Department of Paramedical Sciences

Faculty of Allied Health Sciences

SGT UNIVERSITY

Shree Guru Gobind Singh Tricentenary University

Gurgaon-122505

Syllabus

M.Sc. Medical Laboratory Technology (MLT)

Duration: 2 years (4 Semester)

W.e.f. Academic Session 2020-21

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SGT University, Gurugram

PHYSICAL AND ANALYTICAL BIOCHEMISTRY

PAPER CODE-

M. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits		
4	-	4		**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**
				Duration of Examination:	**3 Hours**

UNIT 1:

General introduction to laboratory equipments and instruments. Glasswares, balances, centrifuges, incubator, hot air oven, water bath. Brief description of Colorimetry and photometry and its laboratory tests – end point reaction and rate of reaction methods. Fluorometry. Flame photometry, electrophoresis, densitometer, blotting techniques. Chromatography – types. Polymerase chain reaction. Flow cytometry.

UNIT 2:

Automation, advantages of auto analyzers, continous flow analyzers, discrete auto analyzer – types (semi automated and fully automated).

UNIT 3:

Electrolytes: Definition, ionisation of weak acids, weak bases pH, Henderson Hasselbach equation. Buffer systems – definition, titration curve of weak acids, buffering capacity, physiological buffers, respiratory and metabolic acidosis and alkalosis.

UNIT 4:

Organisation and quality control in the laboratory, cleaning of glassware, biomedical waste management

PHYSICAL AND ANALYTICAL BIOCHEMISTRY

PAPER CODE-

M. Sc. Semester I (MLT)

L	T	P	Credits		
-	-	2/4		**Examination:**	**30 Marks**
				Int. Assessment:	**20 Marks**
				Total:	**50 Marks**

1. Preparation of various solutions and buffers
2. Acid base titration
3. Colour reactions of proteins, carbohydrates and lipids
4. Validation of Lambert's and Beer's law and derivation of standard curve in colorimetry.
5. Separation of plasma from anti coagulated blood and separation of serum from clotted blood.
6. Standardization of colorimeter, photometer, and spectrophotometer.
7. Determination of unknown concentration of coloured solutions by photometric method.
8. Introduction to working of a semi-auto analyser and fully automated chemistry analysers.
9. Thin layer chromatpgraphy
10. HPLC
11. Serum protein electrophoresis
12. R_f value of amino acids

CELLULAR PATHOLOGY

PAPER CODE-

M. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits		
4	-	4		**Examination:**	**60 Marks**
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				Total:	**100 Marks**

Duration of Examination: 3 Hours

Unit 1-

Cell Structure and functions: various cell organelles with functions. Basic structure of Blood cells. Development and classification of blood cells. The extra cellular matrix, collagen, elastin, fibrillin, fibronectin, laminin etc

Cellular adaptation: Overview of cell injury, mechanism of cellular injury, necrosis and apoptosis, pathological classification, cellular regeneration and repair , control of cell growth and wound healing.

Unit 2

- Neoplasia : Types of cancer, differentiation and anaplesia, cancer epidemiology , molecular basis of cancer, basis of multistep carcinogenesis, aetiology of cancer, carcinogens – classification and mode of action, laboratory diagnosis of cancer, molecular profiling of cancer.

Genetic disorders: mutations, types of mutations, disease due to defective repair mechanism, Mendelian disorders, sex chromosomes related disorders, diseases caused by change in structural proteins- Marfan syndrome, Ehler's syndrome, Danlos syndrome. Diseases caused by mutations in receptors proteins: Familial hypercholesterolemia, diabetes, protein energy malnutrition. Cytogenetics disorders: Down syndrome, Klienfleter syndrome, Turner syndrome, Fragile X syndrome. Paediatric disease , congenital anomalies, respiratory distress syndrome of new born, Necrotising enterocolitis , sudden death syndrome, cystic fibrosis. Fluorescent in-situ hybridisation for identification of chromosomal abnormalities.

Unit 3 –

Hemodynamic disorders: Hyperemia and congestion, haemorrhage , hemostasis, thrombosis, coagulation cascades, DIC, embolism, pulmonary thromboembolism, systemic thromboembolism, fat embolism, infarction.

Environmental pollution : Air pollution, water pollution, and soil pollution, injury by chemical agents, injury by therapeutic and nontherapeutic agents : lead, carbon monoxide, alcohol and drug abuse, injury by physical agents. Exogenous estrogen and oral contraceptive pills side effects.

