

**SHRI GURU RAM RAI UNIVERSITY DEHRADUN,
(UTTARAKHAND)**

**REGULATION OF THE UNIVERSITY FOR THE AWARD OF THE
DEGREE OF
MASTER OF SCIENCE – MEDICAL LAB. TECHNOLOGY**

An exercise of the powers conferred by section of S.G.R.R University Act no.3 of 2017.Academic Council of the Shri Guru Ram Rai University Dehradun hereby makes the following regulations:-

SHORT TITLE AND COMMENCEMENT

These regulations shall be called "THE REGULATIONS FOR THE MASTER OF SCIENCE – MEDICAL LABORATORY TECHNOLOGY OF THE SHRI GURU RAM RAI UNIVERSITY, DEHRADUN, UTTARAKHAND"

- I. These Regulations and the syllabus shall come into force from the 2017-2018 academic session onwards.
- II. The regulations framed are subject to modification from time to time by the standing Academic Board of the University.

OBJECTIVES

To provide an extensive training in the fields of Biochemistry, Microbiology and Pathology to the students to enable them to supervise the entire laboratory.

ELIGIBILITY CRITERIA:-

Candidates have a degree in B.Sc. Medical Laboratory Technology (MLT), B.Sc., Biochemistry, and B.Sc. Microbiology.

ELIGIBILITY CERTIFICATE:

Candidates who have passed any qualifying examination, as specified in Regulation No.3 above from any other Universities other than the Shri Guru Ram Rai University before seeking admission to the affiliated institutions shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the application form which shall be downloaded from the University website (www.sgrru.ac.in).

DURATION OF THE COURSE: - Two years

Each academic year shall consist of not less than 270 working days (including Examination period)

PHYSICAL FITNESS

Every student prior to admission to the course should submit to the Head of the Institution, a certificate of Medical fitness that the candidate is physically fit to undergo the course.

MIGRATION/TRANSFER OF CANDIDATES

Request for Migration/ Transfer of candidates during the course of study from one recognized Institution to another recognized Institution of this or from other University of shall not be granted under any circumstances.

POSTING AND TRAINING IN OUTSIDE CENTRES:

The head of the postgraduate Department shall make necessary arrangements for the postgraduate candidates to undergo training in various skills in other centres.

ATTENDANCE REQUIREMENT FOR ADMISSION TO EXAMINATION

- a) No candidate shall be permitted to appear in any one of the parts of M.Sc (Medical Laboratory Technology) Course Examinations, unless he / she has attended the course in all the subjects for the prescribed period in an affiliated Institution recognized by this University and has to produce the necessary certificates of study, attendance, satisfactory conduct and progress from the Head of the Institution.
- b) A candidate is required to put in a minimum of 80% of attendance (of 270 days) each in theory and practical classes in each subject before admission to the examination.
- c) A candidate lacking in the prescribed attendance and progress in any one subject in theory and practical classes, wherever necessary in the first appearance, shall not be permitted for admission to the entire examination.

EXAMINATION REGULATIONS:

Compartments / Supplementary/ Back Paper:

- (I) A student who obtain 50% of the marks individually but has failed in two Papers shall be permitted to appear in those papers only at the two consecutive examinations and if he/she passes at either of those examinations he/she will be deemed to have passed the examination and will be promoted to higher class. (Aggregate marks should be 50%).
- (II) A student (s) appearing in back paper/ supplementary shall be Eligible to join the next higher Class.

There shall be one main examination in a year and a supplementary to be held not less than 6 months after publication of its results.

MEDIUM OF INSTRUCTION:

The medium of instruction for all subjects shall be English.

AWARD OF DEGREE:-

The degree shall be awarded by the University only after the successful completion of the course.

AWARD OF MEDALS / PRIZES:-

The University shall award at its Convocation, medals and prizes to Outstanding candidates as and when instituted by the Donors as per the schedule prescribed for the award.

