EXAM SCHEME AND SYLLABUS

(Applicable for the batches admitted from the Academic Session 2023-24 onwards)

Master of Medical Lab Technology

(MMLT, 2 Year P.G. Programme)

FACULTY OF PARAMEDICAL SCIENCE & ALLIED HEALTH SCIENCE

Chirayu University

Bhopal, MP 462030, India

MASTER'S DEGREE IN MEDICAL LAB TECHNOLOGY (MMLT)
In
(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

AIMS & OBJECTIVES

A) AIMS & OBJECTIVES OF MEDICAL HEMATOLOGY:

The aim is generally revolve around providing comprehensive knowledge and skills in the field of hematology, which is the study of blood and blood-related disorders.

1. **Understanding Blood Components:**

- Aim: To provide a thorough understanding of the various components of blood, including red blood cells, white blood cells, platelets, and plasma.
- Objectives:
- To explain the structure and function of different blood cells.
- To describe the composition and functions of plasma.

2. **Hematological Disorders:**

- Aim: To familiarize students with the different types of hematological disorders and diseases.
- Objectives:
- To identify and classify various blood disorders such as anemia, leukemia, and clotting disorders.
- To understand the etiology and pathophysiology of hematological diseases.

3. **Diagnostic Techniques:**

- Aim: To equip students with practical skills in laboratory techniques for diagnosing hematological disorders.
- Objectives:
- To demonstrate proficiency in conducting blood tests, including complete blood count (CBC) and blood smears.
- To interpret laboratory results and correlate them with clinical conditions.

4. **Treatment and Management:**

- Aim: To provide insights into the treatment and management of hematological disorders.
- Objectives:
- To understand the principles of blood transfusion and related therapies.
- To explore pharmacological interventions and therapeutic approaches for various blood disorders.

5. **Quality Assurance and Safety:**

- Aim: To instill a sense of responsibility for maintaining high-quality standards and safety in hematology laboratories.

- Objectives:
- To implement quality control measures in laboratory procedures.
- To adhere to safety protocols and ethical considerations in laboratory practices.

6. **Research and Advancements:**

- Aim: To encourage research and stay updated on advancements in the field of medical hematology.
- Objectives:
- To critically evaluate current research literature in hematology.
- To explore emerging technologies and trends in hematology.

7. **Communication and Collaboration:**

- Aim: To enhance communication skills and foster collaboration within the healthcare team.
- Objectives:
- To effectively communicate laboratory findings to healthcare professionals.
- To collaborate with clinicians for accurate diagnosis and patient care.

By achieving these aims and objectives, the Master of Medical Lab Technology program aims to produce well-rounded professionals with the knowledge and skills needed to contribute to the field of medical hematology.

B) AIMS & OBJECTIVES OF MEDICAL HISTOPATHOLOGY:

The aims and objectives of a Medical Histopathology subject in a Master of Medical Lab Technology program are designed to provide students with a comprehensive understanding of the principles, techniques, and applications of histopathology. Histopathology is the study of disease at the microscopic level through the examination of tissues. Here are common aims and objectives for such a subject:

1. **Understanding Basic Histology:**
   - Aim: To provide a foundational understanding of normal tissue structure.
   - Objectives:
     1. To describe the histological structure of various tissues and organs.
     2. To identify and differentiate between different cell types and tissue components.
2. **Pathological Changes in Tissues:**

- Aim: To educate students about the morphological changes that occur in tissues due to diseases.
- Objectives:
  1. To recognize and interpret pathological alterations in tissues.
  2. To correlate histopathological findings with clinical manifestations of diseases.

3. **Diagnostic Techniques:**

- Aim: To equip students with practical skills in histopathological techniques.
- Objectives:
  1. To perform tissue processing, embedding, sectioning, and staining procedures.
  2. To analyze and interpret stained tissue sections under the microscope.

4. **Tumor Pathology:**

- Aim: To specialize in the study of neoplastic diseases and tumors.
- Objectives:
  1. To classify and grade tumors based on histopathological criteria.
  2. To understand the principles of cancer pathology and its implications for diagnosis and treatment.

5. **Immuno histochemistry and Molecular Pathology:**

- Aim: To introduce students to advanced techniques for tissue analysis.
- Objectives:
  1. To understand the principles and applications of immunohistochemistry.
  2. To explore molecular pathology techniques for the diagnosis of genetic and molecular abnormalities.

6. **Quality Assurance and Standardization:**

- Aim: To emphasize the importance of quality control and standardization in histopathology.
- Objectives:
  1. To implement quality assurance measures in histopathological procedures.
  2. To adhere to standard protocols and ethical considerations in tissue analysis.

7. **Research and Emerging Technologies:**

- Aim: To encourage research activities and stay updated on technological advancements.
- Objectives:
    1. To critically review and analyze current literature in histopathology.
    2. To explore emerging technologies and their applications in tissue diagnosis.

8. **Communication Skills and Reporting:**

- Aim: To develop effective communication skills for conveying histopathological findings.
- Objectives:
    1. To prepare accurate and concise pathology reports.
    2. To communicate findings to clinicians and other healthcare professionals.

By achieving these aims and objectives, the Master of Medical Lab Technology program aims to produce skilled histopathologists capable of contributing to accurate disease diagnosis and patient management.

C) AIMS AND OBJECTIVES OF MEDICAL MICROBIOLOGY:

The aims and objectives of Medical Microbiology in a Master of Medical Lab Technology program are designed to provide students with an in-depth understanding of the principles, techniques, and applications of microbiology in the context of medical laboratory technology. Medical Microbiology focuses on the study of microorganisms, including bacteria, viruses, fungi, and parasites, and their role in infectious diseases. Here are common aims and objectives for such a subject:

1. **Understanding Microbial Diversity:**

- Aim: To provide a comprehensive understanding of the diversity of microorganisms relevant to medical microbiology.
- Objectives:
    - To identify and classify bacteria, viruses, fungi, and parasites.
    - To understand the morphological, biochemical, and genetic characteristics of different microorganisms.

2. **Pathogenesis of Infectious Diseases:**

- Aim: To explore the mechanisms by which microorganisms cause diseases in humans.
- Objectives:
    - To understand the host-pathogen interactions and the factors contributing to microbial pathogenicity.
    - To analyze the stages of infection and disease progression.

3. **Diagnostic Techniques:**

- Aim: To equip students with practical skills in laboratory techniques for the diagnosis of infectious diseases.
- Objectives:
    - To perform various microbiological tests, including culture, staining, and serological assays.
    - To interpret laboratory results and correlate them with clinical conditions.

4. **Antimicrobial Agents and Resistance:**

- Aim: To study the principles of antimicrobial therapy and the emergence of resistance.
- Objectives:
    - To understand the mechanisms of action of antimicrobial agents.
    - To analyze the factors contributing to the development of antimicrobial resistance.

5. **Epidemiology and Public Health:**

- Aim: To understand the epidemiology of infectious diseases and their implications for public health.
- Objectives:
    - To analyze the spread and control of infectious diseases in populations.

- To explore strategies for disease prevention and surveillance.

6. **Emerging Infectious Diseases and Outbreak Investigation:**

- Aim: To stay updated on emerging infectious diseases and investigate outbreaks.
- Objectives:
  - To identify and study newly emerging pathogens.
  - To develop skills in outbreak investigation and control.

7. **Quality Assurance and Safety:**

- Aim: To emphasize the importance of quality control and safety in microbiological laboratories.
- Objectives:
  - To implement quality assurance measures in microbiological procedures.
  - To adhere to safety protocols and ethical considerations in laboratory practices.

8. **Research and Advances in Microbiology:**

- Aim: To encourage research activities and stay informed about advancements in medical microbiology.
- Objectives:
  - To critically evaluate current research literature in microbiology.
  - To explore emerging technologies and trends in the field.

By achieving these aims and objectives, the Master of Medical Lab Technology program aims to produce skilled medical laboratory technologists capable of contributing to the accurate diagnosis, treatment, and prevention of infectious diseases.

D) AIMS & OBJECTIVES OF MEDICAL BIOCHEMISTRY:

The aims of Medical Biochemistry in a Master of Medical Lab Technology program are designed to provide students with a comprehensive understanding of the principles, techniques, and applications of biochemistry in the context of medical laboratory technology. Medical Biochemistry focuses on the study of biochemical processes within the human body and their role in health and disease. Here are common aims and objectives for such a subject:

1. **Molecular Basis of Health and Disease:**
   - Aim: To provide a foundational understanding of the molecular and biochemical processes in the human body.
   - Objectives:
     - To explain the structure and function of biomolecules such as proteins, nucleic acids, lipids, and carbohydrates.
     - To understand the role of these biomolecules in maintaining cellular homeostasis.
2. **Metabolism and Energy Balance:**
   - Aim: To explore metabolic pathways and their significance in energy production and utilization.
   - Objectives:
     - To understand the processes of glycolysis, citric acid cycle, and oxidative phosphorylation.
     - To analyze how disruptions in metabolism contribute to various diseases.
3. **Enzymes and Enzyme Kinetics:**
   - Aim: To study the principles of enzyme function and their role in biochemical reactions.
   - Objectives:
     - To explain enzyme kinetics and factors affecting enzyme activity.
     - To understand the diagnostic significance of enzyme assays in medical laboratories.
4. **Clinical Biochemistry and Diagnostic Markers:**
   - Aim: To relate biochemical principles to the diagnosis and monitoring of diseases.
   - Objectives:
     - To correlate abnormal biochemical markers with specific diseases.
     - To interpret laboratory results and contribute to clinical diagnosis.
5. **Endocrine and Hormonal Regulation:**
   - Aim: To understand the role of hormones in regulating physiological processes.
   - Objectives:
     - To explore the endocrine system and its impact on metabolism, growth, and reproduction.
     - To analyze hormonal imbalances and their clinical manifestations.

6. **Nutritional Biochemistry:**
   - Aim: To study the role of nutrients in maintaining health and preventing diseases.
   - Objectives:
     - To understand the metabolism of essential nutrients such as vitamins and minerals.
     - To analyze the impact of nutritional deficiencies and excesses on health.
7. **Molecular Genetics and Genetic Disorders:**
   - Aim: To relate molecular genetics to biochemical processes and genetic disorders.
   - Objectives:
     - To understand the molecular basis of genetic diseases.
     - To analyze the role of DNA and RNA in protein synthesis and gene expression.
8. **Quality Assurance and Laboratory Practices:**
   - Aim: To emphasize the importance of quality control and standardization in biochemical laboratories.

- Objectives:
    - To implement quality assurance measures in biochemical assays.
    - To adhere to standard protocols and ethical considerations in laboratory practices.

By achieving these aims and objectives, the Master of Medical Lab Technology program aims to produce skilled medical laboratory technologists capable of contributing to the accurate diagnosis, monitoring, and understanding of biochemical aspects related to health and disease.

COURSE STRUCTURE

The Degree of Master's in Medical Lab Technology (MMLT) shall be conferred upon a candidate who has pursued a course of not less than two years of academic session, in an affiliated and recognized teaching institute as a regular candidate and who has passed two years theory and practical examinations with regular attendance in theory ,practical and clinical classes are mandatory (As per university rules) .