Unit 4-

Hematopoiesis : origin , development and fate of blood cells. Erythropoiesis origin , development of RBC, biosynthesis of Hb, control of Erythropoiesis. Leucopoiesis – Granulocytes and agranulocytes and platetlets. Mechanism of normal hemostasis. Mechanism and stages of coagulation, factors. Instruments in haematology and haematological stains.

Acute inflammation: Vascular and cellular events , chemical mediators, inflammatory cells, systemic effects of inflammation, general inflammatory markers, CRP, ASO.

CELLULAR PATHOLOGY

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				Total:	**50 Marks**

1. Basic microscopy
2. Hb estimation – Sahli's method
3. Peripheral Blood film (PBF)- Preparation, staining with Leishman's stain and examination/identification of the RBC, WBC (Differential) and Platelets
4. Cell counts by Neubauer chamber (RBC,WBC and platelet)
5. ESR and PCV estimation
6. BT/CT determination
7. ABO/Rh blood grouping – slide method, forward and reverse grouping
8. Urine examination – physical, chemical examination for glucose, proteins, bile salts, bile pigments (bilirubin and urobilinogen), ketone bodies and occult blood.
9. Semen analysis, physical and counting in Neubauer's chamber
10. Automation in haematology.

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GENERAL MICROBIOLOGY AND BACTERIOLOGY

PAPER CODE-

B. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**

Duration of Examination: 3 Hours

General Microbiology:

Unit 1:

- History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates),
- Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

Unit 2:

- Microscopy, Stained preparation, Size & Shape and arrangement
- Morphology of bacteria: Structures of a bacterial cell and their functions
- Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements
- Sterilization and Disinfection
- Culture media and Culture methods
- Identification of Bacteria and their Antibiotic sensitivity testing
- Antimicrobial agents: Mechanism of Actions
- Bacterial metabolism: Oxidation, Fermentation

Bacteriology:

Unit 3:

- Morphology, Cultural Characteristics, Pathogenesis (in brief) Laboratory Diagnosis of following bacteria:
  - *Staphylococcus, Streptococcus including Pneumococcus, Neisseria, Micrococcus, Bacillus, Corynebacterium, Clostridium.*
  - *Enterobacteriaceae, Vibrios, Pseudomonas, Brucella, Haemophilus, Bordetella*
  - *Spirochaetes,*
  - *Chlamydiae, Rickettsiae.*
  - *Mycobacteria*
  - *Lactobacillus, , Bacteroides, Fusobacterium and Leptotrichia, Actinobacillus, Pasteurella,Francisella, Ureaplasma, Actinomycets, Nocardia, Listeria,*

Applied Microbiology and Recent advances

Unit 4:

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- Aetiology and Laboratory diagnosis of Respiratory infections, Urinary tract infections, Pyrexia of unknown origin, Meningitis, Sepsis, Septicemia, Diarrhoeal diseases & food poisoning.
- Prevention and Control of Hospital acquired infections
- Immunoprophylaxis: Types of vaccines and schedule of vaccination.
- Principal and Practice of Hospital waste disposal
- Recent advances in diagnostic microbiology: Automation, Nucleic acid based detection methods.
- Epidemiology of common infectious diseases and Newer vaccines
- Bio-terrorism

GENERAL MICROBIOLOGY AND BACTERIOLOGY

PAPER CODE-

M. Sc. Semester I (MLT)

L	T	P	Credits		
-	-	2/4		**Examination:**	**30 Marks**
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- Aseptic practices in laboratory and safety precautions
- Preparation of stains viz. Gram, Alberts, Ziehl Neelsen (ZN) etc. and performing of staining.
- Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Robertsons cooked meat, Lowenstein Jensens, Sabouraud dextrose Agar.
- Quality control of media, reagents etc.
- Operation and quality control of Autoclave, hot air oven and Inspissator.
- Washing and sterilization of glassware (Plugging and packing)
- Disposal of contaminated materials like cultures.
- Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
- Identification of Bacteria of Medical Importance upto species level
- Care and operation of Microscopes viz. Light and Fluorescent microscopes.
- Methods for the preservation of bacteria, Maintenance of stock cultures.

