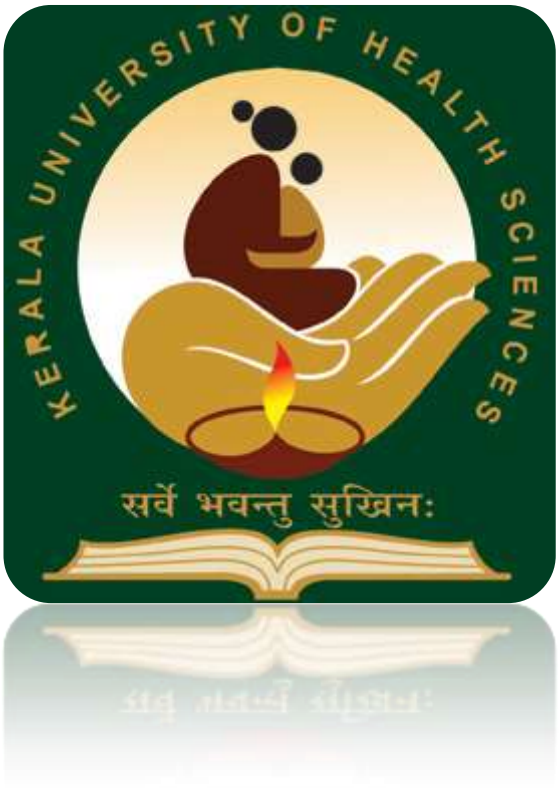
KERALA UNIVERSITY OF HEALTH SCIENCES

THRISSUR – 680 596, KERALA



REGULATIONS, CURRICULUM, AND SYLLABUS OF

M.Sc (MLT)

(With effect from 2011-12 admission)

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1. INTRODUCTION

Scientific and technological advancements have created complexity in the diagnostic field necessitating advanced educational preparation. To keep pace with the tremendous progress in Medical Science and to meet changing health care needs specialization and research are essential in the field of Laboratory science. Specialties in which Post Graduate degree awarded by the University are as follows:

I. MSC(MLT)Microbiology

ii. MSC(MLT)Biochemistry

iii. MSC(MLT)Pathology

2. GOAL/OBJECTIVES

Post Graduate programme in Medical Laboratory Technology (Biochemistry, Microbiology and Pathology) gives opportunity for specialized study in the field of Medical Laboratory Technology for B.Sc (MLT) graduates .Candidates who successfully complete M.Sc (MLT) course shall be able to

1. Learn theories and principles of Medical Laboratory science and Technology
2. Demonstrate the ability to plan and effect the change in laboratory practice and health care delivery system.
3. Setup and manage specialized clinical laboratories and to deliver better health care System to the public.
4. Practice as Specialized Technologists in the concerned subject.
5. Function as effective educators in the field of Medical Laboratory Technology
6. Conduct independent research works and utilize the research findings in Laboratory practice and education.
7. Evaluate various educational programmes in Medical Laboratory Technology.
8. Demonstrate interest in continued learning and research for personal and professional advancement.
9. Establish collaborative relationship with Clinicians and members of other disciplines.

3. Eligibility for admission

Candidates who have passed the B.Sc (MLT) degree of any of the Universities in Kerala or any other Universities recognized by the Kerala University of Health sciences, with a minimum of 50% marks for all the years of B.Sc (MLT) examination taken together will be eligible for admission.

Candidates who have passed their B.Sc (MLT) course from other Universities will be eligible for admission only if their qualifying examination is recognized as equivalent to the B.Sc (MLT) course of Kerala University of Health sciences on or before the date of counseling for admission.

Only Indian citizens of Kerala origin are eligible for admission to the course. They have to provide the relevant certificate along with the application form.

4. SELECTION OF STUDENTS

The selection of students for the Post Graduate course shall be made based strictly on merit as decided by the Entrance Examination conducted by the competent authority approved by the Government of Kerala/Kerala University of Health Sciences.

5. REGISTRATION

A candidate on admission to the M Sc MLT shall apply to the University for registration

- By making a formal application in the prescribed format
- Original degree certificate/ mark list
- Original Council registration certificate.
- Eligibility and migration certificate wherever needed.
- Original SSLC/ equivaleny certificate.
- The fees prescribed for the course.

6. Intake of students (Guide – Student ratio)

The guide student ratio shall be a maximum of 1:4 including Co-guide.

7. Duration of the course

Course of study including dissertation work shall be for a period of two years.

Week/Year	-52 weeks
Leave	-20 days.
Examination	- 2 weeks
Total weeks available	-47 weeks
Total working hours /week	-48 hours
Total working hours/year,	-48hrs x 47 weeks = 2256 hours/year
Total hours for two years	-4512 hours

8. Leave

Candidates can avail 20 days of leave per year and not more than 7 days at a time and also eligible for one day weekly off.

9. Medium of Instruction

The medium of instruction shall be English.

10. Course content and Syllabus

Annexure No.I	- Course content and Syllabus for M.Sc (MLT)-Biochemistry
Annexure No.II	- Course content and Syllabus for M.Sc (MLT)-Microbiology
Annexure No.III	- Course content and Syllabus for M.Sc (MLT)-Pathology

11. TEACHING METHODS

During a period of two years, intensive theoretical and practical training will be imparted to the candidates as follows.

Cognitive

1 Attending didactic lectures: one lecture (followed by discussion).
2 Seminar: one seminar (followed by discussion) of 1h duration weekly.
3 Journal club: for 1h (including discussion) weekly.
4 case presentation
5 Tutorials/ group discussions/ review clubs.

Presentation skill

1 Seminars: M.Sc trainees present seminars under the moderation of a Faculty Member. Each trainee presents a minimum of 6 seminars,
2 Journal club: M.Sc trainees present at least 6 journal clubs in two years.

Training / visit

1. Clinical Laboratory Practices/duty in the concerned sub specialties of the Hospital/college
2. Training / visit in concerned sub specialty Laboratories of national or international reputed Institutions in India

12. Hour distribution for M.Sc MLT Biochemistry

Paper	***Subject***	***Theory hours***	***Practical hours***	***Clinical Laboratory Practice Hrs***	***Total hours***
FIRST YEAR					
Paper-I	General Biochemistry & Chemistry of Biomolecules	100 hrs	600 hrs	1250 hrs	2250hrs
Paper-II	Enzymology, Metabolism &Inborn errors of metabolism	100 hrs			
Paper- III	Vitamins & Hormones	100 hrs			
Paper- IV	General Physiology ,Nutrition &Mineral metabolism	100 hrs			
SECOND YEAR					
Paper -V	Molecular Biology & Immunology	100 hrs	300 hrs	1150 hrs	1650hrs
Paper -VI	Diagnostic Biochemistry, Recent advances in clinical chemistry and Biostatics	100 hrs			
	Dissertation				600 hrs
Total	First and second year including dissertation				4500hrs

13. Hour distribution for M.Sc MLT Microbiology

Paper	***Subject***	***Theory hours***	***Practical hours***	***Clinical Laboratory Practice hours***	***Total hours***
First year					
Paper-I	General Microbiology	100 hrs	600 hrs	1250 hrs	2250 hrs
Paper-II	Systematic & Diagnostic Bacteriology	100 hrs			
Paper -III	Medical Parasitology	100 hrs			

	and Mycology				
Paper- IV	Immunology	100 hrs			
Second year					
Paper -V	Medical Virology	100 hrs			
Paper -VI	Applied Medical Microbiology and Recent Advances	100 hrs	300 hrs	1150 hrs	1650 hrs
	Dissertation				600 hrs
Total	First and second year including Dissertation				4500 hrs

14. Hour distribution for MSc(MLT) Pathology

Paper	***Subject***	***Theory hours***	***Practical hours***	***Clinical Laboratory Practice hours***	***Total hrs***
FIRST year					
Paper-I	Haematology	100 hrs	600 hrs	1250 hrs	2250 hrs
Paper-II	Histopathology	100 hrs			
Paper -III	Clinical Patholgy & Cytogenetics	100 hrs			
Paper IV	Cytology	100 hrs			
SECOND year					
Paper -V	Blood banking & Immunopathology	100 hrs			1650 hrs
Paper - VI	Laboratory Organization, QC, and Recent Advances in Pathology	100 hrs	300 hrs	1150 hrs	
	Dissertation				600 hrs
Total	First and second year including Dissertation				4500 hrs

15. Eligibility for appearing the Examination

(a) Attendance and condonation option

All the candidates joining the postgraduate programme should have 80% attendance to appear the University examination. A condonation of 10% maximum of attendance shortage shall be done once during the whole post graduate programme by the Principal with a committee comprising four senior faculty members of the College/Department of MLT.