PASSING MINIMUM:

A candidate shall be declared to have passed in each paper/subject if he / she secure NOT LESS THAN 50% of the marks prescribed for the examinations.

NUMBER OF APPEARANCE/COMPLETION OF THE COURSE OF STUDY

The duration for completion of the course is double the duration of the course i.e. 4 years to pass the examination, from the date of joining the course. Otherwise he / she has to be discharged from the course.

CURRICULUM: - FIRST YEAR:

SL. No	Paper Number	Subject
1	Paper 1	General Biochemistry, Medical Laboratory Technology
2	Paper 2	General Bacteriology, Immunology and Parasitology
3	Paper 3	Haematology and Clinical Pathology
4	Paper 4	General Pathology
5	Paper 5	Epidemiology & Biostatics

CURRICULUM: - SECOND YEAR:

SL. No	Paper Number	Subject
1	Paper 1	Clinical Biochemistry, Endocrinology and Nutritional Biochemistry
2	Paper 2	Systematic Bacteriology, Virology and Mycology
3	Paper 3	Advances Haematology and Immuno Haematology
4	Paper 4	Techniques in Histopathology and Cytology

SCHEME OF EXAMINATION

IST YEAR

Course code	Course title	Marks for Theory			Marks for Practical			Total Marks
		IA*	EE*	Total	IA*	EE*	Total	
MMLT 101	General Biochemistry, Medical Laboratory Technology	30	70	100	30	70	100	200
MMLT 102	General Bacteriology, Immunology and Parasitology	30	70	100	30	70	100	200
MMLT 103	Haematology and Clinical Pathology	30	70	100	30	70	100	200
MMLT 104	General Pathology	30	70	100	30	70	100	200
MMLT 105	Epidemiology & Biostatistics	30	70	100	-	-	-	100
	TOTAL	150	350	500	120	280	400	900

IIND YEAR

Course code	Course title	Marks for Theory			Marks for Practical			Total Marks
		IA*	EE*	Total	IA*	EE*	Total	
MMLT 201	Clinical Biochemistry, Endocrinology and Nutritional Biochemistry	30	70	100	30	70	100	200
MMLT 202	Systematic Bacteriology, Virology and Mycology	30	70	100	30	70	100	200
MMLT 203	Advances Haematology and Immuno Haematology	30	70	100	30	70	100	200
MMLT 204	Techniques in Histopathology and Cytology	30	70	100	30	70	100	200
	TOTAL	120	280	400	120	280	400	800

SUBMISSION OF PRACTICAL RECORD BOOKS:-

At the time of Practical Examination, each candidate shall submit to the Examiners his / her Practical Record Books duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

The concerned Head of the Department shall evaluate and award the marks for the Practical Record Note Book and Log Book (Internal Assessment) and the Practical Record shall be presented to the Examiner at the time of examinations at the end of each year.

M.Sc MLT IST Year
PAPER – I GENERAL BIOCHEMISTRY, MEDICAL
LABORATORY TECHNOLOGY

General Biochemistry

Unit – 1

Structure of Cell and intracellular organelles

Carbohydrates, lipids, proteins and nucleic acids – structure, classification, properties, functions and Separation techniques

Membrane structure, glycoproteins

Unit – 2

Enzymes: Classification, factors that alter enzymes catalyzed reaction, Michaelis – Menton

Equation, Competitive and noncompetitive inhibition of enzyme reactions, regulation enzyme activity, Isoenzymes – separation and identification, plasma enzymes in clinical diagnosis. Coenzymes.

Unit – 3

Bioenergetics and Oxidative phosphorylation; free energy-exergonic and endergonic reaction, high energy phosphates, components of electron transport chain-mechanism of ATP production, Chemiosmotic theory, inhibitor of respiratory chain.