Tests for motility: hanging drop preparation

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HUMAN PHYSIOLOGY

PAPER CODE-

M. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits
4	-	4	

Examination:	**60 Marks**
Int. Assessment:	**40 Marks**
Total:	**100 Marks**

Duration of Examination: 3 Hours

UNIT 1

Blood - Composition and functions of blood, plasma proteins and their functions, erythropoiesis, leukopoiesis, thrombopoiesis, Structure and synthesis of haemoglobin. Properties and function of haemoglobin. Haemoglobin derivatives. Blood coagulation mechanism.

UNIT 2

Introduction to Digestive system – physiology and function of Salivary secretions, stomach, pancreas, liver and gall bladder, small intestine, large intestine, digestion and absorption of carbohydrates, fats and proteins in GI tract. Introduction to Cardio vascular system – physiology and anatomy of heart, cardiac cycle, arterial blood pressure.

UNIT 3

Physiology and anatomy of Respiratory system – mechanism of respiration,

General introduction to endocrine system – function of pituitary gland, thyroid gland, parathyroid gland, adrenal cortex, adrenal medulla, pancreas, thymus and pineal gland.

Organisation of Nervous system – synapses, central nervous system and autonomic nervous system.

UNIT 4

Physiology and anatomy of Reproductive system, 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, Regulation of body temperature – normal range and factors affecting body temperature.

RESEARCH METHODOLOGY AND BIOSTATISTICS

PAPER CODE-

M. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits
4	-	4	

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks

Duration of Examination: 3 Hours

UNIT-I

Introduction and Some Basic Concepts:
Sample and population. Statistical definitions. Random sampling. Testing of hypothesis. Statistical tools for collection, presentation and analysis of data relating to causes and incidence of diseases.
Measurement of central tendency.
Measures of variation. Frequency distribution.

UNIT-II
Concept of Probability:
Laws of Probability. Probability Distribution
Binomial, Normal and Chi-square distribution
Commonly used procedures and test of significance and estimation
Correlation and regression
Test of significance namely Z test, T test, Chi square test, F test
Analysis of variance.

UNIT-III
Research Statistics:
Research Statistics pertaining to medical laboratory technology
Testing the efficacy of manufacturing drugs
Medicines and injections for curbing and controlling specific diseases
Statistical analysis of instrumental data and comparison of various biological techniques used in hospitals.

UNIT-IV
Health care – an overview:
Functions of Hospital administration
Modern techniques in Hospital management
Challenges and strategies of Hospital management
Administrative Functions–
Planning, Organizing, Staffing, Leading and Controlling Organizational Structure.
Motivation and leadership.
Designing health care organization.

Hospital Management:
Medical record, House-keeping services.
Laboratory performance.
Management of biomedical waste.

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Total patient care – indoor and outdoor.
Nursing and ambulance resources, Evaluation of hospital services. Quality assurance.

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CRITICAL RESEARCH APPRAISAL

(REPORT SUBMISSION)

PAPER CODE-

M. Sc. Semester I (MLT)

L	T	P	Credits		
-	-	2		**Examination:**	**30 Marks**
				Int. Assessment:	**20 Marks**
				Total:	**50 Marks**

The student is expected to read and critically evaluate minimum of 5 papers and present the inference of every part in a clear and precise manner in the form of a report and short seminar at the end of semester based on which the student will be evaluated.

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METABOLISM AND ENZYMOLOGY

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
4	-		4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks

UNIT 1:

Enzymes: definition and classification, enzyme as catalysts, enzyme specificity, factors affecting enzyme activity, Enzyme kinetics, Enzyme inhibitors, co enzymes, isoenzymes, Determination of enzymes – comparison of endpoint reaction and rate of reaction methods.

UNIT 2:

Carbohydrates - Definition, function, classification. Properties and digestion of carbohydrates. Metabolism – Glycolysis, glycolgenesis, glycogenolysis, Citric acid cycle, Hexose monphosphate shunt (HMP), Gluconeogenesis. Electron transport system, Regulation of blood glucose, diabetes, Diabetic profile test, lab test for blood (plasma) glucose determination, glucose tolerance test.

UNIT 3:

Proteins – structure and classification, functions of protein, Types of proteins, Amino acid metabolism, urea cycle and its associated defects. Proteinuria and its causes, Lab determination of protein in body fluids. Aminoacidurias

UNIT 4:

Biochemistry of lipids, digestion and absorption of lipids. Lipid metabolism, lipo protein, dislipidemia, lipid profile.

UNIT 5:

Non protein nitrogenous molecules, Metabolism of nucleotides - nucleosides and nucleotides, Purine and pyrimidine.Heme metabolism and associated disorders.

