toxic effects of metals, solvents, environmental pollutants. Inherited metabolic disorders (Phenylketonuria, MSUD, homocystinuria, galactosemia), gout, diabetes insipidus and diabetes mellitus).

## Suggested Readings:

1. Harrison's Principles of Internal Medicine: 15th Edition, 2-Volume Set [Hardcover] **By** Eugene Braunwald, Anthony S. Fauci, Dennis L. Kasper, Stephen L. Hauser, Dan L. Longo and J. Larry Jameson
2. Wellness nursing diagnosis for health promotion **By** Karen M. Stolte
3. High-risk newborn infants: the basis for intensive nursing care **By** Sheldon B. Korones
4. Manual of neonatal care **By** John P. Cloherty, Eric C. Eichenwald, Ann R. Stark. Publisher: Lippincott Williams and Wilkins.
5. Infectious disease **By** Barbara A. Bannister, Norman T. Begg, S. H. Gillespie. Publisher: Blackwell Science
6. Oncology for Health-Care Professionals **By** V. Pervan, L. H. Cohen, T. Jaftha
7. Sexually transmitted diseases sourcebook: basic consumer health information, edited by Amy L. Sutton
8. Infectious diseases **By** Deanna E. Grimes
9. Harrison's Principles of Internal Medicine, Volume 2, **By** Anthony S. Fauci, Dennis L. Kasper, Eugene Braunwald, Dan L. Longo, Stephen L. Hauser
10. Blueprints Obstetrics and Gynecology **By** Tamara L. Callahan, Aaron B. Caughey. Publisher: Lippincott Williams and Wilkins
11. Clinical hematology and fundamentals of hemostasis **By** Denise Harmening
12. Essentials of Rubin's pathology **By** Emanuel Rubin, Howard M. Reisner. Publisher: Lippincott Williams and Wilkins
13. Rheumatology: diagnosis and therapeutics **By** John J. Cush, Arthur Kavanaugh, Charles Michael Stein. Publisher: Lippincott Williams and Wilkins
14. Robbins and Cotran pathologic basis of disease, Volume 1, **By** Vinay Kumar, Nelson Fausto and Abul Abbas. Publisher: Elsevier Science.
15. Understanding disease: pathology and prevention **By** Steven L. Mera. Publisher: Nelson Thornes
16. Casarett and Doull's toxicology: the basic science of poisons **By** Louis J. Casarett, Curtis D. Klaassen, John Doull
17. Principles of toxicology **By** Karen Stine, Thomas Miller Brown, Thomas M. Brown. Publisher: CRC Press
18. Chemical principles of environmental pollution **By** B. J. Alloway, D. C. Ayres

## MLT 512: Clinical Biochemistry

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **UNIT 1**

Disorders of carbohydrate metabolism: Diabetes mellitus, glycohemoglobins, hypo-glycemia, galactosemia and ketone bodies. Various types of glucose tolerance tests. Glycogen storage diseases.

Physiology of lipids/lipoproteins. Lipidosis. Clinical inter-relationships of lipids (sphingolipidosis and multiple sclerosis), lipoproteins and apolipoproteins. Diagnostic tests for HDL-cholesterol, LDL-cholesterol and triglyceride disorders.

Inborn errors of metabolism:

- a) **Disorders of amino acid metabolism**- Phenylalanemia, homocystinuria, tyrosinemia, MSUD, phenylketonuria, alkaptonuria, albinism and aminoacidurias.
- b) **Disorders of nucleic acid metabolism**- Disorders in purine/ pyrimidine metabolism.

### **UNIT 2**

Electrolytes, blood gases, respiration and acid-base balance. Disorders of acid-base balance and their respiratory and renal mechanisms.

Evaluation of organ function tests: Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions. Clinical importance of bilirubin.

Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine kinase, aldolase and lactate dehydrogenase. Enzyme tests in determination of myocardial infarction. Enzymes of pancreatic origin and biliary tract.

### **UNIT 3**

Hormonal disturbances: Protein hormones (anterior pituitary hormones, posterior pituitary hormones), steroid hormones, adrenocorticosteroids, and reproductive endocrinology. Disturbances in thyroid function.