NOMENCLATURE

MASTER'S IN MEDICAL LAB TECHNOLOGY(MMLT)

a) MEDICAL HEMATOLOGY
b) MEDICAL HISTOPATHOLOGY
c) MEDICAL MICROBIOLOGY
d) MEDICAL BIOCHEMISTRY

DURATION OF COURSE

The duration of the certified study for the Master's in Medical Lab Technology (MMLT) shall be full time regular course and its duration shall extend over a period of two continuous academic Years on a full time basis for the award of the degree.

MASTER'S IN MEDICAL LAB TECHNOLOGY (MMLT) I YEAR & II YEAR IN:

e) MEDICAL HEMATOLOGY
f) MEDICAL HISTOPATHOLOGY
g) MEDICAL MICROBIOLOGY
h) MEDICAL BIOCHEMISTRY

TEACHING DAYS: Each academic year shall consist of 160 teaching days.

DISSERTATION/THESIS

Every candidate pursuing MMLT degree course is required to carry out work on a selected research Project under the guidance of a recognized postgraduate teacher. The results of such a work shall be submitted in the form of dissertation. The dissertation is aimed to train a graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis search and review of literature getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions. Every candidate shall submit to the Registrar of university in the prescribed Performa a synopsis containing particulars of proposed dissertation work within 4 months from the date of commencement of the course on or before the dates notified by the university. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the university will register the dissertation topic. All the synopses of Dissertation have to be approved by the Institutional Ethical Committee. No change in the dissertation topic or guide shall be made without prior approval of the university. Guide will be only a facilitator, advisor of the concept and hold responsible in correctly directing the candidate in the methodology and not responsible for the outcome and results.

The dissertation should be written under the following headings.

1. Introduction
2. Aims or objectives of study
3. Review of literature

4. Material and methods
5. Results
6. Discussion
7. Conclusion
8. References
9. Appendices

The written text of dissertation shall not be less than 50 pages and shall not exceed 100 pages excluding references, tables, questionnaires and other annexure. It should be neatly typed in double line spacing on one side of paper (A4 size, 8.27" x 11.69" and bound properly. Spiral binding should be avoided. The guide, head of the department and head of the institution shall certify the dissertation.

Four copies of dissertation thus prepared shall be submitted to the Registrar (Evaluation), three months before final examination on or before the dates notified by the university.

The examiners appointed by the university shall valuate the dissertation**. Approval of dissertation work is an essential pre condition for a candidate to appear in the university examination.** The dissertation shall be valued by the evaluator (Examiners) apart from the guide out of which one is external outside the institution zone of university / from other college of the same university. Evaluator acceptance other than the guide will be considered as a precondition for eligibility to take.

SCHEME OF EXAMINATION

MMLT-I YEAR (Common for all Specializations)

Institutional examination as per university notification

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY I	INTERNAL II	MAX	MIN I	PRACTICAL	VIVA		
1.	Medical Hematology (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
2.	Medical Histopathology(Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
3.	Medical Microbiology (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
4.	Medical Biochemistry (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
5.	Molecular Biology and Applied Genetics	70	30	100	50	-	-	-	-
6.	Instrumentation, Biostatics, Clinical Pathology & Miscellaneous	70	30	100	50	-	-	-	-
Total Max. Marks				600				400	

N.B.-There shall be institutional/college level examination as per university notification, marks to be send to university .

MMLT-IIYEAR=SPECIALIZATION: MEDICAL HEMATOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Hematology-I	70	30	100	50	60	40	100	50
2.	Medical Hematology-II	70	30	100	50				
3.	Medical Hematology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		**Total Max. Marks**		200	

SPECIALIZATION: MEDICAL HISTO PATHOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Histopathology-I	70	30	100	50	60	40	100	50
2.	Medical Histopathology-II	70	30	100	50				
3.	Medical Histopathology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

SPECIALIZATION: MEDICAL MICROBIOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Microbiology-I	70	30	100	50	60	40	100	50
2.	Medical Microbiology-II	70	30	100	50				
3.	Medical Microbiology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

SPECIALIZATION: MEDICAL BIOCHEMISTRY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Biochemistry-I	70	30	100	50	60	40	100	50
2.	Medical Biochemistry-II	70	30	100	50				
3.	Medical Biochemistry-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Passing Marks of Examination:

- The passing marks of examination would be 50% for each subject and also in total marks obtained. The candidate has to pass in theory and practical examination separately. For theory paper the internal assessment marks and theory examination marks will be counted.
- The candidate should pass separately in two heads i.e in Theory and also in Practical (with50% marks).
- The candidate has to pass separately in each subject in internal assessment examination (with 50% marks) in order to be eligible to appear in university examinations.
- The grace marks shall be allowed according to the general ordinance relating to "Award of Grace Marks".
- Regarding Grace Marks it was decided that total weightage of grace marks would be **5 (five),** and that grace marks can be split between the subjects. There will not be any grace marks for the Practical examination.
- Grace marks will not be added to total marks of the candidate. In Supplementary examination also similar pattern of grace marks will be followed.

SCHEME OF EXAMINATION FOR MMLT COURSES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

MMLT-I YEAR (Common for all Specializations)

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY I	INTERNAL II	MAX	MIN I	PRACTICAL	VIVA		
1.	Medical Hematology (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
2.	Medical Histopathology (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
3.	Medical Microbiology (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
4.	Medical Biochemistry (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50
5.	Molecular Biology and Applied Genetics	70	30	100	50	-	-	-	-
6.	Instrumentation, Biostatics, Clinical Pathology & Miscellaneous	70	30	100	50	-	-	-	-
Total Max. Marks				600				400	

N.B.-There shall be institutional /college level examination as per university notification marks to be send to university.

Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder for all papers in MMLT 1st Year

No. and Type of Questions	Marks for each Question	Total Marks
5 very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SCHEME OF EXAMINATION FOR MMLT COURSE MMLT-II YEAR

SPECIALIZATION: MEDICAL HEMATOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Hematology-I	70	30	100	50	60	40	100	50
2.	Medical Hematology-II	70	30	100	50				
3.	Medical Hematology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks;70 will be as under for all paper in MMLT- II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**

SCHEME OF EXAMINATION FOR MMLT COURSE MMLT-II YEAR

SPECIALIZATION: MEDICAL HISTOPATHOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Histopathology-I	70	30	100	50	60	40	100	50
2.	Medical Histopathology-II	70	30	100	50				
3.	Medical Histopathology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder for all papers in MMLT-II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SCHEME OF EXAMINATION FOR MMLT COURSE MMLT-II YEAR

SPECIALIZATION: MEDICAL MICROBIOLOGY

S. No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Microbiology-I	70	30	100	50	60	40	100	50
2.	Medical Microbiology-II	70	30	100	50				
3.	Medical Microbiology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder for all papers in MMLT-II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SCHEME OF EXAMINATION FOR MMLT COURSE MMLT-II YEAR

SPECIALIZATION: MEDICAL BIOCHEMISTRY

S.No.	SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Biochemistry-I	70	30	100	50	60	40	100	50
2.	Medical Biochemistry-II	70	30	100	50				
3.	Medical Biochemistry-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder for all papers in MMLT-II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500words*	**15**	**30**
Total Marks		**70**

SYLLABUS & SCHEME OF EXAMINATION FOR

MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)

–1stYEAR

COMMON FOR ALL SPECIALIZATIONS

(MEDICALHEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

SYLLABUS FOR MASTER OF MEDICAL LABT ECHNOLOGY (MMLT)–1st YEAR

COMMON FOR ALL SPECIALIZATIONS

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

PAPER-I: MEDICAL HAEMATOLOGY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

SCHEME OF EXAMINATION

Time:3.00Hrs **Max.Marks:70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Hematology (Review of the introduction and basic aspects)	**70**	**30**	**100**	**50**	**60**	**40**	**100**	**50**

The paper setter and practical examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT with at least three years of teaching experience. The viva marks shall be added to theory examination marks and 50% shall be the passing marks for both theory and practical respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder:-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weight age of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weight age of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weight age of the section shall be 30 marks.

MMLT –1st Year
Paper–I: MEDICAL HAEMATOLOGY

Total Teaching Hours:-240hrs Theory:100 & Practical:140hrs

SYLLABUS CONTENTS:

INTRODUCTION TO BASIC HAEMATOLOGY

a) Haematopoietic,

- Physiological Aspects,
- Morphological Aspects, and
- Biochemical Aspects

b) Blood and Its Constituents,

- Erythrocytes,
- Leukocytes,
- Thromboctyes,
- Haemoglobin,
- Ironmetabolism,
- VariousHaemoglobinanditsvariousderivatives.

HAEMATOLOGICAL DISORDERS

a) Erythrocyte Disorder with Its Laboratory Diagnosis,

- Anemia-Definition with Classification,
- Morphologic-Microcytic, Hypochromic, Macrocytic Anemia,
- Iron Deficiency Anemia,
- Hemolytic Anemia,
- Aplastic Anemia,
- Pernicious Anemia,
- Sideroblastic Anemia,
- Anemia of Chronic Renal Insufficiency,
- Hereditary Spherocytosis,
- Hereditary Elliptocytosis,
- Sickle Cell anemia,
- Hemolytic Disease of The Newborn.

b) Leukocyte Disorders with Its Laboratory Diagnosis,

- Leukemia–Definition with Classification (FAB–FrenchAmericanBritishClassification)

c) Thrombocyte Disorder With Its Laboratory Diagnosis,

- Perpura's Disease

d) Abnormal Haemoglobin and Related Disorders,

- Thalassemia,

e) Polycythemia.

CLINICAL HAEMATOLOGY LABORATORY AND HAEMATOLOGICAL INVESTIGATION

a) The Haematology Laboratory,
b) Basic Requirment and Glassware,
c) Collection and Handling Of Blood,
d) Anticoagulants,
e) Routine Haematological Investigation,

- Study Of Blood Smear for Differential Leukocyte Count, Staining Method and Cell Morphology,
- Determination Of Haemoglobin By Sahli's Method,
- Determination Of Haemoglobin by Cyanmethemoglobin Method,
- Total Blood Cell Count–TRBC,AEC,TLC, Total Platelet Count, Reticulocyte count,
- Differential Leukocyte Count–Normal and Abnormal Level With Clinical Significance,
- Study Of Blood films of Leukemia–CLL,ALL,AML,AL,
- Study of Morphology Of RBC–Normal, Abnormal And P.S.Comment,
- Determination Of ESR By Various Method,
- Determination Of PCV By Various method,
- Determination Of Erythrocyte indices,
- Blood Parasitic–Malaria Parasite,
- Determination Of Bleeding Time,
- Determination of Clotting Time,
- Determination Of PT,
- Determination Of Clot Retraction,
- Determination Of Blood Group And Rh Typing–Slide And Tube Method.

f) Special Haematological Investigation,

- Screening of Sickle Cell Anemia,
- Determination of Fetal Haemoglobin,
- Determination of Osmotic Fragility of Red Blood Cell, NESTROF test (Naked Eye Single Tube Red Cell Osmotic Fragility Test),
- Coombs Test–Direct And Indirect Method,
- The Compatibilitytest (TheCrossMatching) By Saline-Tube Method,
- Antiglobulin (Coomb's) Cross Matching,
- Quantitative Determination Of Anti-DAntibodytiter,
- Collection Of Blood From The Donor,
- DeterminationOfGlucose-6-PhosphateDehydrogenase.

BONE MARROW

- Study of Normal Bone Marrow,
- Bone Marrow Aspiration Technique.