METABOLISM AND ENZYMOLOGY-PRACTICAL

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
-	-	2/4		**Examination:**	**30 Marks**
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1. Kinetic properties of enzymes
2. Quantitative analysis of various parameters (protein, glucose, AL, ALT, cholesterol, creatinine, urea).
3. Calculation of clearance (urea and creatinine)
4. Glucose tolerance test.
5. Biochemistry of various body fluids (pleural, pericardial, CSF)
6. Diabetic profile including glycated haemoglobin.
7. Organ function tests: LFT, KFT, lipid profile.
8. Analysis of abnormal urine and its applications

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CLINICAL PATHOLOGY

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**

Unit 1

Fetal and neonatal physiology and pediatric diseases : Growth and functional development of the fetus, adjustment of the infant to extrauterine life, special functional problem in the neonate, problems of prematurity, congenital anomalies, perinatal infections, syndromes of the new born, immune hydrops, tumours and tumour like lesions of infancy and childhood.

Cervical cancer, uterine and ovarian cancers, gestational trophoblastic neoplasia. Sexually transmitted diseases – syphilis, gonorrhoea, trichomoniasis, human papilloma virus infection. Diseases during pregnancy – placental inflammations and infections, ectopic pregnancies, gestational trophoblastic diseases and eclampsia.

Unit II

Red blood cells disorders : basic aspects of anemia - definition, pathophysiology, classification and clinical features. Investigation of anemia in general.

Microcytic hypochromic anemias: Iron deficiency anemia – iron metabolism, causes of iron deficiency, clinical features and laboratory investigation.

Macrocytic anaemias : Megaloblastic anaemia - etiology, clinical features, lab investigations. Non - megaloblastic anaemia. Pernicious anemia.

Normocytic normochromic anemia: anemia in systemic disorders, (acute blood loss, renal failure, liver disorders).

Disorders of haemoglobin : structure of haemoglobin and synthesis,normal and abnormal haemoglobins, haemoglobinopathies (thallesemia and sickle cell anemia).

Haemolytic anemias: definition, pathogenesis, classification, clinical features, lab investigation.

Aplastic anemia: pancytopenia.

Polycythemia – classification, clinical features and lab investigation.

Unit III

WBC disorders: Leukamoid reaction, myelodysplastic syndrome (MDS) – definition, clinical features, peripheral smear and bone marrow findings.

Leukemias : definition, classification – FAB and WHO of acute leukemias, diagnostic criteria, cytochemicalstaining and immunophenotyping.

Chronic leukemia: classification, diagnostic criteria, clinical feature and lab investigation.

Myeloproliferative disorders: classification, clinical features, lab investigations, chronic myeloid leukemia in detail.

Lymphoproliferative disorders : chronic lymphocytic leukemia in detail.

Plasma cell disorders: classification. Plasma cell myeloma – definition, clinical features, lab investigations.

Unit IV

Hemorrhagic disorders: definition, pathogenesis, clinical features and classification of vascular, platelet disorders, coagulation disorders and fibrinolysis.

Platelet disorders: quantitative- thrombocytopenia, ITP – classification, clinical featuresand bone marrow findings in ITP. Qualitative platelet disorders - thrombocytosis- definition, etiology and lab investigations.

Coagulation disorders inherited : Haemophilia A & B, Von – Willebrand's disease, acquired vitamin K deficiency, liver diseases, DIC Investigations of haemorrhagic disorders: tests of vascular and platelet function – bleeding time, clotting time, platelet count, platelet aggregation studies.

Test for coagulation disorders: screening tests (first line tests) – prothrombin time, activated thromboplastin time (APTT), thrombin time. Second line test: coagulation factors assay, urea solubility test for factor XIII, factor VIII, inhibitor study, fibrinogen assay.

Thrombotic disorders: classification- inherited and acquired. Clinical features, investigations of thrombotic disorders (protein C, protein S, PT-III, Factor V)

Antiphospholipid antibody syndrome- definition, clinical features, lab investigation.

Bone marrow examination- aspiration and Trephine biopsy and staining

Automation in hematology

Unit V

Collection, transport, preservation and processing of various clinical specimens.

Urine examination – physical, chemical andmicroscopic urine analysis by Strip method

Body fluids: CSF – specimen collection, normal composition and clinical significance, routine examination (physical and cytological examination)

Other fluids: pleural, pericardial and peritoneal fluids, synovial and gastric fluids - Brief description with routine examination

Semen analysis and pregnancy test.