Disorders of mineral metabolism: Hypercalcaemia, hypocalcaemia, normocalcaemia, hypophosphataemia and hyperphosphataemia.

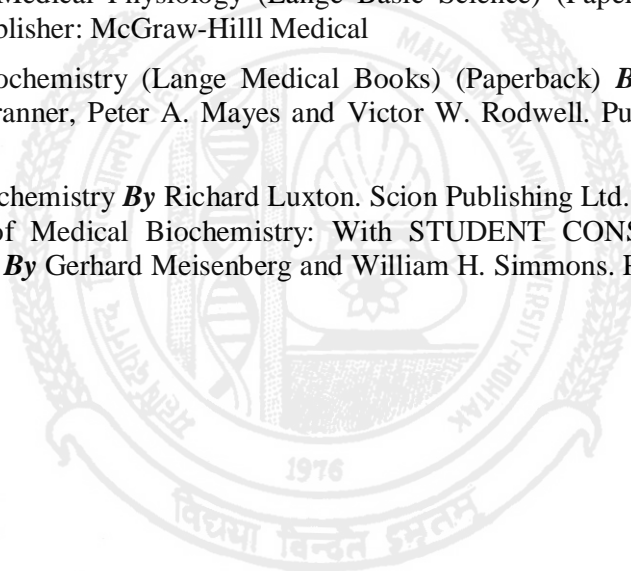
### **UNIT 4**

Biochemical aspects of hematology: Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemias thrombosis and anemias. Laboratory tests to measure coagulation and thrombolysis.

Detoxification in the body: enzymes of detoxification, polymorphism in drug metabolizing enzymes. Mechanism of drug action and channels of its excretion, Disorders of vitamins and trace elements.

Suggested Readings: \_\_\_\_\_.

1. Textbook of Medical Biochemistry **By** MN Chatterjea and Rana Shinde, Jaypee Brothers.
2. Lehninger Principles of Biochemistry 5<sup>th</sup> Ed **By** David L. Nelson and Michael M. Cox, WH Freeman and Company.
3. Davidson's Principles and Practice of Medicine: A Textbook for Students and Doctors (Hardcover) 15<sup>th</sup> Ed **By** LSP Davidson, J MacLeod and CRW Edwards. Publisher: Churchill Livingstone.
4. Medical Biochemistry (Paperback) **By** John W. Baynes and Marek Dominiczak. Publisher: Mosby.
5. Clinical Biochemistry: An Illustrated Colour Text (Paperback) 3<sup>rd</sup> Ed **By** Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd. Publisher: Churchill Livingstone.
6. Review of Medical Physiology (Lange Basic Science) (Paperback) **By** William F. Ganong. Publisher: McGraw-Hill Medical
7. 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.
8. Clinical Biochemistry **By** Richard Luxton. Scion Publishing Ltd.
9. Principles of Medical Biochemistry: With STUDENT CONSULT Online Access (Paperback) **By** Gerhard Meisenberg and William H. Simmons. Publisher: Mosby.





## MLT 513: Medical Laboratory Techniques

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### **Unit I :**

Analysis of amino acids, Screening tests, quantitative tests, test for specific amino acids, determination of proteins in serum, plasma and CSF. Determination of glucose in body fluids, glucose tolerance test and hypoglycemia determination, analysis of ketone bodies, method of estimation of lactate, pyruvate and glycated hemoglobin in blood. Analytical methods for estimation of triglycerides, high density lipoproteins, low density lipoproteins, apolipoproteins.

### **Unit II :**

Laboratory application of nucleic acid technologies to elucidate, diagnose, monitor disease state and to evaluate non-disease status techniques for the detection of DNA and RNA structures at the molecular level, Basic principles and techniques-nucleic acid biochemistry-Relation to laboratory evaluation of disease and establishing a molecular diagnostic laboratory facilities, equipment, personnel. Clinical testing process, quality assurance, clinical validation and accreditation.

### **Unit III :**

Molecular genetics of hematopoietic neoplasm-lineage probes in the evaluation of hematopoietic neoplasma- Molecular analysis of chromosomal aberrations in leukemias and lymphomas, Molecular diagnosis of genetic diseases. Choice of techniques, choice of applications, special concept unique to molecular genetic disorders, specific disease examples. Application of molecular methods in clinical microbiology.