Unit –4

Carbohydrate Metabolism; Glycolysis, TCA cycle, glycogen, gluconeogenesis, blood glucose regulation, diabetes mellitus

Lipid Metabolism: Synthesis and breakdown of fatty acids, ketone bodies, DKA, Cholesterol, bile acids, lipoproteins, atherosclerosis.

Unit – 5

Protein Metabolism: Synthesis and breakdown of amino acids, urea cycle, specialized products from amino acids.

Unit – 6

Molecular Biology: Structure and functions DNA, organization and replication, transcription, protein synthesis.

Recombinant DNA technology

PCR

FISH

Unit – 7

Vitamins, Water and mineral Metabolism: Functions and deficiency manifestations of Vitamin A, D, E, K, C, B Complex. Water and electrolytes, calcium, phosphorus, magnesium, iron, lead, copper, trace elements (iodine, selenium, zinc).

Practicals:

General Experiments:

1. Preparation of buffers and determination of pH
2. Absorption spectra of aromatic amino acids
3. Colour reactions of aminoacids
4. Normal and abnormal constituents of urine
5. Body fluid examination
6. Qualitative analysis and identification of sugars
7. Separation of sugars by paper chromatography
8. Qualitative analysis and identification of amino acids
9. Separation of aminoacids by paper chromatography, TLC
10. Separation of Lipids by TLC
11. Agarose gel electrophoresis
12. SDS_PAGE and quantitation using densitometers
13. Separation of proteins, hemoglobin, lipoproteins b electrophoresis using agarose gel
14. Studies on enzyme kinetics using enzyme sources such as acid phosphatase from potatoes, alkaline phosphatase from liver – effect of pH, Temperature and substrate concentrations
15. Assessment of antioxidant status: Vitamin C and E, glutathione, MDA, Paraoxanose in serum

16. PCR
17. ELISA
18. Western blot
19. Chemiluminescence
20. Blood gas analysis
21. Karyotyping
22. Molecular weight determination by PAGE
23. Cell fractionation
24. Protein purification by
24. NH₄SO₄ Precipitation

Medical Laboratory Technology

Unit -1

General Laboratory Techniques and procedures: Chemicals and related substance, general laboratory supplies, volumetric equipments and its calibration, centrifuges, balances and weighing, concept of solute and solvent, buffer solutions and their actions, physical and chemical units, units of measurements, safety measures.

Unit – 2

Specimen collection and processing: Collection and preservation of blood and urine, sources of biological variations, pre-analytical variables.

Analytical Techniques:

- a. Spectrophotometry, flame emission spectrophotometry, atomic absorption spectrophotometry, fluorimetry, nephelometry, turbidimetry, flow Cytometry
- b. Electrochemistry – potentiometry, biosensors
- c. Chromatography – Theory, description of techniques of various types of chromatography, paper chromatography, HPLC
- d. Electrophoresis – Theory, description of techniques of various types of electrophoresis, technical considerations.

- e. Immunochemical techniques – basic concepts, antigen-antibody binding qualitative methods, quantitative methods.
- f. Centrifugation techniques
- g. Protein purification
- h. Recombinant DNA technology – PCR, western blotting, northern blotting and southern blotting.

Automation: Concepts, automation of analytical processes, integrated automation for clinical laboratory, automation of point of care analyzers.

Unit -3

Laboratory Operation:

- a. Selection and evaluation of methods: Basic concepts, accuracy - reference methodology, systematic error, analytical range, sensitivity and speciality, detection limit, interferences within run-precision, recovery

Assessing method acceptability:

- b. Establishment and use of reference value
- c. Clinical laboratory information-computer system, micro-computer applications laboratory information systems, future use of computers.

Unit-4

Laboratory Management and Safety: Health care delivery and financial strategies for managed care, financial management, human resource management and space and facility management. Lab safety-safety program, safety equipments, chemical hygiene plan. Hazards in the laboratory- identification of hazards, chemical hazards, clinical hazards, electrical hazards, biological hazards. Prevention of hazards.