(b) Internal Assessment

Internal assessment will be based on assessment examination, projects, presentation of seminars, Tutorials, Journal Clubs and work assessment during clinical postings. In the case of candidates who fail in the University Examination, fresh internal assessment marks should be sent (without carrying over the previous marks), before each attempt of University examination. The minimum internal assessment marks required for appearing the University examination shall be 40%. The statement of internal assessment marks of all students in a year countersigned by the Head of department and forwarded to the University when required.

(c) Log Book

All the candidates shall maintain a Log Book for recording performance of activities, seminars, journal Club and other presentations. The Log Book verified by the course coordinator / concerned faculty in-charge shall be certified by the Head of department and presented in the University Practical Examination.

16. Scheme and Schedule of Examination

(1) Theory Examination

Duration of theory examination for all the papers will be three hours each. Maximum marks of each paper shall be 100.

(2) Practical & viva

After the theory examination, Practical and Viva examination in each specialty shall be conducted on three consecutive days, at the end of every year.

Dissertation

The evaluation of the dissertation work will be on the basis of project content,Presentation, defense viva and valuation by the internal and external examiners together, appointed by the University.

17. Scheme of evaluation

Evaluation system for M.Sc (MLT) Degree is Centralized double valuation by examiners of affiliated Colleges. The average of marks of the two valuations are taken as the mark of the theory paper. If the variation in total marks obtained in two valuations is more than 15%, the paper should undergo a third valuation, and the average of aggregate of the nearest two will be counted. Practical and Oral examination shall be evaluated jointly by the examiners appointed by the University. No re-evaluation is permitted, only re-totaling can be allowed on request by the candidate.

18. Scheme of Examination of MSC MLT –Biochemistry

First year

Year	*Paper- theory*	*Maximum*	*Minimum*
1st Year	Paper-I General Biochemistry & Chemistry of Biomolecules	100	50
	Theory Internal assessment	50	20
	Total	150	75
	Paper-II Enzymology ,Metabolism and Inborn errors of metabolism	100	50
	Theory Internal assessment	50	20
	Total	150	75
	Paper- III Vitamins & Hormones	100	50
	Theory Internal assessment	50	20
	Total	150	75

(Part I)	Paper- IV General Physiology, Nutrition &Mineral Metabolism Theory Internal assessment Total	 100 50 150	 50 20 75
	Practical Internal assessment Viva voce Total	300 50 50 400	150 20 200
	TOTAL for PART	**1000**	**500**

Second year

2nd Year (Part II)	Paper -V Molecular Biology & Immunology Theory Internal assessment **Total**	 100 50 **150**	 50 20 **75**
	Paper -VI Diagnostic biochemistry, Recent advances in clinical chemistry and Biostatics, Theory Internal assessment **Total**	 100 50 **150**	 50 20 **75**
	Practical Internal assessment Viva voce Total	200 50 50 300	100 20 150
	Dissertation	400	200
	TOTAL for PART II	**1000**	**500**
GRAND TOTAL (first & second year)		**2000**	**1000**

19. Scheme of Examination of MSc (MLT)-Microbiology

Year	***Paper***	***Maximum Marks***	***Minimum Marks***
	Paper- I General Microbiology Internal Assessment Total	 100 50 150	 50 20 75
	Paper- II Systematic and Diagnostic Bacteriology Internal Assessment Total	 100 50 150	 50 20 75
	Paper III Medical Parasitology and Mycology Internal Assessment Total	 100 50 150	 50 20 75

1st Year (Part I)	Paper- IV Immunology Internal Assessment Total	 100 50 150	 50 20 75
	Practical- Viva voce Internal Assessment Total	300 50 50 400	150 20 200
	Total for PART I	**1000**	**500**
2nd Year (Part II)	Paper- V Medical Virology Internal Assessment Total	 100 50 150	 50 20 75
	Paper- VI Applied Medical Microbiology and Recent Advances Internal Assessment Total	 100 50 150	 50 20 75
	Practical Viva voce Internal Assessment	200 50 50 300	100 20 150
	Dissertation	400	200
	TOTAL for PART II	**1000**	**500**
GRAND TOTAL		**2000**	**1000**

20. Scheme of Examination of MSc MLT – Pathology

Year	***Paper***	***Maximum Marks***	***Minimum Marks***
1st Year (Part I)	Paper- I Haematology Internal Assessment Total	 100 50 150	 50 20 75
	Paper- II Histopathology Internal Assessment Total	 100 50 150	 50 20 75
	Paper- III Clinical Pathology & Cytogenetics Internal Assessment Total	 100 50 150	 50 20 75
	Paper- IV Cytology Internal Assessment Total	 100 50 150	 50 20 75

	Practical Internal Assessment Viva voce Total	300 50 50 400	150 20 200
	Total for PART I	**1000**	**500**
2nd Year (Part II)	Paper -V Blood Banking & Immunopatholgy Internal Assessment Total	 100 50 150	 50 20 75
	Paper -VI Laboratory Organization ,QC, and Recent Advances in Pathology Internal Assessment Total	 100 50 150	 50 20 75
	Practical Internal Assessment Viva voce Total	200 50 50 300	100 20 150
	Dissertation	400	200
	TOTAL for PART II	**1000**	**500**
GRAND TOTAL		**2000**	**1000**

21. Criteria for pass and grace marks

Candidate who has secured 50% marks in each of the theory and practical examination separately shall be declared to have passed in those subject/subjects. Five marks (or as per the University Regulations) may be given as grace mark either in a subject or distribute it among subjects so as to make the candidate eligible for pass the examination.

22. Criteria for promotion

Candidate, who fails in any subject, shall be permitted to continue the studies into the second year. However the candidate shall not be allowed to appear for the second year examination till such time that he/she passes all subjects of the first year M.Sc. MLT examination.

23. Rules for supplementary Examination

No supplementary batch will be conducted for M.Sc. (MLT) course but supplementary examination will be conducted within six months after each regular examination. Candidate failing to secure minimum pass mark in any theory paper shall reappear for that paper only. Candidates who fail in the practical examination shall reappear for both practical and Viva voce in the supplementary examination.

24. Qualification of teacher

i. Professor in MLT- M.Sc. MLT with PhD having 8 years of full time teaching experience in the subject after the acquisition of M.Sc (MLT),

OR

M.Sc. MLT with 10 years of teaching experience in the concerned subject after the acquisition of M.Sc (MLT).

ii. Associate Professor in MLT-M.Sc (MLT) in the concerned subject (Biochemistry, Microbiology, Pathology) having 5 years of full time teaching experience in the subject after the acquisition of M.Sc (MLT).

iii. Assistant Professor-M.Sc (MLT) in the concerned subject (Biochemistry / Microbiology /Pathology).

25. Qualification of Examiner

(1) External Examiners-
External Examiner should be a regular faculty member of the College/Department with MD / MSc(MLT) degree in the concerned subject having 5 years of teaching experience after acquiring Post graduate degree.

(2) Internal Examiner-
Internal Examiner should be a regular faculty member of the College/Department with MSc(MLT) degree in the concerned subject having 5 years of teaching experience after acquiring Post graduate degree.

(3) Question paper setters –
Shall be a regular faculty member of the College/Department with MD / MSc(MLT) degree in the concerned subject and having a minimum of 5 years of teaching experience after acquiring Post graduate degree.

26. Setting of Question paper

All the question paper shall be of standard type. Each theory paper will be of 3 hours duration and shall consist of ten question carry equal mark with a maximum of 100 marks. Theory paper in all the subjects will consists of ten questions of 10 marks each or two sub questions in a ten mark main question.

27. Research Guide

1) Qualification of Guide

(i) Guide: Faculty in Medical Laboratory Technology / expert in the same Specialty with a minimum of 2 years experience in teaching in the Post Graduate Programme in MLT and a minimum of 5 years of experience after Acquiring MD/M.Sc (MLT) degree.

(ii) Co-Guide: A Co-Guide is a Faculty/expert in the field of study.

(iii) Either Guide or Co-Guide should be a regular faculty in the concerned subject Having Post Graduate qualification in Medical Laboratory Technology.