HEMOSTASIS, COAGULATION AND COAGULATION STUDY

- General Consideration,
- Mechanism Of Coagulation,
- Inhibitors of Coagulation Factors,
- Blood Coagulation,
- Routine Coagulation Test,
- Congenital Deficiencies Of Hemostatic Factors,
- Other Clinical Condition Affecting Hemostasis (Liver Diseases),
- Diagnosis Of Bleeding Disorders,
- Routine Hemorrhagic Disorders Test,
- Disseminated Intravascular Coagulation(DIC),
- Liver Disease.

IMMUNOHAEMATOLOGY AND BLOOD BANKING TECHNIQUE

- Introduction, History, Discovery To Blood Group System,
- Organization, Operation, And Administration Of Blood Bank,
- Types Of Glassware And cleaning Of Glassware Used In Blood Banking,
- Human Blood Group Systems,
- Inheritance Of Blood Group System Genetics,
- Donor Selection And Component Preparation,
- Antibody Detection And Identification,
- Blood Transfusion Reaction.

MISCELLANEOUS

- Bence Jones Proteins.

MMLT-1st Year

Practical list Paper-I: MEDICAL HAEMATOLOGY

1. Haematological Laboratory Organization,
2. Blood collection by various methods and study and of various anticoagulants and study of coagulation by cogulometer (coagulation analyzer)
3. Determination of Hb by various methods
4. Determination of abnormal hemoglobin by various methods
5. Preparation of blood smear various methods of staining blood smear and marphlogy of normal blood cells
6. Determination of TLC
7. Determination of DLC
8. Preparation of thick and thin smear and determination of MP
9. Study of PS for leukaemia :- Acute Myeloid Leukaemia (AML), chronic myeloid leukaemia (CML), Acute Lymphoid Leukamia (ALL), chronic Lymphoid Leukaemia (CLL),
10. Determination of ESR by LANDU method
11. Determination of AEC
12. Determination of red Cell Indicices
13. Determinationofcompletehomograms,studyofabsolutevalues(RedCellIndices) and typing of anaemisa
14. Determination of Total platelet count
15. Determination of Reticulocyte count
16. Determination of ESR and PCV by various method
17. Determination of BT, CT, PT and Clotretraction by various method
18. Test for sickling and HBs by various methods
19. Determination of osmatic fragility
20. Determination of G6PD deficiency
21. Aspiration of Bone method, staining of bone marrow smeare and its study
22. Determination of blood grouping and Rh typing by slide and tube method
23. Cross matching
24. Coombs test-direct and in direct method

BOOK REFERENCES:

- Hematology for student by Sood Ramnik
- Laboratory Procedures in Haematology by Mehdi SR
- Wintrobe's clinical hematology Vol-I byGreer john P, Foersters john
- Wintrobe's clinical hematology Vol-II by Greer john P, Foersters john
- Hematology basic principles & practice by Haoffman Ronald
- Diagnostic hematology by Norman Beck

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)–1st YEAR

COMMONFORALLBRANCHES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

PAPER-II: MEDICAL HISTO PATHOLOGY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

SCHEME OF EXAMINATION

Time: 3.00 Hrs **Max. Marks: 70**

SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
	THEORY I	INTERNAL II	MAX	MIN I	PRACTICAL	VIVA		
Medical Histopathology(Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50

The paper setter and practical examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT with at least three years of teaching experience. The viva marks shall be added to theory examination marks and 50% shall be the passing marks for both theory and practical respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under:-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in50-60words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT –1st Year

Paper–II:MEDICAL HISTOPATHOLOGY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

Total Teaching Hours:-240hrs Theory:100 & Practical:140hrs

SYLLABUS CONTENTS:

Managing the Laboratory

- Introduction
- Risk management
- Quality management

Safety in the Laboratory

- Risk management
- Control of chemicals hazardous to health and the environment
- Control of physical hazards from equipment
- Hazards and handling of common histological chemicals.

Basic Histopathology Techniques and the Laboratory Requirements

- Histopathology and cytology techniques
- Introduction
- Laboratory requirements
- Preparation of 70%(v/v)alcohol(200ml)from commercially available ethyl alcohol
- Equipments and instruments
- Histo pathological techniques
- Cell division
- Method of examination of tissues and cells
- Various methods of preparation of tissue sections
- Fixation
- Reagents employed as fixatives
- Various types of fixatives
- Decalcification
- Gross examination and fixation of the specimen
- Decalcification of the calcified tissue
- Processing of tissue by manual method
- Tissue processing by using an automatic tissue processor
- Sharpening of the microtome knife
- Section cutting of paraffin wax embedded tissue
- To fix the sections on the slides

Fixation and Fixatives

- Introduction
- Theoretical aspects of fixation
- Main factors involved in fixation
- Practical aspects of fixation

Tissue Processing and Microtomy

- Introduction
- Principles of tissue processing
- Dehydration
- Clearing
- Paraffin wax
- Automated tissue processing
- Manual tissue processing
- Alternative embedding media
- Microtomy
- Paraffin section cutting

Routine Staining Procedures and Frozen Section Techniques

- General consideration
- Staining of tissue section by using hematoxylinandeosin staining method
- Staining of the connective tissue
- Staining of the section for reticulin by silvernitrate method
- Staining of the section for elastic fibers
- Staining and identification of the various types of carbohydrates (polysaccharides and mucopolysaccharides)
- Staining and identification of amyloids
- Staining of the sections for hemosiderin (a tissue pigment)
- Staining of the section for calcium
- Gram staining of bacteria
- Acid fast staining of bacteria
- Weak acid fast staining

Theory of Staining and Its Practical Implications

- Introduction
- A general theory of staining
- Some dye stuff properties
- Problem avoidance and trouble shooting

The Hematoxylin and Eosin

- Introduction
- Alumhematoxylin
- Iron hematoxylin
- Tungsten hematoxylin
- Molybdenumhematoxylin
- Lead hematoxylin
- Hematoxylin without amordant
- Quality control in routine H& Estaining
- Staining H &E for photomicrography
- Difficult sections

Bone

- Normal bone
- Bone techniques
- Processing decalcified bone
- Preparation of mineralized bone
- Morphometry of bone
- Teeth

Light Microscopy

- Light and its properties
- Image quality
- The components of a microscope
- Magnification and illumination
- Phase contrast microscopy
- Interference microscopy
- Polarized light microscopy
- Fluorescence microscopy
- Use of the microscope
- Setting up the microscope

Cytological Techniques

- General consideration
- Staining of the cellular components in smears of exfoliated cells by Papanicolaou method
- Crysyl violet staining in exfoliative gynecologic cytology
- Differentiation between normal and abnormal cells

Diagnostic Cytopathology Specimen Collection and Preparations

- Introduction
- Cytological preparation
- Cytological fixatives
- Specimen preparation
- Special techniques

Diagnostic Cytopathology Cell Appearances

- Anatomy and Histology
- Cytological smears
- Satisfactory smears
- Infection and Inflammation
- Specific infections
- Squamous Metaplasia, Cervical, Intraepithelial Neoplasia and Invasive Carcinoma
- Borderline Nuclear Changes
- Terminology and reporting
- Non-Gynecological Cytology
- Cerebrospinal Fluid

MMLT-1ST Year

Practical List Paper -II:MEDICAL HISTOPATHOLOGY

1. Working principal, parts and study of Light Microscope and Electron Microscope,
2. Gross examination and fixation of the specimen,
3. Decalcification of the calcified tissue,
4. Tissue processing by manual method,
5. Tissue processing by automatic tissue processor,
6. Processing of histology tissue for paraffin embedding,
7. Study of microtome and sharpening of the microtome knife,
8. Section cutting of paraffin wax embedding tissue and to fix the sections of the slides,
9. Staining of tissue section by using haematoxylin and eosin staining method,
10. Staining of cells by using papanicolaou staining method,
11. Staining of tissue using crystal violet staining,
12. Gram's stain of Paraffin sections,
13. AFB(ZN) stain of Paraffin sections,
14. FNAC: aspiration, smear preparation and staining,
15. Study of tissue of various body organs:-
    a) **Digestive System :** Salivary Gland, Oesophagus, Stomach, Small and Large Intestine, Gall Bladder, Pancreas, Liver,
    b) **Respiratory System:** Trachea, Lungs,
    c) **Reproductive System:** Ovary(Female),Fallopian Tube, Testis(Male)
    d) **Circulatory System:** Artery, Aorta,
    e) **Nervous System:** Spinal Cord, Nerve Cell,
    f) **Muscles:** Unstraiated Muscle, Straiated Muscle, Cardiac Muscle,
    g) **Cartilage:** Hyaline Cartilage, Elastic Cartilage
    h) **Excretory System:** Kidney, Ureter,
    i) **Extra**: Connective Tissue, Retculin, Elastic fibres, Hemosiderin, Skin, Compact Bone.

Book reference:

- Text book of histology by Tandan B.K.
- T.B. of Human Histology with Color atlas by Singh I.B.
- Color text book of histology by Gartner lselie P
- Histology by GP pal

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)–1st YEAR

COMMON FOR ALL BRANCHES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

PAPER-III: MEDICAL MICROBIOLOGY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

Time:3.00Hrs **Max.Marks:70**

SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MIN I	PRACTICAL	VIVA		
	I	II						
Medical Microbiology (Review of the introduction and basic aspects)	**70**	**30**	**100**	**50**	**60**	**40**	**100**	**50**

The paper setter and practical examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT-Microbiology/ M.Sc. Medical Microbiology/Ph.D. Biochemistry with at least three years of teaching experience. The viva marks shall be added to theory examination marks and 50% shall be the passing marks for both theory and practical respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be asunder:-

No. and Type of Questions	**Marks for each Question**	**Total Marks**
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT–1st Year

Paper–III: MEDICAL MICROBIOLOGY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

Total Teaching Hours:-240hrs **Theory:100 & Practical:140hrs**

SYLLABUS CONTENTS

General

- Introduction and brief history of microbiology,
- Safety measures in microbiology,
- Care and maintenance of laboratory equipments,
- Handling and cleaning of glassware apparatus,
- Laboratory organization and management,
- Recording of results,
- Quality control in microbiology,
- Accreditation of laboratories,
- Principles of staining methods and preparation of reagents.
- Collection, Transportation and Specimen processing: i)Blood ii) sputum iii) throat swab iv) Nasopharyngeal swab v) swab (Pus-wound) vi) urine vii) genital discharges and swabs viii) CSF and other body fluids ix) Stool and rectal swab,
- Care and handling of laboratory animals,
- Principles and methods of sterilization,
- Uses and mode of action of antiseptics and disinfectants,
- Decontamination and disposal of contaminated material,
- Preparation, uses and standardization of culture media, aerobic and anaerobic culture methods,
- Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi,
- Epidemiology of infectious diseases,
- Automation in Microbiology.

Nosocomial infections:

- Introduction, common types of nosocomial infections, survelliance (Bacteriological) and control of nosocomial infection and sterility test,
- Toxin and antitoxin assays and pathogencity tests.

Bacteriology:

- Introduction to medical bacteriology (General characteristics and classification of bacteria, growth, nutrition of microbes and identification of bacteria),
- **Lab. Diagnosis of common bacterial infections** (students should know the characteristic and morphology of causative organism) UTI, Diarrheal diseases, Meningitis, PUO, Whooping cough, Syphilis, Gonorrhea, Tuberculosis, and Leprosy and other STD's diseases.

Serological tests:

- Widal,
- CRP,
- ASO,
- TPHAFTA,
- VDRL.