Quality management: Fundamentals, total quality management, total testing process, control of preanalytical and analytical variables, control of analytical quality using stable control materials, external quality assessment, documentation of reports, proficiency testing new quality initiatives.

M.Sc MLT IST Year

PAPER – II GENERAL BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY

General Bacteriology

Unit – 1

Brief history of microbiology with special reference to the contributions of Louis Pasteur, Robert Koch and others.

Morphology and physiology of Bacteria Classification and growth requirement of Bacteria Principles and uses of different kinds of Microscopes

Unit- 2

Sterilization and disinfection procedures

Basic principles of Bacterial genetics

Cultivation methods

Antibiotic –antibiotic susceptibility testing.

Unit – 3

Sources and modes of transmission of infection with prevention of hospital acquired infection

Definition of Epidemic, Endermic, Pandemic and sporadic outbreak of diseases
Virulence factors of Bacteria

Practicals

Handling of microscope, staining methods

Preparation of media, inoculation methods

Preservation of cultures, anaerobic cultivation methods

Washing and sterilization of glassware, handling of equipment Techniques of filtration, maintenance of quality control antibiotic susceptibility testing Molecular techniques

Immunology

Unit – 1

Antigen, antibody definition, examples

Antigen-antibody reaction – principles and their application in the diagnosis of infectious diseases.

Unit- 2

Immunity- classification, active immunity, passive immunity, innate immunity, humoral and cell mediated immunity, immunization schedule

Unit- 3

Hypersensitivity-classification, mechanism and example autoimmunity – mechanism and example tumour and transplantation immunology.

Practicals

Demonstration of agglutination precipitation, neutralization, fluorescent Antibody technique, immune blot technique, ELISA etc

Test to demonstrate CMI

Test to demonstrate hypersensitivity Detection of ANA, Ds DNA etc

Parasitology

Unit – 1

Classification – protozoa-amoeba, flagellates, sporozoa, ciliates
Opportunistic parasitic infections

Unit – 2

Helminthes – cestodes, trematodes.

Unit -3

Helminthes- nematodes and diagnostic methods in parasitology.

Practicals

Stool examination for ova and cysts

Concentration methods

Peripheral blood smear examination

Special staining methods

M.Sc MLT IST Year

PAPER – III HAEMATOLOGY AND CLINICAL PATHOLOGY

Basic Principles of laboratory organization and safety

Sample Collection – principles of analytical, pre and post analytical errors
Reception, labelling and recording of laboratory investigations Cleaning of glassware, pipettes, E.S.R tubes and counting chambers Preparation of capillary pipette, distilled water, reagents, buffers

Collection of blood, preparation of blood smear, staining of blood and bone marrow smears. Genetics

Continuity of life - heredity, variation; mendl's laws of inheritance, chromosomal basis of inheritance; other patterns of inheritance , mutation and chromosomal aberrations;

Human genetics - methods of study, genetic disorders.

DNA as a genetic material - its structure and replication; structure of RNA and its role in protein synthesis; Gene expression - transcription and translation

Basic techniques in Molecular Biology and cytogenetics

Equipment relevant to lab haematology and transfusion medicine including

Mircoscope: Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principal UV-Vis spectrometry and colorimetry instrumentation and its application Fluorimetry: Principal, Instrumentation and application

Electrophoresis: Principal, types and application (agrose gel electrophoreses, starch gel and polyacrylamide electrophoresis)

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and analytical with its application

Blood analyzer: Principal, instrument and its application

Incubator, hot air oven and autoclave: Principal, instrument and its application.