2) Guide – Students Ratio
Maximum of 1:4 (including as co-guide)

3) Change of Guide– Guide may be changed only on unavoidable situations with prior permission from the University.

28. Dissertation

(1) Synopsis

Every candidate undergoing M. Sc (MLT) course shall carry out work on a selected research project under the guidance of a recognized guide. The results of such a work shall be submitted in the form of a dissertation.

The dissertation is aimed to train a postgraduate student in research methods and techniques. It includes identification of problem, formulation of hypotheses, 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 should submit a synopsis to the registrar of the University in the prescribed format containing particulars of proposed dissertation work after obtaining ethical clearance from the Institutional Ethical Committee comprising principal and senior professor of the college within nine months from the date of commencement of the course on or before the date notified by the university. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the dissertation topic will be registered by the university.

(2) Dissertation submission

The candidate should submit their dissertation work at the end of 9 months of second year of the M.Sc.(MLT) course. The Scientific Committee of the college /Department should scrutinize and evaluate the dissertation work and make required correction if necessary and accept with modification before submitting to the university.

Four copies of the dissertation work shall be submitted to the registrar on the 21st month of the commencement of course. Hall ticket for the second year examination will be issued to the candidate only after the submission of dissertation to the university.

(3) Dissertation Valuation

Dissertation valuation of the candidates will be conducted by the internal and external examiners together on the basis of work, presentation and defense viva at the time of second year M.Sc. (MLT) practical examination. The mark distribution is as follows.

Project Content	200
Presentation	50
Defense Viva	100
Continuous Evaluation	50
Total	**400**

Tentative Schedule for desertation

S. No.	Activities	Scheduled Time
1	Submission of the research proposal	End of 9th month of 1st year
2	Submission of dissertation – Final	End of 9th month of IInd Year

29. Duration of the Course

Course of study including the dissertation work shall be for a period of two year.
The students shall do One year internship/service after successful completion of the course as per the Govt. norms.

30. Break of course / Re-admission

The rules for Break of course / Re-admission will be fixed by the Kerala University of Health Sciences from time to time.

31. Migration / Transfer

Migration and transfer from one college to another will not be permitted during course of study and internship.

33. Declaration of Class

(1). Distinction - 75 % and above.
(2) First Class - 60 %and above, less than 75 %
(3). Second Class - 50 % and above, less than 60%.

Candidate who fail in the first attempt in any subject and pass in subsequent examination shall not be ranked in distinction or first class. Maximum number of attempts per subject is three inclusive of first attempt. The maximum period to complete the course successfully should not exceed 4 years.

(4). Award of Rank: Rank will be awarded in each specialty of M.Sc (MLT)

34. Standard format of dissertation

The written text of dissertation shall not be less than 100 pages and shall not exceed 150 pages excluding references, tables, questionnaires and annexure. It should be neatly typed (font size 12 – Time New Roman or font size 123 Arial) in double line spacing on one side of the bond paper (A-4 Size) and bound properly. The Guide and the head of the institution shall certify the dissertation.

The dissertation should be written under the following headings:

(1) Introduction
(2) Objective of study
(3) Review of Literature
(4) Methodology
(5) Analysis and Interpretation
(6) Results
(7) Discussion
(8) Conclusion
(9) Summary
(10) Reference
(11) Appendices

35. Change of dissertation topic /Guide

No change in the dissertation topic/Guide shall be made without prior approval from the university.

36. Award of Degree

A candidate who has passed in all subjects of first and second year of M.Sc. (MLT) in the specialties of Biochemistry/Microbiology/Pathology will be eligible for award of the degree.

37. Question Paper

Model question papers of M.Sc. MLT in Biochemistry/ Microbiology/ Pathology. (Annexure No.VIII)

38. Reference Books / Journals

Attached at the end of each syllabus.

39. Annexure

ANNEXURE NO. I

M.Sc (MLT) Biochemistry
(Detailed Syllabus)

PART- I (First year)

Paper- I- General Biochemistry and Chemistry of Biomolecules

Chemistry of living things: Structure of cell Plant, animal, bacteria and virus. Nucleus, organelle, cell- membrane. Structure and functions.
Water-a medium for living things. Universal solvent, hydrogen bonds, colligative properties. Preparation of high quality water.
Physical chemistry: Viscosity, surface tension, osmosis, Donnan membrane equilibrium, dialysis, diffusion, adsorption, partition coefficient- Principles and biochemical applications..
Methodology: Photometry, spectrophotometry ,fluorimetry, flamephotometry,
Atomic absorption spectrophotometry, osmometrynephelometry.Chromatography, electrophoresis, electrochemistry, Biosensors, chemiluminesence, Flow cytometry.
Homogenization, cell disruption, sonication, centrifugation and ultra centrifugation fractional distillation, solvent extraction ,liophilization.
General concepts regarding laboratory wares and its standardization.
Quantities and units: SI units- their advantages and disadvantages
Specimen collection, preservation and preparation for analysis, constituent stability, documentation and specimen flow system, interferences in the collection process.
Anticoagulants and preservatives.
Regulations and precautions regarding transport of biological specimens.
Biomedical waste disposal.
Electrolytes, pH and buffers- pH meter, pH measurement, buffers, biological buffers.
Radioactivity: radioisotopes, ionizing radiations, measurement of radioactivity, applications of radioisotopes in clinical biochemistry and research, Storage and disposal of radioactive materials.
Biomolecules : Characteristics and properties.
Proteins: Classification, properties and chemistry of amino acids and proteins, structure of proteins amino acid sequencing of proteins..
Carbohydrates: Classification, Chemistry and properties.
Lipids : Classification, Chemistry and properties.
Bio-membranes: Chemistry, structure, Transport process across bio-membranes.
Nucleic acids : chemistry and properties – purines, pyrimidines, nucleosides, nucleotides, nucleic acids, nucleoproteins, genes and Chromosomes.

Paper-II- Enzymology, Metabolism and Inborn Errors of Metabolism.

Enzymes: Classification, co-enzymes, cofactors, mechanisms of enzyme action, factors affecting enzyme action, enzyme kinetics, enzyme inhibition, regulatory enzymes, enzyme immobilization, Clinical enzymology. , Applications of Enzymology
Metabolism: Bioenergetics, free energy, biological oxidations, electron transport, oxidative phosphorylation.
Carbohydrate metabolism: glycolysis, gluconeogenesis, uronic acid pathway, TCA cycle, HMP pathway, glycogen metabolism, galactose metabolism, fructose metabolism, Regulation of blood glucose
Aminoacid metabolism : Transamination, deamination, oxidative deamination, ammonia transport, urea formation

Metabolism of individual aminoacids
Biosynthesis of catacholamines, melanin formation, Nitrogen balance.
Lipid metabolism: Fatty acid synthesis, fatty acid oxidation, ketogenesis.
Metabolism of triglycerides, phospholipids, sphingolipids, and cholesterol. Lipoprotein metabolism, obesity, fatty liver, lipotropic factors and ketosis, atherosclerosis and coronary heart disease.
Purine,Pyrimidine metabolism: Biosynthesis of purine and pyrimidine nucleotides. Degradation of purine and pyrimidine nucleotides.
Hemoglobin metabolism: Heme synthesis, formation of hemoglobin, metabolism of bilirubin, urobilinogen, and other bile pigments.
Inborn errors of metabolism:
Inborn errors of carbohydrate, amino acid, lipid, purine and pyrimidine, heme and bilirubin metabolism – Defect in protein biosynthesis arising from genetic mutations. Enzyme abnormalities occurring in genetic disorders.The biochemical consequences of a primary enzyme block in a metabolic pathway and the ways in which clinical and pathological signs may be produced .Methods of detecting metabolic disorders. Methods of treatment.
Biological Fluids
Cerebrospinal fluid analysis
Amniotic fluid – Bilirubin, Creatinine,alpha feto protein, Lecitin / Spigomyelin ratio, Palmitate and other tests of fetal lung maturity.Screening for Down syndrome.
Urine Analysis – Normal and abnormal urine composition including abnormal pigments.
Biochemical analysis of Peritoneal fluid, Pleural fluid, Synovial fluid, Semen etc.