Virology:

- Introduction to Medical Virology,
- Nomenclature and classification of viruses,
- General characteristics of viruses,
- Physical, chemical and biological properties,
- Collection, transportation, processing and storage of sample for viral diagnosis, retrovirus (HIV), hepatitis virus, dengue and chicken pox.

Mycology:

- Introduction to Medical Mycology,
- Characteristics and classification of fungus,
- Collection and transportation of specimen,
- Common culture media for fungus,
- Identification of fungal isolates,
- Lab. Diagnosis of fungal diseases.

Parasitology:

- Introduction to Medical Parasitology,
- Morphology, life cycle and patho genesis of parasites listed (students should know the medical importance and Lab. Diagnosis methods):
  - i) Protozoa: Intestinal Amoebae, free-living pathogenic amoeba, intestinal and genital flagellates, haemo-flagellates, ciliates of medical importance and source,
  - ii) Malaria parasite,
  - iii) Helminthes: Nematodes:- Intestinal, tissue tramatodes infecting man, cestodes infecting man and larval infection in man.

MMLT-1ST Year

Practical List Paper-III: MEDICAL MICROBIOLOGY

1. Routin staining and microscopy of clinical sample:
   a) Motility of Bacteria,
   b) Stool, ova and cyst,
   c) Gram Staining,
   d) AFB staining,
   e) Albert's Staining,
   f) Staining of Spore,
   g) Demonstration of bacterial capsule by negative staining method,
2. Routine culture and antimicrobial susceptibility of clinical samples,
3. Routine Serology:
   a) Determination of VDRL/RPR by qualitative and quantitative method.
   b) Determination ofASO by qualitative method,
   c) Determination of Widal by qualitative and quantitative method,
   d) Determination of CRP by qualitative method,
   e) Determination of RA Test by qualitative method.
4. Preparation of culture media and antimicrobial disc,
5. Fungal scraping slit smear examination and reporting for leprosy,
6. Sterilization and disinfection of different materials,

Book Reference:

- Sample Collection in micro clinical micro-biology by Iyer
- Illustrated medical microbiology by Gupte S
- Text Book of Microbiology By Baveja
- Practical microbiology for nurses by Baveja C.P.
- Ananthanarayan and paniker's Text book of microbiology by Ed. Paniker C.K.
- Textbook of microbiology by Ananthanarayan
- Clinical microbiology for DMLT students by Maheshwari Nanda
- Quick Review series Microbiology by Parijia Subhash Chandra
- Textbook of Microbiology & Immunology by Parijia Subhash Chandra
- Microbiology for Nurses by Sood Seema
- Practical microbiology for MLT, physical, therapy, occupation therapy by Baveja C.P.
- Practical microbiology for MBBS by Baveja C.P.
- Microbiology an application based approach by Pelczar Michael J.
- Mackie & mdartney practical medical microbiology by Ed. Collee J.G., A.G. fraser
- Kuby immunology by Kindt Thomas

- Medical Parasitology by Ichhpujani RL,Bhatia Rajesh
- Micro Biology for MLT by Jaggi Namita
- Textbook of Medical Parasitology by Paniker LK
- Markell & voge's medical parasitology by John david T
- Atlas of medical heminthology & protozoology by Chiodini P L , Moody A H
- Medical microbiology by Mims cedric
- Immunology by Coico Richard
- Medical parasitology by Sastry
- Essentials medical microbiology by Sastry
- Microbiology by Chakraborty
- Text book of medical mycology by Jagdish chander

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)–1st YEAR

COMMON FOR ALL BRANCHES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

Paper–IV: MEDICAL BIOCHEMISTRY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

Time:3.00Hrs **Max.Marks:70**

SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MIN I	PRACTICAL	VIVA		
	I	II						
Medical Biochemistry (Review of the introduction and basic aspects)	70	30	100	50	60	40	100	50

The paper setter and practical examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT-Microbiology/ M.Sc. Medical Microbiology/Ph.D. Biochemistry with at least three years of teaching experience. The viva marks shall be added to theory examination marks and 50% shall be the passing marks for both theory and practical respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks;70 will be asunder:-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT –1st Year

Paper–IV: MEDICAL BIOCHEMISTRY

(REVIEW OF THE INTRODUCTION AND BASIC ASPECTS)

Total Teaching Hours:-240hrs Theory:100 & Practical:140hrs

SYLLABUS CONTENTS:

Quality Control- Internal and External Quality Control,

Hazards in the Clinical Biochemistry,

Handling and Disposal of Infected and Dangerous Radioactive Materials,

Gas Transport,

Ph Regulation,

Buffer System of Plasma,

Acid-Base Balance sand Its Maintenance,

Laboratory Management,

- Preparation of Operating Budgets; general aspects of financial management of laboratories,
- Cost analysis (test and instruments); justification of providing new services or rejecting existing ones, lease and purchase decision analysis, delegation of budget responsibilities, work load statistics,
- Laboratory safety; fire, chemical, radiation and infection control, hazardous waste and transport of hazardous material,
- Maintenance of records; procedure policy manuals, ward manual, quality control programs, patient data retrieval.
- Personnel management; personnel policy manuals, job descriptions, labor, supervision relation, conducting job interviews, motivation, recognizing job distress syndrome, delegation to a laboratory manager,
- Hospital organization; interactions between the laboratory service and the rest of the hospital,
- Professional Ethics,
- Quality Assurance, Total Quality Management, Development and monitoring of performance indicators.

Chemistry and Metabolism of Carbohydrates

- General Consideration,
- Important Function,
- Classification,
- Properties,

- Digestion And Absorption,
- Metabolic Fates.

Chemistry and Metabolism of Lipids,

- Definition,
- Importance,
- Classification,
- Properties,
- Digestion And Absorption,
- General Metabolism,
- Cholesterol,
- Lipoproteins.

Chemistry and Metabolism of Lipids,

- Definition,
- Important Properties Of Protein And Amino Acids,
- General Metabolism Of Different Amino Acids.

Chemistry and Metabolism Nucleic Acids,

- Definition,
- Importance,
- Metabolism of Purine and Pymidine.

MMLT-1STYear

Practical List Paper-IV: MEDICAL BIOCHEMISTRY

1. Qualitative Analysis of carbohydrates Fats & Protein,
2. Qualitative analysis of normal & abnormal urine,
3. Estimation of blood glucose by Folin Wumethod, Orthotoludine &GOD/POD method,
4. Estimation of protein by Biuretmethod, Lowry, UV method,
5. Estimation of serum creatinine by jaffe's method,
6. Estimation of Urea in blood sample by urease,
7. Estimation of Total cholesterol by CHOD/POD method,
8. Estimation of Triglycerides by GOP/PA method,
9. Estimation of HDL Cholesterol by precipitation method,
10. Estimation of bilirubinin blood sample by kinetic method,
11. Estimation of SGOT in blood sample,
12. Estimation of SGPT in blood sample,
13. Estimation of alkaline phosphatase in blood sample,
14. Estimation of acid phosphatase in bold sample,
15. Estimation of bilirubin in blood sample,
16. Estimation of $NA^{+}K^{+}$&CA^{++},
17. Estimation of common parameters in urine.

Books Reference:

- Bio-chemistry for student by Malhotra
- Bio-Chemistry by Kumar Vijay
- Viva & Practical biochemistry by Kumar
- Textbook of Biochemistry by Singh S.P.
- Textbook of Medical Biochemistry by Chatterjee
- Practical Clinical Biochemistry method and interpretation By Chwala
- MCQS Problem oriented question in biochemistry by Yadav A.S
- Manipal manual of clinical biochemistry by Nayak S.
- Varley's practical clinical biochemistry by Gowenlock A.H
- Text books of biochemistry by West E.S & Todd W.R,
- Text books of medical biochemistry by Chatterjee M.N.
- Lehnenger Principles of biochemistry by Nelson David L

- Acdeb fundamental pf biochemistry by Dev A.C
- Harper's illustrated biochemistry by Murray K. Robert
- Practicals and viva in Medical biochemistry by Dandekar SP,Rane S.A
- Biochemistry by Satyanarayana U, Chakrapani U
- Text book of medical biochemistry by Puri dinesh
- Biochemistry and clinical pathology by Murugesh N.
- Text book of biochemistry by Lal harbans
- Text book of medical biochemistry by Puri dinesh
- Medical biochemistry for physiotherapy student by H Kaur
- Biochemistry by P Naik

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)–1st YEAR

COMMONFORALLBRANCHES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

Paper–V: MOLECULAR BIOLOGY AND APPLIED GENETICS

Time: 3.00Hrs **Max.Marks:70**

SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Molecular Biology and Applied Genetics	70	30	100	50	-	-	-	-

The paper setter examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT-Microbiology/ M.Sc. Medical Microbiology/Ph.D. Biochemistry with at least three years of teaching experience.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks;70 will be asunder:-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT–1st Year

Paper – V: MOLECULAR BIOLOGY AND APPLIED GENETICS SYLLABUS CONTENTS

DNA

- Structure, Types,
- Coiling and Super coiling,
- Topoisomerase,
- Replication,
- Satellite DNA,
- Organization of Prokaryotic and Eukaryotic Genome,
- Chromosomes:-
    - Structure,
    - Number,
    - Sex Chromosomes,
    - Human Karyotype,
    - Method for Chromosomes Analysis,
    - Chromosomes Banding,
    - FISH,CGH,
    - Flow Cytometry,
    - Cell Cycle,
    - Mitosis and Meiosis.

Transcription and Translation

- Factors Involved,
- RNA Processing,
- Types of RNA,
- Genetic Code,
- Lac Operon,
- Tryptophan Operon,
- Regulation in Eukaryotes,
- Gene Dosage and Gene Amplification,
- Generation of Antibody Diversity.

Mutation

- Spontaneous Mutation,
- Induced Mutation,
- Silent Mutation,
- Frame Shift Mutation,
- Physical and Chemical Mutagens,
- Molecular Basis,
- Site Directed Mutagenesis,
- Significance of Mutagenesis,

- DNA Repair,

- Isolating Mutants,
- AmesTest.

Recombinant DNA Technology

- Necessary Elements,
- Enzymes and their Properties,
- DNA Ligase,
- DNA Modifying Enzymes,
- Cloning Vectors Plasmids,
- Cosmids
- Bacteriophages,
- Shuttle Vectors,
- Expression vectors,
- Construction of rDNA and Cloning Strategies-Various Method,
- Genomic Libraies(Using PhageVectors),
- cDNA Libraries,
- Introduction of rDNA in to Host Methods,
- Restriction Map and Sequencing

Genetics in Medicine

- Haemoglobin and Haemoglobinopathies,
- Phenylketonuria,
- Alkaptonuria,
- Homocystinuria,
- LeschNyhan Syndrome,
- Genetics of Cancer,
- Down's Syndrome,
- Di-George Syndrome,
- Klinefelter's Syndrome,
- Turner's Syndrome,
- Hermaphroditism,
- Cystic Fibrosis,
- Haemophilia,
- Prenatal Diagnosis of Genetic Disease,
- Application of Recombinant DNA Technology in Medicine,
- PCR, RFLP, DNA, Finger Printing,
- Therapeutic Protiens,
- Transgenic Organisms,
- Gene Therapy,
- Human Genome Project.