Radioactivity: Radioisotopes, half life units, Geeger Mueller counter, gamma

counter and scintillation PH meter (principle types, types of electrodes and application)

Freezers, coolers platelet agitators, cryo thawing baths Automated immunohaematology analysers

Automated coagulation analysers, platelet aggregometers and thromboelastogram
Haemopiesis

Red Blood Cells : Normal erythropiesis, morphology Red cell disorders – inherited and acquired

Anemias – classification, pathophysiology and diagnosis Haemolytic disorders
Malignant disorders

White Cells – Normal myelopoiesis,

White cell disorders - inherited and acquired

Malignant disorders – classification, pathophysiology and diagnosis

Platelet disorders – classification, diagnosis and pathophysiology

M.Sc MLT IST Year
PAPER – IV GENERAL PATHOLOGY

Unit-1

General introduction to pathology causes of cell injury, cell injury and necrosis
Apoptosis and sub cellular responses to cell injury Cellular responses to growth
and differentiation, pathologic calcification

Acute and chronic inflammation, morphologic patterns of acute and chronic
inflammation, systemic effects of inflammation Complements and their functions
Cytokines and their functions Intracellular accumulation, gangrene – pathology
and classification, pathogenesis and classification of edema, reticulocyte structure
Pathogenesis of thrombosis, embolism, infarction and shock

Unit-2

Control of normal growth, cell cycle illustration and the regulation of cell division,
labile cells, stable cells, permanent cells, molecular events in cell growth
(autocrine signalling, paracrine signaling, endocrine signaling), cell surface
receptors, signal transduction systems and transcription factors.

Growth inhibition, growth factors, extra cellular matrix and cell matrix
interactions, collagen, elastin, fibrillin and elastic fibres, adhesive glycoproteins
and integrins, matricellular proteins, proteoglycans and hyaluronidase.

Repair by connective tissue-angiogenesis, growth factors and receptors for
angiogenesis, extra cellular matrix proteins as regulators of angiogenesis.

Fibrosis, tissue modeling, wound healing, healing by first and second intention
Haemo dynamic disorders – hemostasis and thrombosis.

Unit-3

Genetics (molecular basis of human diseases, production of human biologically
active agents, gene therapy, disease diagnosis, mutations, mendelian disorders,
autosomal dominant disorders, autosomal recessive disorders and X linked
disorders

Biochemical and molecular basis of single gene disorders.

Disorders with multifactorial inheritance, normal karyotype, fluorescence in situ
hybridization, cyto genetic disorders involving sex chromosomes.

Diagnosis of genetic diseases. Direct gene diagnosis, indirect gene diagnosis,
linkage analysis.

Unit – 4

Neoplasia, Nomenclature, characteristics of benign and malignant neoplasms
Molecular basis of cancer, oncogenes and cancer, protein products of oncogenes
Activation of oncogenes, point mutations, chromosomal rearrangements, gene amplification, cancer

Suppressor genes, protein products of tumor suppressor genes.

Molecules that regulate nuclear transcription and cell cycle, Rb gene, P53 gene, BRCA-1 and BRCA-2 gene, molecules that regulate signal transduction, cell surface receptors, other tumor suppressor genes. Genes that regulate apoptosis and DNA repair, Telomeres and cancer, molecular growth, Kinetics of tumor cell growth, tumor, tumor angiogenesis

Lab diagnosis of cancer.

Practicals

Polymerase chain reaction

In situ hybridization

Cytogenetics

Unit - 5

Infectious diseases, new and emerging infectious diseases, categories of infectious diseases in brief, special techniques for diagnosing infections

Tuberculosis-etiology, pathogenesis and lab diagnosis Leprosy – etiology, pathogenesis and lab diagnosis HIV- epidemiology, pathogenesis and lab diagnosis

Practicals

Western blot

Northern blot

Southern blot

CD4 CD8 counts

Systemic pathology

PAS (Periodic Acid-Schiff) stain Romanowsky stain

Stain for micro-organisms Argentaffin and argyrophil stains Amyloid stains

Reticulin stains Trichrome stains

Phosphotugstic acid hematoxylin stain (PTAH)

Stains for hemodierin (Perls), melanin (Fontana) and calcium (von Kossa) Stains for neutral lipids