Paper- III - <u>Vitamins and Hormones</u>
Vitamins: Classification of vitamins.
Chemistry, properties, biological importance and deficiency manifestations of fat soluble vitamins.
Chemistry, properties, biological importance, deficiency manifestations and coenzyme functions of water soluble vitamins.
Hormones: Classification of hormones, mechanism of hormone action, regulation of hormone secretion.
Chemistry, metabolism, biological functions and disorders of-
Hypothalamus & Pituitary hormones
Thyroid hormones
Parathyroid hormones
Pancreatic hormones
Adrenal hormones
Gonadal hormones

Paper -IV - General Physiology, Nutrition and Mineral Metabolism.

Digestion and absorption of carbohydrates, lipids, proteins. Absorption of minerals and electrolytes.
Respiration: Oxygen transport, oxygen dissociation curves, Carbon dioxide transport, factors affecting oxygen transport and carbon dioxide transport, oxygen toxicity, free radical formation, anti oxidants.
Blood clotting: Chemistry of blood coagulation and coagulation disorders.
Muscle contraction: Muscle proteins, Muscle energy metabolism, Chemistry of muscle contraction.
Detoxification: Mechanisms of detoxification, oxidation, reduction, hydrolysis, conjugation, detoxification of drugs.
Nutrition: Caloric values of foods, BMR, respiratory quotient, energy requirements, role of

carbohydrates, lipids, proteins and amino acids in diet, nitrogen balance, protein energy malnutrition, glycemic index, diet in pregnancy and lactation.
Anemia
Mineral metabolism: Metabolism of calcium, phosphorus, magnesium, sodium potassium, chloride, sulphur, iron, copper, iodine, manganese, zinc, molybdenum, cobalt, nickel, chromium, fluorine, selenium

PART II (Second year)

Paper -V Molecular Biology and Immunology

DNA replication, DNA Polymerase , Cell cycle, DNA repair.
Transcription, inhibition of transcription, genetic code, post transcriptional processing, reverse transcriptase.
Protein biosynthesis, post translational processing, inhibitors of protein synthesis.
Molecular genetics and gene expression, principles of breeding, autosomal, recessive, x-linked recessive, population genetics, gene location on chromosomes, mutations, recombination, mutagens, repression, operon, gene amplification, gene switching, transposition of genes, somatic recombination, enhancer, viruses.
Recombinant DNA technology.
Restriction endonuclease, DNA ligase, vectors, chimeric molecules, cloning, gene library, cloning strategies, insitu hybridization, blot techniques and applications, RFLP, Gene Therapy, Transgenesis, DNA finger printing, DNA sequencing, PCR,
DNA probes, hybridoma technology.
Pre-natal diagnosis of genetic disorders.
Immunology: Principles of immunology, antigen, antibodies and their reactions .Immunoglobulins, MHC, Complement system, Interleukins ,Interferons and Cytokines.
Cellular immunity, immune responses and cells involved , autoimmunity, immuno deficiency diseases .
Immunological Techniques, MIF, TRC, ELISA, Immuno electrophoresis, double diffusion technique , immunofixation, Immunoassay of enzymes, Nephelometric immunoassay, Chemiluminesence immunoassay western blot , Immunofluorescence and Radio immunoassay.
Preparation,assessment and storage of antisera (polyclonal and monoclonal). Methods of assessing analytical sensitivity, specificity and standardization

PAPER- VI- Diagnostic Biochemistry, Recent advances in clinical chemistry and Biostatistics

Liver diseases and diagnostic tests for liver diseases.
Pathophysiology of diabetes mellitus and related disorders, diagnostic tests for DM
Renal Diseases, tests for diagnosis of renal diseases
Pancreatic Function test
Intestinal function test
Gastric function test
Thyroid function test
Cardiac function test
Feto-Placental function test
Acid-base balance and diagnostic test for acid-base disorders
Diseases of CNS
Renal and pancreatic calculi.
Acute phase proteins:- Diagnosis and significance of C-reactive proteins, alpha feto proteins,

$alpha_1$- anti trypsin,$alpha_2$-macroglobulin, haptoglobulin etc.
Pathophysiology of Cancer, Oncogens, Tumor suppressor genes, Apoptosis. Tumor markers- their biochemical and pathological significance , use in management of benign and malignant tumors. Anti cancer drugs
Biochemistry of AIDS, Laboratory analysis, anti HIV drugs, prevention
Biochemistry of ageing, Alzheimer's disease, Prions, Beta amyloid
Toxicology Analysis – Action, detection and quantification of common drugs in therapy and toxic agents. Digoxin, lithium, salicylates, paracetamol, barbiturates, alcohol, morphine derivatives, amphetamines, lead, iron, mercury, carbon monoxide, organophosphates, carbamates and cyanide.
Laboratory Organization, Laboratory Management and Quality management system ISO 9000 system.
Chemicals, reagents and apparatus- their selection, sources of supply and techniques for assessing the quality
Analytical Systems
Electro Chemistry
Mass Spectrometry
Automatic Clinical Chemistry Analyzers
Point Of Care Test (POCT)
Biostatistics
Reference Intervals And Clinical Decision Limits
Evaluation of methods
Interference in Chemical Analysis
Quality Control in Clinical Chemistry
Quality control serum preparation.

Books Recommended :

1. Biochemistry by Geoffrey L Zubay, Fourth Edition, 1998
2. Fundamentals of Biochemistry by Donald Voet, Judith Voet and Pratt, second edition, 1995
3. Biochemistry – LubertStryer
4. Harper's Biochemistry by Murray etal. Appleton and Lange Publishers, 27^{h} edition, 2006
5 . Principles of Biochemistry by Lehninger, Nelson and Cox, fourth edition, W H Freeman And Company, New York, USA, 2005
6. Textbook of Biochemistry by West and Todd, Fourth Edition, 1966
7. Text book of clinical chemistry - Teitz
8. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition
9. Practical Biochemistry – Wilson & Walker
10. Clinical chemistry – Marshal
11. Clinical Biochemistry Principle and Practice – Praful B Godkar
12. Lecture notes on Clinical chemistry – L.G.Whitby
13. Clinical Chemistry – Kaplan
14. Clinical chemistry in diagnosis and treatment – Philip D Mayne
15. Clinical Chemistry – Michael L Bishop
16. NMS Biochemistry
17. Immunology: Janis Kuby fourth edition, W H Freeman Company, USA (2000)
18. Essential Immunology: Ivan Roitt (Blackwell Science Publishers, UK, 1997)
19. A Hand Book of Practical Immunology:GP Talwar (Vikas Publishing House, 1983)
20. Principles of Statistics.

PRACTICAL - FIRST YEAR

PAPER- l

Laboratory safety : Fire, chemical, radiation ,handling of biological specimens, waste disposal regulations, workplace hazardous.
Specimen collection , identification, transport, delivery and preservation.
Patient preparation for tests.
Anticoagulants and preservatives
Regulations and precautions regarding transport of biological specimens
Preparation of high quality water
pH determination
Preparation of buffers and determination of pH
Measurement of radioactivity
Practical related to solvent extraction, Partition coefficient, Dialysis, Concentration, desalting and Ultracentrifugation.
Calibration of equipment and laboratory wares.
Familiarization and usage of Colorimetry, specterophotometry, fluorimetry,
flame photometry, atomic absorption spectroscopy, nephelometry, osmometry, chemiluminesence ,ion selective electrodes, flowcytometry.
Chromatography : - Paper, Thin layer, Gel filtration, Ion exchange, HPLC, GLC,
Separation of various sugars, amino acids, lipids, drugs toxins etc. Urine aminogram.
Electrophoresis :- Paper, Agarose gel, Cellulose acetate, PAGE, SDS-PAGE. Separation of serum proteins, lipoproteins, haemoglobin, globin chain and isoenzymes
Tissue homogenization and cell disruption
Cell fractionation methods
Extraction of glycogen and its estimation
Extraction of protein and its estimation
Extraction of lipids and estimation of total lipids, glycolipid, phospholipids and cholesterol.
Determination of saponification number and iodine number from oils
Estimation of lacticacid and pyruvic acid
Qualitative analysis of carbohydrate
Detection of unknown sugars
Qualitative analysis of proteins
Isolation of DNA and RNA
Estimation of DNA and RNA
Agarose gel electrophoresis of DNA

PAPER- ll

Study of factors influencing enzyme reaction .
Type of inhibition shown by various inhibitors
Determination of Km and Vmax of enzyme.
Determination of activity of clinically important enzymes – Alkaline phosphatase,
Acid phosphatase, AST, ALT, Amylase, Lipase, LDH, CK, G^PD, Pyruvate kinase, Aldolase, 5^1- Nucleotidase, Leucine amino peptidase, Gamma glutamyltrans peptidase, Choline esterase, Enolase, Isocitrate dehydrogenase, Catalase, various isoenzymes etc.
Estimation and standardization of Glucose, Urea, Cholesterol, Triglycerides, Phopholipids, Total lipid, Uric acid, Creatine , Creatinine, Ammonia, Ketone bodies, Glycosylated haemoglobin, Bilirubin,, Plasma haemoglobin , Myoglobin
Investigations of Alkaptoneuria, Cystinuria, Pentosuria, Glycogen storage diseases,

Galactosemia.
Estimation of porphyrins and porphobilinogen in urine.
Urine qualitative and quantitative analysis.
Biochemical analysis of CSF, Amniotic fluid, Peritoneal fluid, Pericardial fluid, Pleural fluid, Synovial fluid, Semen etc.