Book Reference:

- MCQs In Medical Laboratory Technology And Molecular Biology: By Kumar Santosh Yadav
- Microfluidics for Medical Applications: By Albert van den Berg and others.
- Essentials of Molecular Biology & Genetics: By Dr. Aminul Islam.
- Textbook of Cell & Molecular Biology: By Dr. Ajoy Paul.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)–1st YEAR

COMMON FOR ALL BRANCHES

(MEDICAL HEMATOLOGY/ MEDICAL HISTOPATHOLOGY/ MEDICAL MICROBIOLOGY/ MEDICAL BIOCHEMISTRY)

Paper – VI: INSTRUMENTATION, BIOSTATICS AND CLINICAL PATHOLOGY AND MISCELLANEOUS

Time:3.00Hrs **Max.Marks:70**

SUBJECT	SCHEMEOFMARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Instrumentation, Biostatics, Clinical Pathology & Miscellaneous	**70**	**30**	**100**	**50**	-	-	-	-

The paper setter examiner will be recognized teachers in pathology M.D. (Pathology) or MMLT-Microbiology/ M.Sc. Medical Microbiology/Ph.D. Biochemistry with at least three years of teaching experience.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks;70 will be asunder:-

No. and Type of Questions	**Marks for each Question**	**Total Marks**
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT –1st Year

Paper – VI: INSTRUMENTATION, BIOSTATICS AND CLINICAL PATHOLOGYAND MISCELLANEOUS

INSTRUMENTATION

Microscopy:

- Specimen preparation for microscopy,
- Micrometry,
- Simple microscopy,
- Phase contrast microscopy,
- Fluorescence microscopy and
- Electron microscopy.

Chromatographic techniques :(General principle sand introduction of)

- Low-pressure column chromatography,
- High performance liquid chromatography(HPLC),
- Partition chromatography,
- Ion-exchange chromatography,
- Gas liquid chromatography (GLC),
- Thin layer chromatography(TLC),
- Paper chromatography, Affinity chromatography,
- Gel Filtration and
- Fluorescence Spectroscopy.

Electrophoresis:

- Moving boundary and zone (paper, geletc.),
- Electrophoretic techniques:
- General principles and introduction to Electrophoresis of proteins,
- Electrophoresis of nucleic acid.

Immunochemical techniques:

- Production of antibodies,
- Immuodiffusion(ID),
- Radioimmunoassay(RIA),
- Enzyme-Linked immunoassay (ELISA),
- Fluorescent immunoassay (FIA).

Molecular biology techniques:

- Isolation of nucleic acid,
- Physical analysis of DNA,
- Isolation of specific nucleic acid and sequences,
- Southern Blotting,
- Northern Blotting,
- Western Blotting,
- Recombinant DNA technology

- **Centrifugation techniques:**
- Basic principles of sedimentation,
- Centrifuges and their use,
- Ultra Centrifugation.

BIOSTATICS

Measures of central tendency:

- Mean, mode and median,
- Concept of dispersion,
- Variants,
- Standard deviation,
- Coefficient of variation,
- Skewness and kurtosis,
- Correlation and regression for two variables.

Probability:

- Definition and uses of probability,
- Probability distribution: normal, binomial, and person for one variant.

Sampling Methods:

- Simple and random sampling without replacement,
- Test of significance based on small samples: chi-square test, T-test and F-test,
- Analysis of variants: one-way and two-way classifications,
- Data Presentation,
- Stastical Distribution.

Fundamentals of computers:

- DOS commands,
- MS excel as a mean to calculate mean, mode, median, standard deviation, regression and plot curve fitting,
- Power Point Presentation.

CLINCAL PATHOLOGY

Collection, Transport, Preservation and Processing of various Clinical Specimens,

Urine Examination

- Physical Examination,
- Chemical Examination,
- Microscopic Examination,
- Urine analysis by Strip Method test for Haemosider in Pigment.

Sputum Examination

- Physical Examination(Macroscopic),
- Microscopic Examination-Gram's Stain, Ziehl Neelsen Stain for AFB.

Gastric Analysis

- Indication, ContraIndication,

- Method of Collection,
- Fasting Gastric Juice,
- Macroscopic Examination,
- Microscopic Examination,
- Fractional Test Meal,
- Augumented Histamin Test,
- Hollander' test.

Cerebrospinal Fluid Analysis

- Physical Examination (color and Turbidity),
- Microscopic Examination (Total Count, Differential Count).

Microscopic Examination

- Pleural Fluid,
- Pericardial Fluid,
- Synovial Fluid,
- Peritonial Fluid.

Pregnancy Test

- Method,
- Interpretation, Advantages, Disadvantages,
- HCG.

Semen Analysis

- Liquefaction,
- Volume,
- Color,
- Reaction,
- pH,
- Motility,
- Sperm Count,
- Morphology of Soerm,
- Importance and Interpretation.

Stool Examination

- Macroscopic Inspection,
- Concentration Method, Flotation Method and Sedimentation,
- Microscopic Examination for Paracites,
- Strip Method's
- Test for Occult Blood-Benzidine Test.
- Fecal fat and other chemical analysis

Book Reference:

- Research methodology, method & techniques by Kothari CR
- Clinical Pathology & Clinical Bacteriology, by Sachdev KN
- Clinical Pathology, Hematology & Blood Banking by Maheshwari Nanda

SYLLABUS & SCHEME OF
EXAMINATION FOR

MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)

–2nd YEAR

(SPECIALIZATION:MEDICALHAEMATOLOGY)

SCHEME OF EXAMINATION FOR MMLT COURSE

MMLT-II YEAR

Specialization: Medical Hematology

S. No.	SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Hematology -I	70	30	100	50	60	40	100	50
2.	Medical Hematology -II	70	30	100	50				
3.	Medical Hematology - III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be as under for all papers in MMLT- II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HAEMATOLOGY

PAPER-I: MEDICAL HAEMATOLOGY – I (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Haematology –I	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D.Pathology or MMLT Medical Haematology with at least three years of teaching experienceshall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions;*Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions;*Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

MMLT II YEAR- SPECIALIZATION**: MEDICAL HAEMATOLOGY**

PAPER – I: <u>MEDICAL HAEMATOLOGY – I</u>

(With Recent Advancements)

Haematology,

- Laboratory organization,
- Quality assurance,
- Investigation of the abnormal hemoglobins
- Comparisons between plasma and Serum
- Platelet and granulocyte antigens and antibodies.

Haematological Disorders,

- Acquired Autoimmune Hemolytic Anemia,
- Immune Hemolytic Anemia,
- Sideroblastic Anemia and Congenital Dyserythropoietic Anemia,
- Pure Red cell Aplasia,
- Infectious mononucleosis,
- Multiple myeloma
- Fragmentation syndromes,
- Pure red cell aplasia,
- Sideroblastic anemia and congenital dyserythropoietic anemias,
- Porphyrias,
- The myelodysplastic syndromes,
- Chronic myeloproliferative disorders,
- Non-leukemic myeloproliferative disorders- polycythemia vera, essential thrombocythemia and idiopathic myelofibrosis,
- Chronic lympho proliferative disorders- chronic lymphocytic leukemia, prolymphocytic leukemia and hairy cell leukemia,
- Multiple myeloma and Waldenstrom's Macroglobulinaemia,
- Disorders of the mononuclear phagocytic system.

Haematological Investigation,

- Determination of ESR by micro-sedimentation (Landau) method,
- Determination of absolute eosinophil count,
- Calculation of Red Blood Cell Indices-MCV, MCH and MCHC,
- Determination of 1. Iron 2. Total iron binding capacity (TIBC) in serum,
- Determination of hemograms,
- Preparation of lupus erytromatosus (LE) cell,
- Determination of red cell pyruvate kinase.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HAEMATOLOGY

PAPER-II: MEDICAL HAEMATOLOGY – II (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Haematology –II	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D.Pathology or MMLT Medical Haematology with at least three years of teaching experienceshall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

PAPER – II: MEDICAL HAEMATOLOGY – II

(With Recent Advancements)

SYLLABUS CONTENTS

Bone Marrow and Study

- Trephine Technique
- Bone Marrow Biopsy
- Microscopic Examination of Bone Marrow Smear and Detection Of Iron in the Prepared Smear
- Study of various Haematological And Non Haematological Disorder
- Bone Marrow Transplantation
- The HLA System in Bone Marrow Transplantation

Hemostasis Coagulation and Coagulation study

- Laboratory control of anticoagulant, thrombolytic and antiplatelet therapy
- Determination of plasma recalcification time
- Determination of partial thromboplastin time(PTT)
- Determination of activated partial thromboplastin time (APTT)
- Determination of thrombin time
- Protamine sulfate test
- Determination of fibrinogen
- Automated coagulation systems
- Sysmex coagulation analyzers
- The vascular purpuras
- Disorders of coagulation- inherited and acquired
- Hyper-coagulable states (thrombophilia)

Immunohematology and Blood Banking Technique

- Red cell blood-group antigens and antibodies
- Laboratory aspects of blood transfusion
- Blood component therapy
- Cellular components
- Plasma components
- Autologous transfusion
- Irradiated blood products
- Therapeutic hemapheresis
- Adverse effects of transfusion
- General complications
- Acute transfusion reaction

- Delayed consequences of transfusion
- Infectious disease transmission by blood components
- Hemolytic disease of newborn
- Definition and patho physiology
- Rh hemolytic diseases of the newborn due to other maternal antibodies
- Routine antenatal laboratory testing
- HLA antigens and antibodies
- HLA testing
- Linkage disequilibrium and antigen distribution
- Clinical application of HLA testing
- Component Preparation
- Antibody Detection and Identification
- Orientation to the Routine Blood Blank Laboratory
- Modern Principles of Blood Banking Compliance with Food and Drug Administration Regulation
- Organization-Wide Quality Assurance
- Transfusion Therapy
- Apheresis
- Adverse Effects of Blood Transfusion
- Transfusion Transmitted Viruses
- Hemolytic Disease of the Newborn and Fetus
- Autoimmune Hemolytic Anemia
- Polyagglutination
- Paternity Testing
- Blood Bank Information Systems
- Medicolegal and Ethical Aspects of Providing Transfusion Service
- Technologic Advance and Future Trends in Blood Banking

- **Automation in haematology**

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HAEMATOLOGY

PAPER-III: MEDICAL HAEMATOLOGY – III (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Haematology –III	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Pathology or MMLT Medical Haematology with at least three years of teaching experienceshall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

PAPER – III: MEDICAL HAEMATOLOGY – III

(With Recent Advancements)

SYLLABUS CONTENTS

Advance Test in Haematology,

- Parasitic infections of blood,
- Flow through cytochemical differential counter,
- New parameters,
- Hematology histograms,
- Eublobulin Lysis time,
- Anti-thrombin Ill assay,
- Protein C assay,
- Lupus Anticoagulant,
- Di Gugliemo syndrome,
- Preparation of Heinz bodies,
- Detection of trypanosomes (the causative agent of sleeping sickness),
- Laboratory diagnosis of Kala azar,
- Electrophoretic fractionation of hemoglobin species,
- Determination of plasma hemoglobin,
- Determination of serum haptoglobin,
- Detection of hemosiderin in urine,
- Determination of reduced glutathione (GSH),
- Acidified-serum test (HAM Test),
- Sucrose lysis test,
- Laboratory methods used in the investigation of paroxysmal nocturnal hemoglobinuria,
- Use of radionuclides in hematology,
- Special leukocyte studies,
- Leukocyte alkalin phosphatise,
- Leukocyte peroxidise,
- Sudan black B,
- Leukocyte esterase,
- Periodic acid-Schiff,
- Terminology deoxynucletidyle,
- Transferase (TdT),
- Chromosome studies,
- Sucrose lysis test,