CLINICAL PATHOLOGY-PRACTICAL

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M. Sc. Semester II (MLT)

L	T	P	Credits		
-	-	2/4		**Examination:**	**30 Marks**
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				Total:	**50 Marks**

1. Coomb's test (direct and indirect)
2. Urine : microscopic examination and automation in urine analysis
3. Reticulocyte count: preparation, staining examination and corrected retic count.
4. Semen analysis: microscopic examination and methylene blue staining for morphology
5. Pregnancy test
6. Body fluid analysis (CSF, pleural and peritoneal/ascetic fluid)- physical, chemical and microscopic examination
7. Sickling test for sickle cell anemia
8. Osmotic fragility test
9. LE cell preparation and examination
10. PT and APTT test
11. BT/CT with clot lysis and clot retraction time
12. Automation in urine analysis

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IMMUNOLOGY AND VIROLOGY

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
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				Total:	**100 Marks**

Immunology:

Unit 1:

- Immunity (Innate and Acquired) Antigens
- Antigen
- Antibody

Unit II

: Antigen and antibody reactions

- General Features of antigen-antibody reaction Precipitation, Agglutination
- Complement Fixation
- Immunofluorescence, RIA, EIA Western Blot

Unit III:

- Structure and function of Immune system: (In brief)
- Major Histocompatibility Complex
- Immune Response: Humoral Immune response, Primary & secondary immune response, Cellular Immune Response.
- Hypersensitivity
- Autoimmunity and Immunodeficiency Diseases
- Transplantation immunology: Classification of transplants, Allograft reaction,
- Factors favouring allograft survival, Graft-vs-host reaction
-

UNIT-IV

Virology

- General Properties of viruses
- Nomenclature and Classification of viruses
- Morphology: virus structure and Virus replication
- Virus host interactions
- Bacteriophage,
- Morphology, life cycle, laboratory diagnosis of:
    - Herpes viruses, Mumps, measles, Rubella virus Influenza viruses, Paramyxoviridae
    - Polio, Hepatitis viruses, Rabies virus
    - Human immunodeficiency viruses, Oncogenic viruses
    - Epidemiology of viral infections Pox viruses, Echo and Coxsackie viruses, Enteric viruses other than Polio virus Rhinoviruses.
    - Adenoviruses and Corona viruses.
    - Anti viral agents and viral vaccines

IMMUNOLOGY AND VIROLOGY

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
-	-	2/4		**Examination:**	**30 Marks**
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- Serological tests – ELISA for HIV, HBsAg, HCV
- Collection of blood by venipuncture, separation of serum and preservation of serum.
- Performance of serological tests viz. Widal, VDRL/RPR.
- Enzyme linked immunosorbant assay: HIV, HBsAg, HCV.
- Latex agglutination tests: RA, CRP.
- Rapid tests HIV

MOLECULAR BIOLOGY AND DIAGNOSTICS

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**

UNIT I:

Introduction of Molecular Biology, structure of DNA & RNA, DNA replication, Transcription and Translation in Prokaryotes and Eukaryotes, Isolation of nucleic acids, Qualitative and quantitative estimation of nucleic acids, Chromatography, Qualitative and quantitative estimation of proteins, Electrophoretic separation of macromolecules.

UNIT II:

Recombinant DNA technology

Cloning, restriction enzymes, vectors, transformation and transfection, Applications of recombinant DNA

UNIT III

Polymerase chain reaction and its types, Methods for synthesis of double strand cDNA, RT PCR and Real Time PCR, DNA sequencing (Sanger's dideoxynucleotide), RFLP, Blotting of macromolecules.

UNIT-4:

Importance and applications of Molecular diagnostics: Viral load monitoring, window period, diagnosis of various diseases: HIV type -1, HIV type II, HPV, Various hepatitis strains, Influenza (H1N1) a0nd Mycobacterium tuberculosis, role of Molecular diagnostics in Blood banking

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PROJECT DEVELOPMENT

PAPER CODE-

M. Sc. Semester II (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
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In this semester the student is expected to work on finalising the topic and methodology with a detailed review of literature work to be submitted in the form of a synopsis along with a seminar to be held. Allotment of guide will also be carried out. It will involve a comprehensive literature survey of the chosen research area. Through regular meetings, the student and advisor discuss this literature in detail and the topic for research project

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CLINICAL AND APPLIED BIOCHEMISTRY

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**

. UNIT I

Kidney function test – laboratory test aiding in the evaluation of kidney function, kidney functions, Diseases of the kidneys

Liver function test – clinical manifestation of liver diseases, liver functions, Metabolism of bile pigments, bile acids, Jaundice,

Heart diseases, cardiac injury panel tests, markers of myocardial infarction – creatine kinase MB, Myoglobin, Troponin complex, Cardiac troponins T and I.