PAPER- lll

Estimation of vitamin A,C,E from serum and metabolites of vitamins in urine.
Analysis of various hormones related to biological functions and disorders of Hypothalamus, Pituitary, Thyroid, Parathyroid, Pancreatic, Adrenal, Gonads etc.
Estimation of hormone metabolites in urine – 17- ketosteroid, 17- ketogenicsteroid,VMA, 5-HIAA, Urinary estriol etc.

PAPER- IV

Bleeding disorders – PT, APTT, TT, Fibrinogen
Estimation of Calcium , Phosphorus, Magnesium, Manganese, Sodium , Potassium, Chloride, Iron , Copper, Iodine, Zinc, Protein bound iodine

PRACTICAL - SECOND YEAR

PAPER- V

Isolation of plasmid DNA
Identification of DNA by agarose gel electrophoresis.
Restriction enzyme digestion of Plasmid DNA.
Separation of DNA fragments after restriction enzyme digestion by agarose gel electrophoresis.
Polymerase chain reaction and confirm the amplification by agarose gel electrophoresis.
Application of PCR in diagnosis of diseases.
Blotting of DNA and RNA and the detection of blot.
Agglutination reaction, Precipitation reaction, Immunodiffusion, Double diffusion technique, Immuno electrophoresis, Immunofixation, Migration inhibition factor, ELISA, Nephelometric immunoassays, Chemiluminesence immunoassays, Immunofluorescence,
Western blotting and identification of blot by ELISA technique.
Preparation of antisera and its standardization.

PAPER- VI

Diagnostic tests – Diabetes mellitus, Liver function, Renal function, Cardiac function, Thyroid function, Feto-placental function, pancreatic function, Intestinal function, Gastric function, Acid base disorders etc.
Detection of Tumor markers.
Lab diagnosis of HIV
Detection and estimation of acute phase proteins.
Analysis of renal and pancreatic calculi
Analysis of common drugs in therapy and detection of Toxins
Collection and tabulation of data
Graphical representation of data
Correlation and regression analysis

Student 't' test
Chi-square test
Analysis of variance
Quality control charts, calculation of various values and it interpretations.
Preparation of QC sample.

Books Recommended for Practical :

1. Text book of clinical chemistry - Teitz
2. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition
3. Practical Biochemistry – Wilson & Walker
4 . Clinical Biochemistry Principle and Practice – Praful B Godkar
5. Essential Immunology : Ivan Roitt (Blackwell Science Publishers, UK, 1997)
6. A Hand Book of Practical Immunology : GP Talwar (Vikas Publishing House, 1983)
7. Principles of Statistics.

Paper .VII – Dissertation.

ANNEXURE NO. II

Course II. M.Sc Medical Laboratory Technology (Microbiology) Detailed Syllabus

PART I (First year)

Paper I - General Microbiology.

Introduction to Microbiology
History & scope of microbiology, safety methods in microbiology Laboratory, first aid in microbiology laboratory, universal safety precautions, safety cabinets, common glassware for microbiology and its cleaning and sterilization, disposal of waste materials in microbiology.
Sterilization and disinfection
Physical methods
Heat -Autoclaves, hot air oven
Filtration
Radiation
Chemical methods
Disinfectants, Antiseptics, Testing of disinfectants.
Disinfection of thermo labile equipments
Sporicidal agents
Mycobacterial disinfection
Quality control in sterilization.
Microscope
Principle, methods of safe working, different parts, preparation of smears for examination, applications of following microscopes –
Bright field, dark ground, phase contrast, differential interference contrast, fluorescent, electron (scanning, transmission (STEM), polarizing, tunneling and confocal.
Micrometry.
Bacterial morphology

Ultra structure of bacterial cell, cell wall, capsule, flagella, fimbria, bacterial spores, cytoplasmic inclusions.
Staining methods for bacteria
Principles, preparation of stains and reagents preparation of smears, modification of following staining methods
Simple staining, differential staining (Gram staining, AFB staining), Negative staining, Fluorochrome staining, Staining of Volutin granules, Staining of spirochetes, spore staining, capsular staining, flagellar staining.
General Bacteriology
Classification of Medically important Bacteria
Bacterial Metabolism, Bacterial growth, Growth Requirements, Growth Curve.
Culture Media
Classification of culture Media, Preparation of Culture Media, Quality Control of Culture Media .
Inoculation, Incubation & purification methods in bacteriology.
Quantitation of bacterial growth
Preservation of bacteria.
Biochemical tests for Identification
Principle, Media & Reagents, Method, Interpretation & Quality Control of Biochemical tests.
Tests for metabolism of carbohydrates.
Tests for metabolism of proteins and amino acids.
Tests for enzymes.
Tests for metabolism of fats.
Rapid identification systems.
Bacterial genetics
Phenotypic and genotypic variations, Regulation and expression of gene activity, Genetic transfer in bacteria.
Practical
Preparation of bacterial smear and staining.
Preparation of media, cultivation of bacteria, Biochemical tests for identification bacteria.

Paper II Systematic and Diagnostic Medical Bacteriology

Systemic Bacteriology

Isolation and identification of bacteria.
Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus, Enterococcus,
Mycobacteria: general characters and classification.
Gram negative cocci of medical importance including Neisseria, Branhamella, Moraxella, Veillonella
Gram positive bacilli of medical importance including Laciobacillus,coryneform organisms, Gardnerella, Bacillus, Actinomyces, Nocardia, Actinobacillus and other Actinomycetales, Propionibacterium, Bifidobacterium, Eubacterium, Erysipelothrix, Listeria, Clostridium and other spore-bearing anaerobic bacilli.
Gram negative bacilli of medical importance including Enterobacteriaceae,Vibrio, Aeromonas, Plesiomonas, 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,Spirochaetes,Mycoplasmas and chlamydiae,Rickettsiae including Bartonella,

Coxiella, etc.

Knowledge of the above family/ genus/ species should include definition, historical perspectives, classification, morphology, cultural characteristics, metabolism, and antigenic structure, laboratory isolation and identification, tests for virulence and pathogenicity, susceptibility.

Practical

Study of morphological, cultural and biochemical characters of common bacterial pathogens.

Diagnostic Bacteriology

Epidemiology of bacterial infections, Guidelines for the collection, Transport, Processing analysis, isolation of bacterial pathogens and reporting of cultures from specimens for bacterial infections

Bacterial infections of respiratory tract.
Bacterial infections of gastro intestinal tract and food poisoning.
Bacterial urinary tract infections.
Bacterial infections of genital tract and reproductive organs.
Bacterial infections of central nervous system.
Skin and soft tissue infections.
Bone and joint infections
Eye ear and sinus infections
Cardiovascular infections
Tissue samples for culture
Anaerobic infections
Zoonotic infections.
Infections associated with immunodeficiency and immune suppression
Pyrexia of unknown origin.

Bacterial immuno serology

Enteric fever
Streptococal infections
Syphilis
Rickettsial infections
B rucellosis
Primary atypical pneumonia
New rapid serological diagnostic methods for bacterial infections.

Antibiotics in clinical laboratory

Antibiotics and mechanism of action
MIC&MBC
Invitro susceptibility tests-Different methods
Rapid methods of antibiotic susceptibility tests
Antibiotic resistance mechanisms
Detection of methicillin resistant staphylo coci

Practical

Isolation, Characterization and identification of pathogens from various clinical specimens.
Study of antibiotic sensitivity of common pathogens

Common serological tests for the diagnosis of bacterial infections.