### **Unit IV :**

DNA analysis; historical aspects advantage of DNA over traditional serology; impact of DNA specimen collection, DNA degradation and environmental damage, quality assurance, standard, databank, legal challenge.

Suggested Readings: \_\_\_\_\_ .

1. Methods in Molecular Biology: Amino Acid Analysis Protocols **By** Catherine Cooper, Nicolle Packer and Keith Williams. Publisher: Humana Press
2. Medical Biochemistry [Paperback] **By** John Van Pilsum. Publisher: University of Minnesota Press.
3. Clinical Biochemistry: Metabolic and Clinical Aspects [Paperback] **By** William J. Marshall and Stephen K. Bangert. Publisher: Churchill Livingstone.
4. Clinical Chemistry: Techniques, Principles, Correlations (Bishop, Clinical Chemistry) [Hardcover] **By** Michael L Bishop, Edward P Fody and Larry E Schoeff. Publisher: Lippincott Williams and Wilkins
5. Nucleic Acid Amplification Technologies: Application to Disease Diagnosis [Hardcover] **By** H Olsvik (Editor), S Morse (Editor), O Lee (Editor). Publisher: Eaton Publishing, USA.
6. Chromosomal Alterations: Methods, Results and Importance in Human Health [Hardcover] **By** Gunter Obe and Vijayalaxmi. Publisher: Springer
7. Handbook of Hematologic Pathology (Diagnostic Pathology) [Hardcover] **By** Harold R. Schumacher, Sanford A. Stass and William A. Rock. Publisher: Marcel Dekker Inc.
8. Molecular Diagnosis of Genetic Diseases (Methods in Molecular Medicine) (Methods in Molecular Biology) (v. 1) [Hardcover] **By** Rob Elles. Publisher: Humana Press.
9. Color Atlas and Textbook of Diagnostic Microbiology [Hardcover] **By** Elmer W Koneman, Stephen D Allen, William M Janda, Paul C Schreckenberger and Washington C Winn. Publisher: Lippincott
10. Molecular Diagnostics: Promises and Possibilities [Hardcover] **By** Mousumi Debnath, Godavarthi B.K.S. Prasad and Prakash S. Bisen. Publisher: Springer

## **MLT 514: Medical Microbiology**

**Note:** Que. 1 will be compulsory and will cover the entire syllabus in the form of short questions. Que. 2 to 9 will include two questions from each unit and candidate will have to attempt one question from each unit. Overall, five questions to be attempted. All questions to carry equal marks.

Max. Marks: 80

Max. Time: 3 hrs

### ***UNIT 1***

Methods of classification of microorganisms, general characteristics of main groups of microorganisms. Mycoplasmas. Gram +ve and Gram -ve bacteria with structure and functions of peptidoglycan in them. Different phases of microbial growth and physical conditions required. Culture media and isolation of pure bacterial cultures. Staining methods for bacteria. Quantitative measurement of bacterial growth, microbial taxonomy, Bacterial morphology, growth and nutrition of bacteria,

### ***UNIT 2***

Bacterial genetics, pathogenesis, antibacterial agents, drug resistance and drug sensitivity tests, laboratory diagnosis of bacterial infections. Chemical control of microorganisms: Heat, filtration and radiation. Identification of bacteria on the basis of cultural characteristics (morphological and serological features): Staphylococcus and streptococcus including pneumococci, Family Enterobacterial, Haemophilus & Bordetella, Cornyaebacterium and Nessleria & Treponema.