- Ham’s Acid Hemolgysis Test,
- Von- Wille Brand Disorder,
- Autohemollysis Test,
- Donath – Landsteriner Test for Paroxysmal cold hemoglobinuria,
- Porphyrin Precursor Assays,
- Leukocyte chemotaxx,
- Nitroblue Tetrazolium Test,
- Chemiluminescence,
- Leukemic cell morphology,
- Philadelphia Chromosome,
- Leuko-erythroblastic reaction,
- Ringed Siderbloastis,
- Tarrate Resistant acid phosphatise,
- Cryglobulins Cryocrit,
- Congo Red test of Amyloid,
- Hemolytic Asssay CH_{50},
- C1q binding assay,
- Raji Cell Assay,
- PHA Stimulation,
- Microcytotoxiciety Assay,
- Extgractable Nuclear antigen,
- Anti-Smooth muscle Antibodies,
- Anto-mitochondrial Antibodies,
- Anti-acetylcholine receptor antibody.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HEMATOLOGY

PAPER - IV MEDICAL HAEMATOLOGY – IV

- **Dissertation/ Project Thesis**
- **Max Marks - 100**

Practical List

MEDICAL HAEMATOLOGY

1. Determination of LE Cell.
2. Staining of smear by various cyto chemical stain,
3. Determination of various Hb using electrophoresis method.
4. Determination of Glysosylated Hb by various methods,
5. Detection of Kala Azar,
6. Determination of Haemosiderin in urine,
7. Determination of reduced glutehone (GSH).
8. Study of Leukocyte alkalin phossphatase,
9. Study of blood cell by Sudan Black 'B' method,
10. Study of blood cell by PAS method.
11. Sucrose lysis test.
12. Acidified –serum test (HMA Test).
13. Nitroblue Tetrazolium Test.
14. Cogo Red test of amyloid.
15. Bone Marrow Biopsy technique and study.
16. Study of various anticoagulant used in Haematology.
17. Determination of plasma recalcification time, PTT, APTT and thrombin time.
18. Preparation of various blood components.
19. Determination of HLA.

SYLLABUS & SCHEME OF EXAMINATION
FOR

MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)

–2nd YEAR

(SPECIALIZATION: MEDICAL HISTOPATHOLOGY)

SCHEME OF EXAMINATION FOR MMLT COURSE

MMLT-II YEAR

Specialization: Medical Histopathology

S. No.	SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Histopathology - I	70	30	100	50	60	40	100	50
2.	Medical Histopathology - II	70	30	100	50				
3.	Medical Histopathology - III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be as under for all papers in MMLT- II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HISTOPATHOLOGY

PAPER-I: MEDICAL HISTOPATHOLOGY – I (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Histopathology –I	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Pathology or MMLT Medical Histopathology with at least three years of teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

INSTRUCTIONS FOR THE CANDIDATES: Answer all questions only in required word.

SYLLABUS CONTENTS

An Overview of Quality Control

- Introduction,
- Random selection audit,
- Histotechnology QC,
- New methods,
- Quality of performance of diagnostic histopathologists,
- Total review audit,
- Single subject audit,
- Diagnostic external quality assessment,
- Statistical analysis of diagnosis incidence,
- Quality of quantitative diagnosis : grading,
- Clinic-pathological meetings,
- Laboratory accreditation.

Frozen Section and Tissue Processing Techniques

- Frozen and related sections,
- Frozen sections and their uses,
- Freeze drying and freeze substitution,
- Frozen section substitution
- Preparation of frozen sections,
- Staining of fat.

Application of Microwave Technology to Histology,

- Introduction,
- Microwave staining,
- Microwave processing,
- Microwave fixation,
- Microwave antigen retrieval,
- Microwave immunohistochemistry.

Museum Techniques

- Preparation of specimen,
- Storage of specimens,
- Mounting of museum specimen.

Plastic Embedding Media and Techniques,

- Introduction,
- Ultrastructural studies,

- Extremely hard tissues and implants,
- High resolution light microscopy,
- Plastic Embedding Media,
- Application of Acrylic sections,
- Acrylic Resin Embedding- The Future.

Electron Microscopy: The Preparative Techniques,

- Components of the transmission electron microscope,
- Tissue preparation for transmission electron microscope,
- Aldehyde Fixatives,
- Osmium Tetraoxide,
- Dehydration,
- Embedding,
- Epoxy Resins,
- Acrylic Resins,
- Tissue processing schedules,
- Procedures for other tissue samples,
- Ultramicrotomy,
- Staining.

Transmission Electron Microscopy: Diagnostic Applications,

- Introduction,
- When to use TEM,
- Examples of diagnostic applications,
- Renal disease: The Kidney Glomerulus,
- Malignant Tumors,
- Non-Neoplastic diseases.

Quantitative Data from Microscopic Specimens

- Introduction,
- Traditional approaches,
- Image analysis,
- Image analysis processes,
- Image analysis software,
- Specimen analysis,
- Specimen preparation for image analysis

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HISTOPATHOLOGY

PAPER-II: MEDICAL HISTOPATHOLOGY – II (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Histopathology –II	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D.
Pathology or MMLT Medical Histopathology with at least three years of teaching experience shall beon the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

SYLLABUS CONTENTS

Connective Tissues and Stains

- Introduction,
- Formed or fibrous intercellular substances,
- Connective tissue cells,
- Connective tissues,
- Connective tissue stains.

Mucins,

- Introduction,
- Glycogen,
- Mucins,
- Fixation and section preparation,
- Glycogen demonstration techniques,
- Demonstration of mucins.

Lipids,

- Introduction,
- Histophysical methods,
- Histochemical methods,
- Combination techniques,
- Lipid immunohistochemistry,
- Application of lipid histochemistry in pathology.

Proteins and Nucleic Acids,

- Introduction,
- Simple proteins with demonstration,
- Nucleic acid with demonstration.

Pigments and Minerals,

- Introduction,
- Endogenous pigments,
- Artifact pigments,
- Exogenous pigments and minerals.

Amyloid

- Introduction,
- Classification,
- Ultrastructure,
- Pathogenesis,
- Diagnosis,
- Demonstration,
- Polarizing microscopy and congo red,
- Methyl or crystal violet 'Metachromasis',
- Miscellaneous methods,
- Immunohistochemistry for amyloid,
- Evaluation of methods.

Cytoplasmic Granules, Organelles and Neuroendocrine,

- Bone marrow,
- Mast cells,
- Paneth cells,
- Russell bodies,
- Hair, Keratin and Keratohyaline,
- Alcoholic hyaline,
- Mitochondria,
- Nucleolar organizer regions (NORs),
- Lysosomes,
- The Neuroendocrine System,
- Cell biology,
- The Distribution and function of regulatory peptides,
- Pathology,
- Technique for the demonstration of Neuroendocrine cells.

Microorganisms,

- Introduction,
- Detection and Identification,
- The Gram stain,
- Techniques for Mycobacteria,
- Some important Bacteria,
- Fungal Infection,
- A selection of the more important Fungai and Actinomycetes,
- The determination of Rikettsia,
- The detection and identification of Viruses,
- Some important viral infection,

- Prion disease,
- The demonstration of Protozoan and other organisms,
- Worms.

Techniques in Neuropathology,

- Introduction,
- Silver impregnation,
- Staining of components of the Nervous system,
- Techniques for staining nervous,
- Myelin,
- Support cells The neuroglia,
- Histological investigation of Dementia,
- Neuropathology laboratory specimen handling.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL HISTOPATHOLOGY

PAPER-III: MEDICAL HISTOPATHOLOGY – III (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Histopathology –III	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D.
Pathology or MMLT Medical Histopathology with at least three years of teaching experience shall beon the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

Specialization: MEDICAL HISTOPATHOLOGY

PAPER-III: MEDICAL HISTOPATHOLOGY – III (With Recent Advancements)

SYLLABUS CONTENTS

Internal Quality Control and External Quality Assessment of Immunohistochemistry,

- Introduction,
- Internal quality control of immuncytochemistry,
- Quality control of the reagents used in the IHC assay,
- Internal quality control of immuncytochemical techniques,
- External Quality Assessment (EQA).

Immunochemical Techniques,

- Introduction,
- Immunocytochemistry Theory,
- Immunocytochemistry Meyhods,
- Immunocytochemistry in practice.

Immunohistochemistry in Breast Pathology,

- Introduction,
- Diagnosis of breast conditions,
- Progastic factors,
- Assessment of prognosis in practice,
- Factors which predict response to the therapy.

Immunocytopathology of Lymphomas,

- Introduction,
- The clinical uses of antibodies in lymphomas diagnosis,
- Hodgkin's disease.

Immunohistochemistry and Diagnostic Pathology,

- Introduction,
- Intermediate Filaments,
- Keratin – positive tumors,
- Epithelial Markers,
- Carcinomas,
- Mesotheliomas,
- Sarcomas,
- Melanomas,
- Lymphomas,
- Seminomas,
- Neural and Neuroendocrine tumors,
- Infectious agents,
- Immunohistochemistry for prognosis and therapy.

Molecular Pathology and In-Situ Hybridization,

- Introduction,
- Principle of IN-SITU Hybridization,
- Overview of IN-SITU Hybridization,
- Procedural notes for ISH methods,
- IN-SITU Hybridization methods.

Immunofluorescent Techniques,

- Introduction,
- Substrate antigens,
- Unfixed frozen sections,
- Performance testing of conjugates,
- Microscopy,
- Photography,
- Standardization,
- Staining and incubation procedures,
- Immunofluorescent techniques in diagnostic Histopathology.

Enzyme Histochemistry and Its Diagnostic Applications,

- Introduction,
- Enzymes types,
- Nomenclature,
- Types of Histochemical reactions,
- The use of controls,
- Hydrolytic enzymes,
- Esterase demonstration in paraffin sections,
- Oxidative enzymes,
- Enzyme histochemistry diagnostic applications,
- Miscellaneous diagnostic applications of enzyme histochemistry.

Specialization: MEDICAL HISTOPATHOLOGY

PAPER - IV

MEDICAL HISTOPATHOLOGY – IV

- **Dissertation/ Project Thesis**
- **Max Marks - 100**

Specialization: MEDICAL HISTOPATHOLOGY

Practical List : MEDICAL HISTOPATHOLOGY

1. Staining and identification of the various types of carbohydrates.
2. Staining and identification of amyloids.
3. Staining and observation of Bone marrow.
4. Staining and observation of Mast cell.
5. Staining and observation of Mitochondria.
6. Techniques for demonstration of Neuroendocrine cells.
7. Staining of fungus.
8. Determination of Rekettsia.
9. Detection and identification of viruses.
10. Staining and observation of various components of the Nervous system.
11. Neuropathology laboratory specimen handling.
12. Diagnosis of breast condition.
13. Diagnosis of lymphomas.
14. Diagnosis of carcinomas.
15. Diagnosis of mesotheliomas.
16. Diagnosis of sarcomas.
17. Diagnosis of melanomas.
18. Diagnosis of of sminomas.
19. Diagnosis of of Hodgkin's disease
20. Diagnosis of Neuroendocrine tumors.
21. Eyeball processing.
22. Preparation of frozen sections.
23. Staining of fat.
24. Microwave fixation method.
25. Microwave processing method.
26. Microwave staining method.
27. Preparation of specimen for museum.
28. Storage of Museum specimen.
29. Mounting of museum specimen.
30. Tissue preparation for transmission electron microscope.
31. Specimen preparation for image analysis.
32. Tissue processing for anyloid.
33. Staining of amyloid.
34. Techniques of demonstrating neuroendocrine cells.
35. Method of IN-SITU hybridization.
36. Performance testing of conjugates.
37. Use of immunofluorescent techniques in diagnosis.
38. Demonstration of esterase in paraffin sections.