Thyroid function test

UNIT II

Hormones - classification and general features, mechanism of hormone action. Hormonal disorders – thyroid gland, pituitary gland, hypothalamus, adrenal gland, hormones of gonads, clinical chemistry of menstrual cycle and pregnancy.

UNIT III

Electrolytes and mineral metabolism – sodium, potassium, chlorine, calcium, importance of trace elements. Laboratory determination of calcium, inorganic phosphorus and electrolytes, Biochemistry of – Cancer, proto oncogenes and tumour markers, molecular techniques.

UNIT IV

Vitamins and toxic elements in health and disease. Deficiency disorders of vitamins

CLINICAL AND APPLIED BIOCHEMISTRY-PRACTICAL

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
-		2/4		**Examination:**	**30 Marks**
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				Total:	**50 Marks**

1. Principle, working, standardization and calibration of ELISA.
2. Standardization and calibration of various instruments such as semi-auto analyser, fully automated analyser, CLIA, ISE analyser.
3. Quality control in the laboratory- external and internal preparation of SOPs and application of westgerald's rules.
4. Hormonal analysis including thyroid profile and infertility profile on ELISA and CLIA.
5. Arterial blood gas analysis and interpretation.
6. DNA extraction, PCR and RT PCR
7. Analytical electrophoresis
8. Quantification of tumour marker, bone markers and anemia profile.
9. Estimation of vitamin D and Vitamin B_{12}

BLOOD BANKING, HISTOPATHOLOGY AND CYTOLOGY

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
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				Total:	**100 Marks**

Unit I

Blood banking (immunohematology)

Instruments in blood banking

Blood groups – genetics (ABO and Rh system), Bombay blood group

Techniques of blood typing and cross matching

Coomb's test – techniques and application of Coomb's test

Du tests

UNIT-II

Haemolytic disease of the newborn – causes and lab investigation

Donor selection and tapping of a donor

Blood storage

Screening of donor

Principles of blood transfusion

Diseases transmitted through blood

Lab investigation prior to blood transfusion

Screening of blood for infective material.

Blood component therapy

Transfusion reactions and investigations

Quality control in blood banking

Unit III

Histopathology: instruments and reagents in histopathology

Histopathology techniques: grossing, tissue processing, fixatives, decalcification, microtomy, general staining procedure, slide adhesives, fixatives and stains used.

Frozen section

Brief introduction to immunohistochemistry

Quality control in histopathology

Unit IV

Cytology

Instruments , techniques and stains in cytology

Exfoliative cytology

Cytology of body cavity fluids (effusions)

Fine needle aspiration cytology (FNAC)

Quality control in cytopathology

BLOOD BANKING, HISTOPATHOLOGY AND CYTOLOGY-PRACTICAL

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
	-	2/4		Examination:	30 Marks
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				Total:	50 Marks

1. Cytology – various techniques in FNAC and staining
2. Cytology of body fluid
3. Bone marrow aspiration/ biopsy techniques with staining/ examination of normal marrow contents
4. Histopathology – grossing, processing, block making, cutting, staining and mounting etc
5. Surgical histopathology protocol – registration, tissue accession, gross room, histopathology lab, HP reports, quality control
6. Special stains – H and E, Giemsa, pap stain and various other special stains for specific components (amyloid, carbohydrate, connective tissues, lipids and micro organisms)
7. Blood banking – component separation and antibody titre
8. Plasma haemoglobin
9. Haemosidrinurea
10. Fetal haemoglobin
11. Electrophoresis of various haemoglobin
12. Investigations of G6PD deficiencies
13. Automation in histopathology and cytology and blood banking

Advanced experiments/investigations

14. Immunofluorescence – fluorescent microscopy, electron microscope, enzyme histochemistry
15. Immunohistochemistry
16. Cytogenetics, karyotyping and diagnostic molecular pathology
17. Flow cytometry
18. Computers in pathology lab
19. Image analysis and morphometry