Mucin stains Glemsa stain Elastic fibers Myelin stains

Enzyme histochemistry and immunoenzyme technique

Immunohistochemistry and the various immunohistochemical stains in the diagnosis of various disorders

Tissue of special interest– nervous system Hard tissue

Miscellaneous cells

Endocrine cells

Cytology technique

Quantitative methods

Autoradiography (specimen radiography)

Microincineration

Museum technique

Specimen photography and microphotography

Microscopy

- General microscopy
- Dark ground microscopy
- Immunofluorescence and fibers and formaldehyde induced fluorescence
- Fluorescence microscopy
- Polarizing microscopy
- Phase contrast microscopy
- Electron microscopy

Flow cytometry

Other methods for analysis of cell proliferation and Nucleolar Organiser region evaluaton polymerase chain reaction and application of PCR technology in Pathology cytogenetics interphase cytogenetics

M.Sc MLT IST Year
PAPER – V EPIDEMIOLOGY & BIostatISTICS

Epidemiology:

1. Epidemiology - definition, concept and role in health and disease.
2. Definition of the terms used in describing disease transmission and control.
3. Modes of transmission and natural history of a disease
4. Measures for prevention and control of communicable and non-communicable disease.
5. Principal sources of epidemiological data.
6. Definition, calculation and interpretation of the measures of frequency of diseases and mortality.
7. Need and uses of screening tests.
8. Accuracy and clinical value of diagnostic and screening tests (sensitivity, specificity, & predictive values).
9. Causal Association & Various types of epidemiological study designs
10. Critical evaluation of published research

Biostatistics:

Frequency distribution: diagrams, characteristics of a frequency distribution Basic distribution statistics: measures of central tendencies

Measures of variation/dispersions Confidence intervals

Measures of accuracy and precision Statistical sampling methods

Basic for statistical inference Sampling distribution Statistical inference Statistical inference

Type I and Type II errors

Parametric comparison of populations

The null hypothesis and statistical significance Comparison of means test including paired test One way analysis of variance (Anova)

Non Parametric distribution statistics Sign test Mann-whitney rank sum test X^2 (Chi Square) test

Linear regression and correlation Scatter diagram Correlation coefficient
Regression coefficient Multiple regression

Sensitivity, specificity and predictive values Receiver – operating characteristics curve.

M.Sc MLT IIND Year

PAPER – I CLINICAL BIOCHEMISTRY, ENDOCRINOLOGY AND NUTRITIONAL BIO-CHEMISTRY

Clinical Biochemistry

Unit -1

Clinical Enzymology: Enzymes in plasma and their origin, general principles of assay, clinical significance of enzymes and isoenzymes, Measurement of serum enzymes in diagnosis – cardiac and skeletal muscle enzymes, liver and biliary tract enzymes digestive, bone and gi disorders.

Unit-2

Disorders of carbohydrate metabolism: diabetes mellitus – diagnosis, gestational diabetes mellitus, role of laboratory in diagnosis and prognosis in diagnosis and prognosis, hypoglycemia. Determination of glucose in body fluids, ketone bodies, lactate and pyruvate. Glycated proteins, urinary albumin excretion –specimen collection, storage and quantitative assay. Qualitative tests for individual sugars in urine. Inborn errors of metabolism

Disorders of Lipid Metabolism: Atherosclerosis and coronary artery disease. Disorders of lipoprotein metabolism. Measurement of lipids, lipoproteins and apolipoproteins. Sources of analytical and biological variations in measurements.

Disorders of protein metabolism: plasma proteins, proteins in body fluids. Analysis of proteins in blood and other body fluids. Electrophoresis of plasma proteins. Aminoacidurias-selected disorders of amino acid metabolism-phenylalanine, tyrosine, alkaptonuria, melanuria, cystinuria, homocystinuria, cystinosis, organic acidurias. Analysis of amino acids – screening test, quantitative tests for specific aminoacids.