### ***UNIT 3***

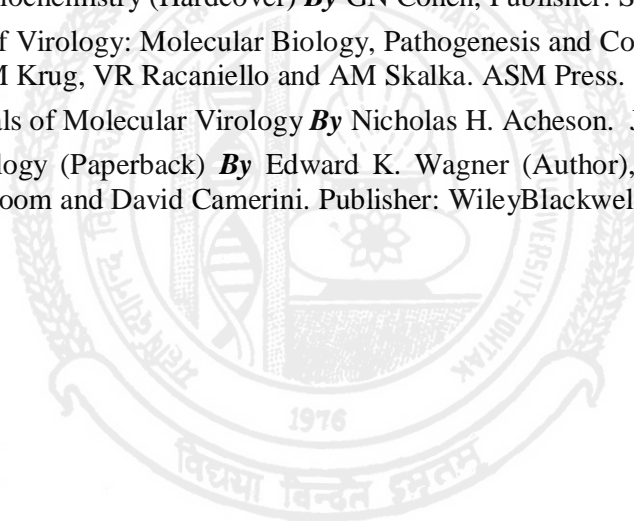
Virus structure including viral proteins, virus classification and lytic/lysogenic life cycles in viruses. Virus-induced changes in cells, methods of assay of viruses. Replication of RNA viruses- negative strand (VSV), positive strand (polio) and retroviruses. Replication of DNA viruses (Adenovirus or SV40).

### ***UNIT 4***

Air borne infections (Tuberculosis, Whooping cough, Influenza, Pneumonia, streptococcal infections, Diphtheria, Measles, Chicken pox, Mumps), Food and water borne infections (Cholera, Typhoid, Shigellosis, Brucellosis, Gastroenteritis, Amoebiosis, Taeniasis, Poliomyelitis, Jaundice) Sexually transmitted diseases (AIDS, Syphilis, Gonorrhoea, Lymphogranuloma venereum, Genital Herpes, Trichomoniasis) Vector borne diseases (Plague, Rickettsia, Malaria, Filariasis, Rabies, Leptospirosis),

Suggested Readings: \_\_\_\_\_ .

1. Microbiology: An Introduction, Eighth Edition **By** Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson Education.
2. Fundamentals of Microbiology **By** I. Edward Alcamo. Benjamin-Cummings Pub Co.
3. Microbiology (Hardcover) **By** Lansing M. Prescott, John P Harley and Donald A. Klein. Publisher: McGraw Higher Education.
4. Medical Microbiology **By** FH Kayser, KA Bienz, J Eckert and RM Zinkernagel. Publisher: Thieme Medical Publishers, Germany.
5. Medical Microbiology **By** P Murray, KS Rosenthal and MA Pfaller. Publisher: Mosby, Elsevier.
6. Principles of Microbiology **By** Ronald M. Atlas
7. Microbiology **By** BD Davis, R Delbecco, HM Eisent and HS Ginsberg. Medical Division, NY.
8. Microbial Biochemistry (Hardcover) **By** ML Srivastava, Alpha Science Intl Ltd.
9. Microbial Biochemistry (Hardcover) **By** GN Cohen, Publisher: Springer.
10. Principles of Virology: Molecular Biology, Pathogenesis and Control. **By** SJ Flint, LW Enquist, RM Krug, VR Racaniello and AM Skalka. ASM Press.
11. Fundamentals of Molecular Virology **By** Nicholas H. Acheson. John Wiley & Sons.
12. Basic Virology (Paperback) **By** Edward K. Wagner (Author), Martinez J. Hewlett, David C. Bloom and David Camerini. Publisher: WileyBlackwell



## **MLT 515- Lab Course III**

**Max Marks :100**

**Total Time Duration: 3 hours**

### **Unit I**

Sterilization of glassware & culture media; preparing & dispensing culture media-establishing pure cultures. Preparation of wet mount, mobility test –Simple stain-Gram's stain-Acid Fast stain-Capsule stain.

### **Unit II**

Physiological reaction of bacteria –Catalase test –Coagulates test –Oxidase Test- Nitrate test –Carbohydrate Fermentation test – IMVIC test –TSI test, Antibiotic sensitivity test- Qualitative: Kirby Bauer's methods, Quantitative, MIC

### **Unit –III**

Blood Pressure, Pulse rate, Clotting time, Bleeding time, Haemoglobin estimation, Erythrocyte Sedimentation Rate, Packed cell volume. Prothrombin time, Differential count, Total Red Blood cell count, Total White blood cell count, Platelet count, Eosinophilic count, Reticulocyte count.

### **Unit -IV**

Blood sugar, Urea, Uric acid, Creatinine, Cholesterol, triglyceride, High Density Lipoproteins, Low Density Lipoproteins, Very Low Density Lipoproteins.