PARASITOLOGY AND MYCOLOGY

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
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Unit 1:

Protozoa & Helminthology

- Morphology, life cycle, laboratory diagnosis of:
  - *Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma,*
  - *Plasmodium,*
  - *Toxoplasma, Coccidian parasite.*

UNIT-II

- *Taenia, Echinococcus, Hymenolepis, Schistosomes,*
- *Trichuris, Strongyloides, Ancylostoma,*
- *Ascaris, Enterobius, Wuchereria bancrofti*

Unit III:

The morphology and reproduction in fungi.
Classification of fungi Morphology, diseases caused and lab diagnosis of:-

1. Opportunistic fungi - Cryptococcus, Candidiasis, Aspergillus, Zygomycetes.
2. Fungi causing superficial mycoses- Ptyriasis versicolor, Tinea Nigra, Piedra Dermatophytes
3. Subcutaneous mycoses – Mycetoma, Rhinosporidium, Sporothrix, Dematiaceous fungi

UNIT-IV

4. Dimorphic fungi – Histoplasma, Blastomycoces, Chromoblastomycosis and Penicillium
5. Anti-mycotic agents

PARASITOLOGY AND MYCOLOGY-PRACTICAL

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
	-	2/4			

Examination:	**30 Marks**
Int. Assessment:	**20 Marks**
Total:	**50 Marks**

- Collection of specimens for Mycology
- Direct Examination of specimens by KOH, Gram, Lactophenol Cotton Blue stains.
- Isolation and identification of common laboratory contaminants, dermatophytes and others of medical importance (Yeasts, dematiaceous fungi) on Sabouraud's Dextrose agar, Chrom Agar etc
- Maintenance of stock culture.
- Special techniques like Wood's Lamp examination, hair baiting, hair perforation, and slide culture.
- Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (Salt flotation and Formol-Ether methods).
- Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears. Performance of stains – Leishman, Giemsa.

TECHNICAL WRITING

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits	Examination:	50 Marks
4	-		4		

In this semester the student will start working on their research proposal and evaluate the outcome of the project along with a detailed seminar presentation on progress made. Each student must submit to the university with the signed approval of the advisor, a thesis proposal defining the thesis project, the methods and design of the experiments needed for completion, the progress to date and plans for completion in the fourth semester.

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SGT University, Gurugram

MEDICAL EMERGENCIES AND PATIENT CARE

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
4	-		4		

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks

Unit – I: Introduction to Emergency Services

Organization of Emergency Department, Guidelines in Emergency, Clinical Monitoring, Fluid Therapy and Blood Transfusion, Airway Management, Cardiopulmonary Resuscitation, Principal of Mechanical Ventilation, Injection – An Infusion Method, Acid Base and Electrolyte Imbalance

Unit – II: Handling of Different Emergencies

Cardiogenic Shock, Congestive Cardiac Failure, Myocardial Infarction, Head Injuries, Vasovagal Syncope, Seizer, Epilepsy, Conjunctival and Corneal Foreign Body, Foreign Body in Nose & in Ear, Epistaxis, Asthma, COPD, Haemoptysis, Rib Fracture, Tear Gas Exposure, Food Poisoning, Diarrhea, Urine Retention, Blunt Scrotal Trauma, Hypo & Hyperthermia

Unit – III: Fundamentals of Patient Care

Concept of health & Illness, Health Determinants, Concept of Patients & Their Types, Patient Centred Care & Fundamentals of Communications, Reporting & Recording of Patients, Rights of Patients , Concepts of Disease & Its Types, General Concept, Care & Prevention of Accident, Trauma & Infections

Unit – IV: Patient Care, Associated Units & Departments

Ambulatory Units, Critical Care Units ,Paediatric, Neonatal Intensive Care Unit (NICU), Emergency Department, Inpatient Units, Haematology/Oncology and Immunology Unit , Orthopaedic Unit, Psychiatry Unit ,Neurology and Neurosurgical Unit, Renal, Dialysis Unit, Gastroenterology/Endocrinology Unit, Life Flight Critical Care Transport Program, Radiology Department, Surgical Units, Cardiac Catheterization Lab, Operating Room, Post Anaesthesia Care Unit, Managing patients with disabilities, Geriatric Care, Care of Critically Ill Patients, Tracheotomise Patients, Nutritional Support in ICU