Paper –III Medical Parasitology& Mycology

General parasitology

Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections.

Diagnostic parasitoloy

Systemic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Protozoa – Intestinal amoeba, free living pathologic amoeba, Giardia, Trichomonas, Balantidium, Isospora, Cryptosporidium, Microspora.

Malaria, Leishmania, Trypanasoma, Toxoplasma, Babesia.

Helminthes –

Cestodes – Taenia, Echinococus, Diphylobothrium.

Trematodes- Schistosoma, Fasciola, Fasciolepsis, Paragonimus.

Nematodes- Ascaris, Hookworm, Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus,

Practical

Examination of stool for parasites.

Examination of blood & bone marrow for parasites.

Examination of other body fluids & biopsy specimens for parasites.

Culture techniques for parasites.

Serological diagnostic methods in parasitology.

Mycology

General Mycology – Fungus – Classification

Fungal Structure & Morphology, Immunity to Fungal Infections.

Culture Media in Mycology , Stains in Mycology.

Diagnostic Mycology

Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections.

Specimen collection, preservation, Transportation & Identification of Mycological Agent.

Anti fungal agent, invitro tests.

Serological tests for mycotic infections.

use of lab animals in Mycology.

Superficial Mycosis – Pityriasis Vessicolor, white piedra, black piedra, tinea nigra, Malassezia species, dermatophytes .

Subcutaneous Mycosis – Mycetoma Sporotrichosis, Chromoblastomycosis, Phaeohyphomicosis, Rhinosporidiosis, Lobomicosis.

Systemic Mycosis- Histoplasmosis, Blastomicosis, Coccididiomicosis, Para Coccididiomicosis

Opportunistic Mycosis – Candidiasis, Aspergillosis, Zygomicosis, Penicillin marneffei, pneumocystis Carinii.

Miscellaneous Mycosis- Otomycosis, fungal infections in eyes, Mycotoxins, Allergic Fungal diseases.

Practicals

Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology.

Paper-IV Basic and Applied Immunology

History of immunology, innate and acquired immunity, immune system, antigens, immunoglobulin, Monoclonal antibodies, MHC, complement system, interleukins an interferons, immune responses and cells involved, immunity and infection, tumor immunology, hypersensitivity reactions, autoimmunity and autoimmune diseases, immuno deficiency, transplantation and rejection, immunomodulation including vaccines with recent developments.

Clinical laboratory methods for detection of antigens and antibodies-

Precipitation reactions-immunodiffution, immunoelectrophoresis,

Agglutination, complement fixation, neutralization.

Binder ligand assay- ELISA, RIA, Immunofluoresence, immuno blotting.

Clinical laboratory methods for-

Detection of cellular immune function
Delayed hypersensitivity skin tests
Assay for lymphocytes
Flow cytometry and cell sorting.

PART II (Second year)

Paper V Medical Virology

General virology- General characteristics and classification of viruses, Morphology and structure of viruses, Bacteriophage, propagation and identification of viruses

-Cell culture, embryonated eggs, animal inoculation,
-Viral replication and virus-host cell interactions
-Safety in the virology laboratory.

Systematic Virology- Systematic study of following viruses

Parvo viruses, Adeno viruses, Papova virus, Herpes virus, Pox virus, orthomyxovirus, paramyxovirus , Rubella virus, Arbovirus, Rhabdo virus, Hepatits viruses, Retro viruses, Human enteric viruses, Oncogenic viruses, Prions of humans.

Diagnostic virology-

Laboratory diagnosis of viral infections.
Collection, Preservation, transportation, Processing, and reporting of various clinical specimens for viral infections.
Pathogenesis of viral infections
Immune response to viral infections
Epidemiology of viral infections
Antiviral agents
Viral infections in immunocompromised patients.
Emergence and re-emergence of viral infections.

Practical

Diagnostic tests in virology, Animal-cell cultures, Media, Sterilization, Demonstration of cell lines, CPE, embryonated egg inoculation, immuno fluorescent techniques, Viral neutralization tests, Viral haemagglutination tests and haemagglutination inhibition tests, serological tests for viral infections, Western blot technique.

(Students should visit and observe all techniques in virology in a reputed institute)

Paper VI Applied and Recent advances in Medical Microbiology

Nosocomial infections

Epidemiological aspects of control infections and diseases
Typing methods in Bacteriology
Hospital acquired infections
Surgical and trauma related infections
Microbial bio – film -prevention, control and removal
Role of microbiology lab for infection control in hospital
Emerging infectious diseases

Public health Microbiology

Microbiology of air
Bacteriology of water and water born infections
Microbiology of milk and milk products
Milk born infections
Bacteriology of food and food born diseases
Vaccines for infectious diseases
Molecular diagnostic methods in microbiology
Automation in diagnostic microbiology
Microbiology Laboratory Physical design, Management and organization
Quality in the clinical Microbiology Laboratory
Genetically modified microorganisms

Molecular Diagnostic methods

Molecular diagnostic techniques relevant to medical microbiology.
PCR and its modifications including nested PCR, Multiplex PCR.
Special emphasis to Real-time PCR.
Principles of different hybridization techniques
Principles of recombinant DNA technology

Care and management of laboratory animals

Handling feeding, breeding of common laboratory animals
Bleeding of lab animals
Killing of animal and disposal of carcasses

Practical

Animal inoculation and bleeding.
Animal house management
Microbial analysis of water
Microbial analysis of air
Microbial analysis of milk
Microbial analysis of food

Reference books

1. Topley & Wilsons – Microbiology & Microbial Infections – 9th Edition
   Leslie Collier, Albert Balows, Max Sussman – Volume I, II, III, IV, V
2. Mandell, Douglas & Bennetts
   Principle & Practice of Infectious Diseases – Volume I, II – IVth Edn
3. Colour atlas of & text book of Diagnosis Microbiology – IVth Edn
   Felmer W. Koneman

4. Bailey & Scott's Diagnostic Microbiology – 12th Edn
5. Jawetz Melnick & Adelberg's Medical Microbiology
6. Medical Microbiology – Minna Plafair Roitt

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Paper VII Dissertation

ANNEXURE NO. III

M.Sc Medical Laboratory Technology (Pathology)

(Detailed Syllabus)

PART- I (First year)

Paper- I HEMATOLOGY (Theory and Practicals)

Haemopoiesis
Anaemia and other disorders of Erythropoiesis
Disorders of Leucopoiesis
Haemostasis & its investigations
Investigations of Thrombotic tendency
Laboratory control of Anticoagulant , Thrombotic and platelet therapy
Collection and handling of Blood
All Routine and special Haematological Investigations
Blood and Bone Marrow preparations
Leucoproliferative disorders with special references to Leukaemias
Automation in Haemtology
Cytochemistry of Leukaemic cells
Amniocentesis
Bone marrow transplantation
Application of different Microscopes
Preparations of various Reagents and Stains used in Haematology
Immunophenotyping
Flowcytometry
Molecular techniques in Haematology

Paper-II - HISTOPATHOLOGY

(Theory and Practicals)
Organisation of Histology Laboratory
Histological equipments
Reception and recording of tissue specimen
Tissue processing and Microtomy including frozen
Theory of staining
Preparation and quality control of all routine and special stains used in Histopathology
All staining techniques and their interpretation
Immunohistochemistry
Molecular markers of malignant neoplasms
Molecular techniques
Immunofluorescent techniques
Enzyme histochemistry
Museum techniques
Autopsy Techniques
Automation in Histological Techniques

Paper- III - CLINICAL PATHOLOGY AND CYTOGENETICS

(Theory and Practicals)
Examination of Urine - Routine and Special tests
Examination of Stool - Routine and Special tests
Examination of Sputum - Routine and Special tests
Semen examination - Routine and Special tests
Examination of CSF - Routine and Special tests
Examination of various body fluids-Pleural Fluid, Pericardial Fluid, Synovial Fluid, Ascetic Fluid
Various methods of detecting HCG levels
Structure and molecular organization of Chromosomes
Identification of human chromosomes
Karyotyping
- Direct chromosome preparation of Bone Marrow cells
- Culture techniques

Banding techniques
Sex Chromatin bodies
Autoradiography of human chromosomes
Chromosome Identification by image analysis and Quantitative cytochemistry
Clinical Manifestations of chromosome disorders