Unit-3

Disease related to organs: Liver- LFT, Jaundice, hepatitis, cholestasis

Kidney- RFT, renal failure, uremia, nephritic syndrome, renal calculi, renal tubular acidosis, diabetes insipidus, dialysis. Early makers of renal pathology – microalbuminuria, albumin: creatinine ratio.

GIT- Gastric and pancreatic function tests, pancreatitis, malabsorption syndrome.

Unit – 4

Electrolytes and blood gas analysis – specimens for electrolyte determination- sodium, potassium, chloride, bicarbonate, determination of pCO₂, O₂ and pH.

Unit – 5

Miscellaneous topics: Composition of CSF, meningitis, encephalitis, cancer, oncogenes, tumour markers, AIDS- basic concepts, diagnosis, Cytokinetics.

Endocrinology and Nutritional Biochemistry

Unit – 1

General concepts of endocrinology- the endocrine system, hormones- chemical nature, classification, hormonal action- receptors, hormone receptor interaction, regulation of gene expression by hormones, second messengers (camp, GMP, Ca++) Protein kinase cascade. Concepts of hormones assay.

Unit- 2

Hypothalamus and pituitary- anatomy, chemistry, functions, regulation. Diseases related to the hormones of these glands. Assessment of anterior and posterior pituitary.

Unit – 3

Thyroid anatomy, chemistry, synthesis, functions, regulation, thyroid function test in various abnormal conditions, parathyroid – anatomy, chemistry, synthesis, functions, regulations, diseases of parathyroid glands

Hormones involved in calcium and phosphate metabolism. Diseases related to its metabolism. Calcium chemistry and functions.

Unit- 4

Adrenal cortex and medulla – anatomy, chemistry, synthesis, metabolic effects, pathophysiology of the adrenal cortex. Assessment of adrenal functions, Gonadal hormones – anatomy, chemistry, functions, regulations and diseases related to these glands. Endocrinology of male and female infertility, pregnancy and lactation.

Unit – 5

Gastrointestinal and pancreatic hormones – chemistry, synthesis, metabolic effects, regulation, diseases related to the hormones of these glands. Detection of anomalies.

Unit - 6

Nutritional requirements of carbohydrates, proteins and lipids. Deficiency states of carbohydrates, proteins and lipid. RDA, Nutritional requirements of vitamins (fat and water soluble)- Structure, functions, deficiency states, dietary source, Nutritional requirements of macro and microelements-functions, deficiency states, dietary source, RDA.

Practicals

Procedures using automated analyzers

1. Estimation of blood glucose, GT, glycated haemoglobin, fructosamine, urine microalbumin.
2. RFT- Estimation of blood urea, serum creatinine, uric acid, GFR, urinary proteins, protein, Creatinine ratio.
3. LFT – Estimation of total bilirubin, total protein, albumin, SGOT, SGPT, ALP, GGT
4. Lipid profile- total cholesterol, triglycerides, HDL, LDL
5. Cardiac enzymes – creatinine kinase, CK- MB, LDH
6. Pancreatic function tests – amylase.

7. Estimation of calcium, phosphorous, magnesium, iron
8. Electrolytes
9. Quantitative analysis of urine- protein, uric acid, creatinine, calcium chloride
10. Analysis of CSF
11. Hormones: Thyroid profile- FT₂, FT₄, TSH, Fertility profile – LH, FSH, prolactin, estradiol, testosterone; cortisol, insulin
12. Tumor markers : P:SA
13. CAD risk assessment: Apo A, Apo B 100, hs Homocysteine, Lp(a)

M.Sc MLT IIND Year
PAPER – II SYSTEMIC BACTERIOLOGY, VIROLOGY AND
MYCOLOGY

Systemic Bacteriology

Unit – 1

Gram positive cocci- staphylococci, pneumococci, streptococci

Gram Negative cocci – N. Gonorrhoeae, N. meningitides

Unit – 2

Gram positive bacilli- corynebacteria, Mycobacteria, Clostridia, Actinomycetes
Bacillus Anaerobes