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LABORATORY MANAGEMENT OF FUNGAL AND PARASITIC INFECTIONS

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
4	-		4	**Examination:**	**60 Marks**
				Int. Assessment:	**40 Marks**
				Total:	**100 Marks**

UNIT I: PROTOZOA & HELMINTHOLOGY

Morphology, life cycle, laboratory diagnosis of: Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, ,Plasmodium, ,Toxoplasma, Coccidian parasite. ,Taenia, Echinococcus, Hymenolepis, Schistosomes, , Trichuris, Strongyloides, Ancylostoma, ,Ascaris, Enterobius, Wuchereria bancrofti

UNIT II: MORPHOLOGY AND REPRODUCTION IN FUNGI

Classification of fungi Morphology, diseases caused and lab diagnosis of:- Opportunistic fungi - Cryptococcus, Candidiasis, Aspergillus, Zygomycetes. Fungi causing superficial mycoses- Ptyriasis versicolor, Tinea Nigra, Piedra ,Dermatophytes , Subcutaneous mycoses – Mycetoma, Rhinosporidium, Sporothrix, Dematiaceous fungi , Dimorphic fungi – Histoplasma, Blastomycoces, Chromoblastomycosis and Penicillium ,Anti-mycotic agents.

UNIT III: LABORATORY INVESTIGATION PROCEDURES

Conventional fungal identification techniques, various types of fungal culture methods, various stains and its preparation, scotch tape method, slide culture method, antifungal sensitivity testing, stool concentration techniques, microbial identification techniques from stool samples, new automatic identification techniques of fungi and parasites.

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LABORATORY MANAGEMENT OF FUNGAL AND PARASITIC INFECTIONS

PAPER CODE-

M. Sc. Semester III (MLT)

L	T	P	Credits		
	-	2/4		**Examination:**	**30 Marks**
				Int. Assessment:	**20 Marks**
				Total:	**50 Marks**

1. Collection of specimens for Mycology
2. Direct Examination of specimens by KOH, Gram, Lactophenol Cotton Blue stains.
3. Isolation and identification of common laboratory contaminants, dermatophytes and others of medical importance (Yeasts, dematiaceous fungi) on Sabouraud's Dextrose agar, Chrom Agar etc
4. Maintenance of stock culture.
5. Special techniques like Wood's Lamp examination, hair baiting, hair perforation, and slide culture.
6. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (Salt flotation and Formol-Ether methods).
7. Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears. Performance of stains – Leishman, Giemsa.

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DISSERTATION

PAPER CODE-

M. Sc. Semester IV (MLT)

L	T	P	Credits	Examination:	300 Marks
	-		12		

After completion of dissertation lab work, this involves preparation of the thesis. The thesis must include a cover page, abstract, table of contents, introduction of the thesis topic with a comprehensive review of literature, appropriately organized methods, results and discussion section for the experiment performed and final conclusions section summarizing the outcome of the project. The student should submit a draft of the thesis along with a manuscript draft (submitted or prepared for publication in Scopus indexed Journal) to the advisor by the end of the fourth semester. Also a draft of the review/research paper (submitted or prepared to be submitted) must be submitted to respective guide before seminar presentation.

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BOOKS RECOMMENDED FOR READING

MICROBIOLOGY

1. Essential for Microbiology- Apurba Shankar Sastry
2. Textbook of Medical Mycology- Jagdish Chandra
3. Medical Parasitology- Dr Arora
4. Diagnositc techniques in - Fleck and Moody medical parasitology
5. Tropical Medicine and parasitology - Gold Smith and Heynemann
6. Immunodiagnosis of Parasitic diseases- Walls and Sohantz
7. Clinical Microbiology- J.Stokes and G.L.Ridgeway
8. Introduction in Medical Microblology- Anant-Narainyan
9. Practical Medical- Microbiology- Mackie and MC Cathey

BIOCHEMISTRY

1. Varley's Practical Clinical Biochemistry- A.H Gowehlock
2. Lab Manual in Biochemistry- E.A.Storey V.G.Makarova
3. Microanalysis in Medical Biochemistry- Wooten I.D.P. Freeman H.

PATHOLOGY

1. Cellular Pathology Techniques- C.F.A. Culling
2. An Introduction to Medical Laboratory Technology- F.J.Baker et al
3. Practical Haematology- J.V.Dacia

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TV- 75 CV- $\frac{25}{75} \times 100 = \frac{100}{3} 33$