Paper-IV - CYTOLOGY

(Theory and Practical)
Morphology and Physiology of cell
Cytology of
- Female genital Tract
- Urinary Tract
- Gastrointestinal Tract
- Respiratory Tract
- Effusions
- Miscellaneous Fluids

Collection,Preservation,Fixation and Processing of various Cytological Specimen
Preparation and Quality control of various stains and reagents used in cytology
All routine and special Staining techniques in cytology
FNAC
Immunocytochemistry
Flowcytometry
Automation in Cytology

PART - II (Second year)

Paper- V - BLOOD BANKING & IMMUNOPATHOLOGY (Theory and Practical)

Blood banking
Basic principles of Immunohaemeatology
ABO Blood group systems
Rh Blood group systems
Other blood group systems

All materials and reagents used for different investigations in blood bank
Blood grouping techniques
Antibody screening and Identification
Compatibility testing
Blood collection and processing
Preservation and storage of blood
Blood component preparation and therapy
Screening tests
Transfusion reactions
HDN
Quality assurance in Transfusion Service
Special investigations in Transfusion technology

Immunopathology
History of Immunology and Immunopathology
Review of Basic Immunology
Transplantation Immunology
Immune response to infectious diseases
Vaccines
Immunodeficiencies- B cell, T cell , Combined, Phagocytic &Compliment
Cancer and the immune system
Hypersensitivity
Autoimmune diseases
Clinical Laboratory methods for the detection of antigens and Antibodies
Clinical Laboratory methods for the detection of cellular immunity
Histocompatibility testing
Molecular genetic techniques for clinical analysis of the immune systems
Experimental animal methods
Raising antibodies in laboratory animals
Recombinant DNA Technology
Gene transfer to Mammalian cells
Separation serum protein by different electrophoresis
Separation of different cells in the blood

PAPER- VI - LABORATORY ORGANIZATION, QUALITY CONTROL AND RECENT ADVANCES IN PATHOLOGY

(Theory and Practical)
Different levels of laboratories
Basic requirements and functions of a laboratory
Purchasing of equipments and chemicals
Open and closed system analyzers
National and international accreditation of laboratories
Laboratory safety
Quality control, External and internal quality controls, quality control materials, filing of QC charts
Principles of Instrumentaion
Automation in Heamatology, Cell counters, coagulation analyzers, ESR by automation, Blood collection and delivery to different laboratories in a hospital
Automation in Histopathology – New generation microtomes, tissue processing, paraffin,

Embedding, Station, tissue -tek systems, image analysis, stainers and cover slippers. Use of microwave oven
Automation and recent advances in different disciplines of pathology
New generation equipments used in blood banks
Laboratory statistics
Clinical Laboratory Informatics
All aspects Laboratory management including Financial mangement

Books Recommended:

1. Theory and practice of histological Techniques John.D.Bancroft
2. Hand book of histopathological Techniques. CFA Culling
3. Practical haematology. Davie & Lewis
4. Wintrobes Practical haematology
5. Lynch's Medical Laboratory Technology
6. Haematology Charles E David
7. Diagnostic Cytology Koss. Volume I & II
8. de Gruchy's Clinical Haematology
9. Atlas of Haematology.
10. Henry's Clinical Diagnosis&Management by Laboratory method.
11. Basic Histopathology – Stevens.
12. Practical Cytology – Astarita.
13. Atlas of Haematology – Mc Donald-Paul Anderson.
14. Recent Advances in Haematology – Choudhary.
15. Hand book of Medical Laboratory Technology – Robert H. Carman
16. Compendium of Transfusion Medicine.- Dr.R.N. Makroo
17. Immunology – Kuby.
18. Cytogenetics by Yunis..

Annexure - IV

Proforma for Submission of M. Sc (MLT) Dissertation Proposal/ Synopsis

1. Name & Address of Student:

2. Email ID of the Student:

3. Registration Number:

4. Name & Address of Recognized Institution:

5. Title of the Dissertation:

6. Name of the Guide:

7. Address, phone number and E-mail ID of the Guide:

8. Educational Qualification of the Guide:

9. Experience of teacher in guiding postgraduate students. (in years):

10. Name of the Co-Guide:

11. Address, phone number and E-mail ID of the Co-Guide:

12. Educational Qualification of the Co-Guide:

13. Synopsis of the study: Attached – Yes/No

Date: Signature of the Guide

Enclosures:

I.) Bio- Data of the Guide

II.) Synopsis of the study (maximum 4-6 pages)

Proposal/Synopsis Outline

1. Title
2. Background /significance of the problem.
3. Purpose of the study
4. Statement of the problem
5. Objectives of the study
6. Operational Definitions
7. Conceptual Framework
8. Assumptions/ Hypotheses
9. Research Methodology
    a) Research Approach
    b) Research Design
    c) Setting
    d) Population, Sample & Sampling Technique
    e) Tools & Technique
    f) Pilot Study
    g) Plan for data collection
    h) Plan for data analysis
10. Work Plan
11. Budget
12. Ethical Considerations
13. References
14. Appendices

Guidelines in writing synopsis

1. The research protocol should be of about 1200 words (4-6 pages of A4 size) on the topic. The research protocol should be submitted with a covering letter signed by the candidate and guide.
2. The work on and writing of protocol/ dissertation should be done under the Guide approved by the University.
3. The guide must be as per University norms.
4. The synopsis should be signed by the candidate and forwarded through the Guide, Departmental head and Principal of the Institution.

Annexure-V

KERALA UNIVERSITY OF HEALTH AND ALLIED SCIENCES
MEDICAL COLLEGE P.O., THRISSUR – 680 596

PROFORMA FOR RECOGNITION OF POST GRADUATE TEACHER
[Read the instructions carefully before filling up the proforma]

1	**NAME (in Block Letters)**
2	**DATE OF BIRTH:AGE** **(Attested copy of SSLC marks card / proof of date of birth to be enclosed)**
3	**PRESENT DESIGNATION:**
4	**DEPARTMENT:**
5	**ADDRESS:** **Phone (o) :** **Email: Hospital:** **College Fax:**
6	**Present Residential** **Address** **Phone (R)**

6. QUALIFICATION:
(Attested Xerox copies of all the certificates to be enclosed)

Sl No.	Name of the Degree and Specialization	Year of Passing	Name of the University and Place	Apex body recognition
UG				
PG				
Ph.D.				

7. Teaching Experience

Designation	Name of the Institution	Duration of teaching		Subject / ‘s taught
		UG From -- To	PG From -- To	
Total teaching experience				
Total teaching experience		Before PG___After PG_____Total_		

Note:

1. Only full time teaching in a teaching institution affiliated to KUHS / other A university established by law in India is considered as teaching experience.
2. Attested copies of appointment order, service certificate, promotion order & PG Degree, to be enclosed to claim teaching experience.
3. Application is to be submitted through proper channel.
4. The envelope should be super scribed as ‗Proforma for Recognition as Post Graduate Teacher'.
5. Any other relevant information: (Attach a separate sheet)
   (Regarding additional qualifications, achievements, publications, awards etc.,)

Declaration by the Teacher

I hereby declare that the above information provided by me is true and correct. I shall take the sole responsibility for any wrong information provided and liable for any action taken by the university.

Place :

Date : Signature of the Teacher

Endorsement by the Principal

The information provided by the teacher is verified from the office records and found to be correct. He/She is eligible to be recognized as a PG teacher to guide the dissertation work of PG students.