SYLLABUS & SCHEME OF EXAMINATION
FOR

MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)

–2nd YEAR

(SPECIALIZATION: MEDICAL MICROBIOLOLOGY)

SCHEME OF EXAMINATION FOR MMLT COURSE

MMLT-II YEAR

Specialization: Medical Microbiology

S. No.	SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Microbiology-I	70	30	100	50	60	40	100	50
2.	Medical Microbiology -II	70	30	100	50				
3.	Medical Microbiology-III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be as under for all papers in MMLT- II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization : MEDICAL MICROBIOLOGY

PAPER-I: MEDICAL MICROBIOLOGY – I (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Microbiology –I	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Microbiology or M.Sc./Ph.D./ MMLT Medical Microbiology with at least three years of teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

SYLLABUS CONTENTS

Immunology

- **Immune system and immunity:** History of immunology, composition and function of cells and organs involved in immune system,
- **Immune responses:** Evolution of immune response, immunological tolerance, active and passive immunization, innate immunity and acquired immunity,
- **Determinants of innate immunity:** Species and strains, individual differences, Influence of age, hormonal influence, nutritional factors and mechanical barriers and surface secretions,
- **Non-specific immune mechanisms:** surface defenses, tissue defenses, opsonization, inflammatory reactions, hormone balance,
- **Antigens and antibodies:** Antigens - structure and properties, types-iso and allo haptens, adjuvant, antigens specificity,
- **Immunoglobuline:** Structure, heterogeneity,, types and subtypes, properties (Physiochemical and biological),
- Theories of antibody production,
- **Complement:** structure, components, properties and functions of different components, complement pathways and biological consequences of complement activation,
- **Antigen-antibody reactions:** In vitro methods- agglutinations, precipitation, complement fixation, immunofluorescence, Lymphocytes, their subpopulation, their properties and functions, membrane bound receptors of lymph cells, Helper T cells in immune response.
- Development and differentiation of B and T cells,
- Mechanism of cell mediated immunity, immune tolerance to self antigen,
- Synthesis of antibodies and antibody diversity, Hybridoma technology.

Immunogenetics:

- Blood groups and transplantation antigens,
- Major Histocompatibility complex and tumour immunology,
- Structure and functions and disease association of MHC and HLA-system,
- Gene regulation and Ir-genes,
- HLA and tissue transplantation,
- Graft versus host reaction and rejection,
- Immune suppression-specific and non specific,
- Autoimmunity-theories, mechanisms and diseases,
- Tumor immunology-tumor specific antigens, immune response to tumor,
- **Hypersensitivity reactions:** Type I, Type II, Type III, Type IV hypersensitivity reactions.
- **Defects in immune system:** Primary and secondary defects, defects in complements, defective phagocyte mechanisms, Allergy.
- **Immunoprophylaxis:** vaccines and vaccine production, monoclonal antibodies and hybridoma technology.
- Automated blood cultures,
- Rapid antigen tests (specially for HIV I and HIV II), advanced antibody detection,
- Phenotypic testing of bacterial antimicrobial susceptibility,
- Rapid bacterial characterization and identification by MALDI - TOF mass spectrometry,
- Probe based microbial detection and identification,
- Microarray based microbial identification and characterization,
- PCR and its variations, non-PCR mediated target amplification techniques, invitro nucleic acid amplification techniques,
- Pulsed field gel electrophoresis.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL MICROBIOLOGY

PAPER-II: MEDICAL MICROBIOLOGY – II (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Microbiology –II	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Microbiology or M.Sc./Ph.D./ MMLT Medical Microbiology with at least three years of teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks

SYLLABUS CONTENTS

Systemic Bacteriology

- Introduction to Systematic Bacteriology,
- Basic trends of classification scope and importance of systematic bacteriology,
- Isolation and identification of bacteria,
- Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus, Enterococcus, anaerobic cocci, etc,
- Gram negative cocci of medical importance including Neisseria, Branhamell, Moraxella, Veillonella, etc,
- Gram positive bacilli of medical importance including Lactobacillus, coryneform organism, Gardnerella, Bacillus, and aerobic bacilli, Actinomyces, Nocardia, Actinobacillus and other Actinomycetales, Propionibacterium, Bifidobacterium, Eubacterium, Erysipelothrix, Listeria, Clostridium and other spore bearing anaerobic bacilli,
- Gram positive bacilli of medical importance including vibrios, Aeromonas, Plesiomnas, Haemophilus, Bordetella, Brucella, Pasteurella, Francisella, Legionella, Pseudomonas, Burkholderia, Chromobacterium, Flavobacterium, Acinetobacter, Achromobacter, Cardiobacterium and other non-fermenters, Bacteroides, Fusobacterium, Prevotella, Porphyromonas, Leptotrichia, Mobiluncus and other anaerobic gram negative bacilli,
- Helicobacter, Campylobacter and Spirillum,
- Enterobacteriaceae,
- Mycobacteria,
- Spirochaetes,
- Chamydiae,
- Mycoplasmatales: Mycoplasm, Ureaplasma, Acholeplasma, Spiroplasma and other mycoplasmas of medical importance.
- Rickettsiae including Bartonella, Coxiella, etc.

NOTE:- Knowledge of the above family/ genus/ species should include definition, historical perspectives, classification, habitats, epidemiology, morphology, cultural characteristics, metabolism, genetics, molecular and antigenic structure.

- Bacteriological examinations of water, milk, food and air,
- Bacterial pathogenicity
  i) Definitions of pathogenicity, pathogenesis and virulence,
  ii) Sources of infection,
  iii) Modes of spread of infections,
  iv) Types of infections.
- Bacterial Genetics.
- Infrequently Occurring Pathogens: (transmission, epidemiology, Pathogens, and Clinical disease, Diagnosis) Brucellosis, Tularemia, Pasteurella infections, Aeromonas and Plesiomonas, Gardnerella and Mobiluncus.

Parasitology

- General character and classification of medically important parasites,
- Methods of identification of parasites,
- Protozoan parasites of medical importance including Entamoeba, free-living amoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Microsporodium, Cyclospora, Isospora, Babesia, Balantidium,
- Helminths of medical importance including those belonging to Cestoda (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium, Multiceps, etc.), Trematoda (Schistosoma, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis, etc.), and Nematoda (Trichuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Drucunculus, filarial worms).

NOTE:- The study of the above parasites should include: morphology, life cycle, taxonomy and the detailed knowledge of diseased caused by them. This must include historical perspective, pathogenesis, clinical features, diagnosis, immunology, treatment, prevention and control of parasitic infections.

- Entomology: common arthropod and other vectors, *viz* mosquitoes, sandfly, ticks, mite, Cyclops, louse and bugs including agents causing myiasis.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization : MEDICAL MICROBIOLOGY

PAPER-III: MEDICAL MICROBIOLOGY – III (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Microbiology –III	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Microbiology or M.Sc./Ph.D./ MMLT Medical Microbiology with at least three years of teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

SYLLABUS CONTENTS

Virology

- Origin and evolution of viruses,
- General properties of viruses,
- Structure and classification of viruses,
- Isolation , and Growth of viruses,
- Replication of viruses,
- Viral genetics,
- DNA viruses of medical importance including poxviridae, herpesviridae, adenoviridae, hepadnaviridae, polyomaviridae, papillomaviridae and parvoviridae,
- RNA viruses of medical importance including picornviridae, togaviridae, flaviviridae, orthomyxoviridae, paramyxoviridae, reoviridae, rhabdoviridae, arenaviridae, buniyaviridae, retroviridae, filoviridae, coronaviridae, caliciviridae, astroviridae and bornaviridae,
- Unclassified viruses: hepatitis delta virus (HDV) and hepatitis E virus (HEV),
- Prions,

NOTE: Study of the above viruses should include: historical perspectives, taxonomy, morphology, inactivation, epidemiology, pathogenesis and cytopathology, immune response, clinical presentations, disease/ syndromes, laboratory diagnosis, treatment, prevention (including immunization) and control.

- Persistent viral infections,
- Bacteriophages and their genetics,
- Viruses and oncogenes,
- Antiviral compounds,
- Laboratory methods in basic Virology Cytopathologic effects,
- Electron Microscopic ,
- Detection of virus and its components,
- Proteins, Enzymes and Immune response to virus Serology,
- In Reference to: CMV Rubella, Polio, Rabies, HBV, HCV, HIV, Retro I-IPV.

Mycology

- General characteristics and classification of fungi,
- Morphology and reproduction of fungi,
- Isolation and identification of medically important fungi,
- Fungi causing superficial mycoses, subcutaneous mycosis and systemic infection,

- Tissue reaction to fungi,
- Yeasts and yeast-like fungi of medical importance including Candida, Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces, etc.
- Mycelial fungi of medical importance including Aspergillius, Zygomycetes, Pseudoallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes and other hyalohyphomycetes, etc.
- Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicillium marneffei, etc.
- Dermatophytes,
- Fungi causing mycetoma, keratomycosis and otomycosis,
- Pneumocyctis caionii infection,
- Rhinosporidium seeberi and Loboa loboi,
- Actinomycetes and Nocardia,
- Common laboratory contaminant fungi.

NOTE:- Knowledge of the above family/ genus/ species should include definition, historical perspectives, classification, habitats, epidemiology, morphology, cultural characteristics, metabolism, genetics, molecular and antigenic structure, laboratory isolation and identification, virulence and pathogenecity, tissue reactions, clinical features and syndromes, susceptibility, prevention including vaccines and recent developments.

- Antimycotic agents,
- Antifungal chemotherapy,
- Preparation of culture media for fungi and culture techniques SDA, Corn Meal agar, Rice Starch Agar, slide cultures etc.
- Staining of fungi and preparation, storing and processing of samples preparation, Lactophenol Cotton Blue etc),
- Contaminants and opportunistic fungi : (Pathogenesis & Lab Diagnosis) Candidiasis, Pneumocystosis, Cryptococcosis , Penicilliosis marneffei, Aspergillosis, Zygomycosis.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization : MEDICAL MICROBIOLOGY

PAPER - IV
MEDICAL MICROBIOLOGY – IV

- **Dissertation/ Project Thesis**

Practical List : MEDICAL MICROBIOLOGY

1. HIV Serology.
2. Use of ELISA Technique in Testing.
3. Anaerobic culture of clinical sample.
4. Mycobacterium culture.
5. Collection and transportation of samples.
6. Animal Inoculation.
7. Egg Inoculation.
8. Hospital infection control surveillance.
9. Biomedical waste Managements.
10. Visit to ICTC's of Medical College/Hospital.