Unit- 3

Gram negative bacilli – Enterobacteriaceae, Pseudomonas, Vibria Brucella,
Bordetella, Haemophilus, Yersinia

Unit – 4

Spirochetes – Treponema, Leptospira, Borrelia

Rickettsiae, Chlamydiae, Miscellaneous bacteria

Practicals

Introduction of Clinical specimen, identification of bacteria, staining methods
Biochemical tests, antibiotic sensitivity testing

Darkground microscopy, special staining methods, use of experimental animals
Food milk and water bacteriology

Air Sampling and theatre sterility

Virology

Unit – 1

Classification and general properties of viruses – interferon, inclusion bodies
Cultivation of viruses and laboratory diagnostic methods of viral diseases

Unit – 2

Pox virus, herpes virus, myxoviruses, enteroviruses

Unit - 3

Rabies, Arbo viruses, hepatitis, HIV, viruses causing gastro enteritis, miscellaneous viruses

Practicals

Tissue culture methods

Fluorescent microscopy, ELISA, PCR

Mycology

Unit – 1

General properties of fungi, cultivation methods, laboratory methods of diagnosing fungal infection.

Unit - 2

Superficial and deep fungal infections, opportunistic fungal infection

Mycotoxins

Practicals

Identification of fungi, microscopy, culture, special staining methods

References:

1. Practical medical microbiology – Mackie and McCartney – latest Ed
2. Medical microbiology – David Green Wood, Richard – latest Ed
3. Medical lab Manual- Vol I and II – ELBS
4. Manual of Clinical Microbiology – latest Ed
5. Lab immunology and serology – N – Bryant
6. Textbook of Diagnostic Microbiology – Conne R. Mahon and George – WB Saunders 2nd Ed

M.Sc MLT IIND Year
PAPER – III ADVANCED HAEMATOLOGY AND
IMMUNOHAEMATOLOGY

Coagulation disorders and basics of their work up Thrombotic disorders and basics of testing Automated cell counters and coagulation analysers – principles Manual Haemoglobin and Counts

Peripheral smear –Preparation and Interpretation Manual tests of coagulation, factor assays

Urine and stool – analysis, micro and interpretation Immunohaematology:

Basic Genetics and immunology ABO and Rh blood group systems

Other major blood group systems – clinical significance of Compatibility testing, Antibody screening and identification, clinical significance of Choice of reagents and QA of the same Donor Screening and bleeding

Blood bags, Anticoagulant and preservative solutions Blood Components – preparation, Quality control Apheresis

Infectious disease screening

Transfusion reactions, Haemolytic Disease of the Newborn Some basics of appropriate use of blood

Choice of blood in specific clinical scenarios – HDN, Multiply transfused etc Basics of HLA typing and anti HLA antibody detection

M.Sc MLT IIND Year
PAPER IV TECHNIQUES IN HISTOPATHOLOGY AND
CYTOLOGY

Unit -1

PAS (Periodacid – Schiff) Stain Stain for micro-organisms Argentaffin and argyrophil stains Amyloid stains

Reticulin Stains Trichrome stains

Posphotugstic acid hematoxylin stain (PTAH) Stains for hemosiderin, Melanin and CA Stains for neural lipids

Mucin stains Giemsa Stain Elastic stain Myelin stain Romanowsky stain

Unit - 2

Enzyme histochemistry and immunoenzyme techniques

Immunohistochemistry and the various immunohistochemical stains in the diagnosis of various –disorders

Tissues of special interest – nervous system Hard tissue

Miscellaneous cells Endocrine cells

Unit – 3

Cytology techniques Quantitative methods Micro incineration

Unit – 4

Autoradiography Museum tech

Specimen photography and microphotography

Unit -5

Microscopy General Microscopy

Dark ground microscopy Immunofluoresence