SYLLABUS & SCHEME OF EXAMINATION
FOR

MASTER OF MEDICAL LAB TECHNOLOGY (MMLT)

–2nd YEAR

(SPECIALIZATION: MEDICAL BIOCHEMISTRY)

SCHEME OF EXAMINATION FOR MMLT COURSE

MMLT-II YEAR

Specialization: Medical Biochemistry

S. No.	SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
		THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
1.	Medical Biochemistry-I	70	30	100	50	60	40	100	50
2.	Medical Biochemistry -II	70	30	100	50				
3.	Medical Biochemistry -III	70	30	100	50				
4.	Project Work	-	-	-	-	100		100	50
Total Max. Marks				300		Total Max. Marks		200	

Pattern of Examination (Theory) for Maximum Marks; 70 will be as under for all papers in MMLT- II Year

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL BIOCHEMISTRY

PAPER-I: MEDICAL BIOCHEMISTRY – I (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Biochemistry –I	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Biochemistry or M.Sc./Ph.D./ MMLT Medical Biochemistry with at least three years of
teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theoryand practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

SYLLABUS CONTENTS

Biomedical Techniques:-

- Methods of Qualitative Analysis of Biomolecules: Principles, Experimental Procedures and Application of Chromatography- Paper, Thin- layer, IonExchange Affinity, Gel Filtration, Gas- Liquid And HPLC, Principles, Procedure and Application of Electrophoresis- Paper ,Polyacrylamide Gel, Agarose Gel,Capillary and Cellulose Acetate.
- Quantitative Method: Principles and Application of Photometry, Spectro Photometry, Flame Photometry, Flow Cytometry.
- ELISA, RIA, Western Blotting, FACS, Immunoelectrophoresis.

Disorders of Biomolecules

- Disorders of Carbohydrate Metabolism,
- Abnormalities of Proteins in Plasma,
- Disorders of Plasma Lipids and Lipoproteins,
- Diabetic Panel Test,
- Glucose Tolerance Test (GTT) Importance and Principle and Techniques of GTT,
- Insulin Tolerance Test,
- Gastric Juice Analysis,
- Water and Electrolyte Balance and Imbalance: - Potassium, Chloride, CO2 (HCO3-), Total and Ionized Calcium, Phosphorus (inorg.), Magnesium,
- Bile Pigment Metabolism and Pathophysiology of Jaundice,
- Enzymes and Iso-Enzymes of Clinical Importance- Alkaline Phosohates, Acid Phosphates, SGOT, SGPT, CPK and LDH,
- Clearance Test for Urine Function,
- Qualitative and Quantitative of Urine.

Laboratory Evaluation and Management of Overdosed or Poisoned Patients,

- The National Academy of Clinical Biochemistry Guidelines for Emergency Toxicology,
- The Important Differences Between Urine and Blood(Including Serum And Plasma) for Monitoring and Detection of Drugs/ Xenobiotics,
- Designing and Implementing Standardized STAT Panel of Laboratory tests for Evalution of Overdosed/ Poisoned Patients,
- The Toxicologic Profile of Specific Agents, Including Acetaminophen, Salicylates, Alcohols, and Glycols, Barbiturates, Tricyclic Antidepressants, Carbonmonoxide, Organophosphates and Carbamate, Digoxin Lead, Iron, and Cyanide,
- The Gegeral Supportive Measures, The Role of Alkalinization, The Importance of Specific Antidotes, The Variable Efficacy of Exchange Transfusion Hemodialysis, Plasmapheresis, And Charcoal Hemoperfusion of Blood in The Management of Specific Agents.

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL BIOCHEMISTRY

PAPER-II: MEDICAL BIOCHEMISTRY – II (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY	INTERNAL	MAX	MINI	PRACTICAL	VIVA		
	I	II						
Medical Biochemistry –II	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Biochemistry or M.Sc./Ph.D./ MMLT Medical Biochemistry with at least three years of
teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks: 70 will be as under :-

No. and Type of Questions	**Marks for each Question**	**Total Marks**
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question upto five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question upto 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question upto 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

PAPER-II: MEDICAL BIOCHEMISTRY – II (With Recent Advancements)

SYLLABUS CONTENTS

Pancreatic Function Tests,

Thyroid Function Tests,

Liver Function Tests,

Renal Function Tests,

Cardiac Profile Test,

Metabolic Regulation and Inborn Errors of Metabolism,

1. Vitamins:

- Chemistry,
- Absorption,
- Metabolism,
- Biochemical Roles,
- Requirements,
- Deficiency,
- Estimation Of Vitamins,

2. Minerals:

- Absorption,
- Biochemical Roles,
- Requirements,
- Deficiency Manifestation Of Bulk,
- Trace And Ultra Trace Elements,
- Effects Of Toxic Metals,
- Measurement Of Serum Minerals Like Zn, Cu, Na, K, Cl, Mg, Mn,Ca, P, I, Fe, Se,
- Iron Binding Capacity,
- Transferring And Ferritin,
- Ceruloplasmin,

3. Hormones:

- Mechanism of Action Of Hormones,
- Hormone Receptors,
- Signal Transduction,
- Cyclic AMP,
- Cyclic GMP,
- Biosynthesis of Adrenal and Thyroid Hormones,
- Hormonal Regulation of Gene Expression,
- Hormonal Disorders,

4. Inborn Errors:

- Carbohydrate Metabolism,
- Lipid Metabolism,
- Protein and Amino Acid Metabolism,
- Nucleic Acid Metabolism,
- Vitamins and Mineral Metabolism,
- Hormone Metabolism.

Automation in Clinical Biochemistry,

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL BIOCHEMISTRY

PAPER-III: MEDICAL BIOCHEMISTRY – III (With Recent Advancements)

SCHEME OF EXAMINATION

Time: 3.00 Hrs. **Max. Marks: 70**

SUBJECT	SCHEME OF MARKS				PRACTICAL		MAX	MINI
	THEORY I	INTERNAL II	MAX	MINI	PRACTICAL	VIVA		
Medical Biochemistry –I	**70**	**30**	**100**	**50**	Practical Max.Marks-60 & Viva Max.Marks-40 will be common for Medical Hematology –I,II and III			

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations. Recognized teachers M.D. Biochemistry or M.Sc./Ph.D./ MMLT Medical Biochemistry with at least three years of
teaching experience shall be on the panel of examiner. 50% shall be the passing marks for both theory and practical university examination respectively.

INSTRUCTION FOR THE PAPER SETTER

The Pattern of Examination (Theory) for Maximum Marks; 70 will be as under :-

No. and Type of Questions	Marks for each Question	Total Marks
5 Very short answer Questions; *Answer to be given in 50-60 words*	**02**	**10**
3 Short answer Questions; *Answer to be given in 250-300 words*	**10**	**30**
2 Essay type Questions; *Answer to be given in 450-500 words*	**15**	**30**
Total Marks		**70**

Section-A: This will consist of 05 very short answer type questions with answer to each question up to five lines (Fifty to sixty words) in length . All questions will be compulsory to answer. Each question will carry two marks. Total weightage of the section shall be 10 marks.

Section-B: This will consist of short answer questions with answer to each question up to 2 pages (250-300 words) in length. Five questions will be set by the examiner and three have to be answered by the candidate. Each question will carry 10 marks. Total weightage of the section shall be 30 marks.

Section-C: This will consist of essay type questions with answer to each question up to 5 pages (approx500 words) in length. Four questions will be set by the examiner and two have to be answered by the candidate. Each question will carry 15 marks. Total weightage of the section shall be 30 marks.

INSTRUCTIONS FOR THE CANDIDATES: Answer all questions only in required word.

SYLLABUS CONTENTS

Acute Phase Protiens

- Diagnosis and Clinical Significance of C-Reactive Protiens, Alpha Fetoproteins, Alfa 1 Antitrypsin, Alfa 2 Macroglobulin, Ceruloplasmin.

Biochemistry of Aids

- HIV Gene and Gene Products, Biochemical Changes during HIV Infection, Diagnosis and Precautions.

Ageing

- Biochemistry of Ageing, Alzheimer's Disease, Prions, Beta-Amyloid.

Blood and Disorders

- Biochemical Derangement in Anemia, Conditions Associated with Abnormal Acid Base Status, Abnormal Electrolytes Composition of The Blood, and Diagnosis of Acid Base Disorders.

Clinical Toxicology

- History of Toxicology, Concept and Scope of Toxicology, Factors Modifying Action of Poisons, Fatal Dose, House Hold Plants, House old Chemical, Agricultural chemicals, Drugs of abuse- Amphitamine, Cannabissativa, Cocaine, Lysergic Acid, Diethylamide, Mescaline, Methaqualone, Phincyclidine, Nutmeg, Asthma Powder, Tolatile Nitrites, Poisones Mushrooms.

Tumor Biomarkers,

- The Definition, Classification, Biochemistry, and Distribution of Tumor Markers, both Protein And Carbohydrate, including but not Limited to, Prostate – Specific Antigen, Calcitonin, Human Chorionic gonadotropin, Alfa-Fetoprotien, Carcinoembryonic Antigen CA 15-3, CA 125, And CA 19-9,
- Recent Developments in Identifying Proteomic Patterns for Cancer Detection.

Pediatric Clinical Biochemistry,

- Problems of Specimen Collection, Capillary Specimen,

- Reference Range Differences In Infants and Children: Those that vary Significantly with Age and Sex (Inorganic Phosphorus, Creatinine, Alkaline Phosphatase, Aspartate Aminotransferase, Creatine Kinase),
- Special Problems in Pediatrics: Respiratory Distress Syndrome, Gastrointestinal Disease (Fat Absorption, Disaccharide Intolerance, Protein- losing Neonatal).

Drug Metabolism

- The Differences between Phase 1 And Phase 2 Drug Metabolism Reactions,
- Various Consequences of Competing Metabolic Pathway to modulate both the Efficacy and Toxicity of Administered Medications,
- Frequent Inter Individual Variability Drug- Metabolizing Enzymes and its Impact on the Variability of Drug Response,

Toxicologic Syndromes

- The Pathophysiological basis and be recognize the five major toxicologic syndromes (cholinergic, anticholinergic, sympathomimetic, opiate and sedativehypnotic),
- Formulation of toxicologic differential diagnosis and designing a clinical laboratory testing protocol for each of the syndromes,
- The Basic Therapeutic Approach to each Syndrome.

PAPER - IV

MEDICAL BIOCHEMISTRY – IV

- **Dissertation/ Project Thesis**

CHIRAYU UNIVERSITY-BHOPAL

SYLLABUS FOR MASTER OF MEDICAL LAB TECHNOLOGY (MMLT) –2nd YEAR

Specialization: MEDICAL BIOCHEMISTRY

Practical List : MEDICAL BIOCHEMISTRY

1. Chromatography: paper, thin layer, gel, ion-exchange, demonstration of HPLC and GLC.
2. Electrophoresis slide gel, PAGE Agarose gel, Native, SDS PAGE of Blood Sample, (Demo only).
3. Biochemical tests for anemia.
4. Detection/Estimation of C-reactive proteins.
5. Diagnosis of HIV.
6. Demonstration of Western blotting.
7. Electrophoresis of serum proteins.
8. Determination of serum thyroxin binding capacity.
9. Determination of serum bicarbonate.
10. T3, T4 and TSH.
11. Estimation ascorbic acid in biological fluids.
12. Estimation of Trace elements in urine Zn, Cu, Mg, Fe.
13. Estimation of serum transferring.
14. Estimation of tyroglobulin.
15. Urinary VUM
16. Lipid profile.
17. Glucose tolerance test.
18. Determination of Lactate dehydrogenase, Acid & Alkaline phophatase, Creatine Phosphokinase (CPK)