Place :

Date : Signature of the Principal

INSTRUCTIONS:

1. The Prescribed Performa must be duly filled by the applicant in his/her own handwriting and submitted to the university through the principal's office.
2. The Principal should verify all the informations provided especially the date of birth, qualification, experience, and service details before sending the proforma to the university.
3. Ensure that attested copies of all relevant documents are furnished along with the application.
4. The Principal will be held responsible for any false information provided.
5. Incomplete and incorrect applications and applications with false information will be rejected and they are liable for disciplinary action by the university**.**

Annexure-VI

KERALA UNIVERSITY OF HEALTH AND ALLIED SCIENCES
MEDICAL COLLEGE P.O., THRISSUR – 680 596

POST GRADUATE DISSERTATION – PROFORMA TO BE SUBMITTED FOR CHANGE OF GUIDE

1. Particulars of Candidate, and Existing Guide

Candidate's Name & Address	:
Name of the Institution	:
Course of Study & Subject	:
Date of Admission to Course	:

Title of the Topic :
Name & Designation of Existing Guide
Signature of the Candidate :

3. Particulars of proposed and Existing Guide
Name & Designation of proposed Guide :

Has the proposed guide been recognized as PG teacher by KUHS: Yes / No
If yes, please furnish the particulars of university letter & If No, Please send his/her proforma for recognition as PG teacher

Signature of the proposed Guide:

Name & Designation of Co-Guide if present: Signature of the Co-Guide:

Endorsement for change of guide

1. Remarks and Signature of the HOD :

2. Specific Reason for change of Guide:

3. Remarks and Signature of the Principal:

Annexure-VII
Format for the submission of Dissertation Hard &Soft copy

Instructions to candidates

Although your dissertation may be prepared on a computer, consider the following requirements for meeting the standards.
Paper

Use only one side of high-quality, plain white (unlined in any way) bond paper, minimum

20-lb weight, and 8 ½ ‖ x 11‖ in size. Erasable paper should not be used.

Type Size and Print

Select fonts type Times New Roman and a size of 12 characters. The size of the titles should be 14 and Bold, the size of subtitles should be 12 and bold. Print should be letter quality or laser (not dot matrix) printing with dark black characters that are consistently clear and dense. Use the same type of print and print size throughout the document.

Pagination
Number all of the pages of your document, including not only the principal text, but also all plates, tables, diagrams, maps, and so on. Roman numerals are used on the preliminary pages (pages up to the first page of text) and Arabic numerals are used on the text pages. The numbers themselves can be placed anywhere on the page, however they should be consistent.

Spacing

Use double spacing except for long quotations and footnotes which are single-

Margins

To allow for binding, the left-hand margin must be 1.5‖. Other margins should be 1.0‖. Diagrams or photographs in any form should be a standard page size, or if larger, folded so that a free left-hand margin of 1.5‖ remains and the folded sheet is not larger than the standard page.

Photographs

Professional quality black-and-white photographs are necessary for clear reproduction. Colors are allowed, but you should be certain the colored figure will copy clearly and will not be confusing when printed in black and white.

FILE FORMAT

Dissertation format should be in .Doc (Ms Word Document) or PDF (Portable Document Format), Image files in JPG or TIFF format and Audio Visual in AVI (Audio Video Interleave), GIF, MPEG (moving picture expert) files format.

Labeling on CD

CD-ROM Labeling should be standard and should contain title, name of the candidate, degree name, subject name, guide name, name of the department, college, place and year.

References

Vancouver style format.

GUIDELINES OF DISSERTATIONS FOR M.Sc (MLT) DEGREE

Title (Capital)

Emblem (University)

Student's name (Capital)

Name of the College

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY
KERALA UNIVERSITY OF HEALTH SCIENCES**

Year

<----------Title---------->

by

Name of the Candidate
Dissertation Submitted to the

KERALA UNIVERSITY OF HEALTH AND ALLIED SCIENCES
THRISSUR

Inpartialfulfillment
of the requirements for the degree
of

Degree Name

in

Subject Name

Under the guidance of
Name of the Guide

Name of the Department
Name of the College
Place

Year

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation/thesis entitled –<----------Title-

---------->" is a bonafide and genuine research work carried out by me under the guidance of **Name & designation of the Guide**.

Signature of the candidate

Place
Date ::

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled –<----------Title---------

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I hereby declare that the Kerala University of Health and Allied Sciences, Kerala shall have the rights to preserve, use and disseminate this dissertation in print or electronic format for academic / research purpose.

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ACKNOWLEDGMENT

Not lengthy. Avoid Superlatives.

Signature of the Candidate

Place:
Date

Name

ABSTRACT

(Include problems and objectives, methodology, results, interpretation and conclusion in a single paragraph limited to 250-300 words)

Keywords
(Max. 10)

Keywords shall be chosen from reference Books and Text Books (Each keyword should be separated by semicolon)

TABLE OF CONTENTS

i. List of Tables **i**
ii. List of Figures **ii**
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4.	Methodology	Page No.
5.	Results	Page No.
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8.	Summary	Page No.
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LIST OF TABLES
(14 size bold)

Sl.No	Tables	Pages
1.		
2.		

LIST OF FIGURES
(14 size bold)

Sl.No	Figures	Pages
1.		
2.		

LIST OF APPENDICES
(14 size bold)

Sl.No	Figures	Pages
1.		
2.		

CHAPTER 1

1. INTRODUCTION (14 size bold)

2. OBJECTIVES

3. REVIEW OF LITERATURE

4. METHODOLOGY

5. RESULTS

6. DISCUSSION

7. CONCLUSION

8. SUMMARY

9.REFERENCES

10. ANNEXURES

CHAPTER I

Introduction (14 sizes, Bold)

Sub Headings (12 size, bold)

Background of the problem

Need and significance of the study

Statement of the problem

Objectives

Operational definitions

Assumptions (if any)

Hypothesis (write research hypothesis)

Conceptual/theoretical frame work

CHAPTER.2 (14 sizes, bold)

Review of literature

Subheading of the literature reviewed (12 size, bold)

Summary (of reviewed literature at the end)

CHAPTER 3 (14 SIZE, BOLD)

Methodology

Research approach

Research design

Variables

Schematic representation of the study

Setting of the study

Population

Sample and sampling technique

- **Inclusion criteria**
- **Exclusion criteria**

Tool/instruments

Development/selection of the tool

Description of the tool

Content validity

Reliability of the tool

Pilot study

Data collection process

Plan for data analysis

CHAPTER 4 (14 SIZE, BOLD)

Analysis and interpretation

Section title

(Section wise presentation of data)

CHAPTER 5 (14 SIZE, BOLD)

Results

Objectives

Hypothesis

Results

CHAPTER 6 (14 SIZE, BOLD)

Discussion, summary and conclusion

Discussion

Summary

Conclusion

Implications

Limitations

Recommendations

DISSERTATION STYLE: Vancouver style format is used

Citations in the text

General rules:

1. References are numbered consecutively in the order in which it is cited in the text. Place each reference number in parentheses e.g. (5) or as superscripts Eg. …….was discovered [1.3] throughout the text, and tables. Use Arabic numerals in parentheses e.g. (5) for in-text citation; the number in parentheses links directly to the reference list at the end of the work. If the same reference is used again, re-use the original number. Either square { } or curved brackets () can be used as long as it is consistent.

2. Superscripts Number should be inserted to the left or colons and semi colons. Full stops are placed either before or after the reference number e.g…….. was discovered [1.3] or was discovered [1.3] .

3. Direct quotes are to be used very carefully. If a direct quote is necessary, place quotation marks around the quote and number the reference as usual.

4. Personal communication used as a reference should be avoided, unless it provides essential information not available from a public source. Do not number this type of reference; instead cite the name of the person and date of communication in parentheses in the text.

5. When multiple reference are cited at a given place in a text, use a hyphen to join the first and and last numbers that are inclusive, e.g (6-8). Use commas to separate non-inclusive numbers e.g (2,3,4,5,7,9) is abbreviated to (2-5,7,9)

6. The same number is used for a source throughout a paper. This number is determined by the first citation of the source. So, for examble, if a work is the fourth source cited in a paper, it will be referred to as (4) or by the superscript number 4 throughout that paper.

7. Whatever format is chosen, it is important that the punctuation is consistently applied to the whole document.

Tables

Tables must be self-explanatory. The data must be clearly organized and should supplement and not duplicate the text. Data may be presented either in a table or pictorial form. Do not use internal horizontal or vertical lines. Explanatory matter should be given as footnotes. Statistical analysis used must be appropriate. Confidence intervals along with exact probability values must be stated for the results. Round decimals in two digits. Each table must have a title and should be numbered with Arabic numericals e.g (1,2) .Type or print each table with double spacing on a separate sheet of paper. Number tables consecutively in the order of their first citation in the text

and supply a brief title for each. Give each column a short or an abbreviated heading. Explain all nonstandard abbreviations in footnotes. Table should not be carried over to the next page.

Example for a table

Table 18

Distribution of isolates according to Anti-fungal susceptibility pattern

Isolates	Sensitive	Resistant	Total
C.albicans	37	10(21.3%)	47
C.tropicalis	16	7(30.43%)	23
C.glabrata	9	10(52.63%)	19
C.parapsilosis	8	3(27.27%)	11

Illustrations and figures

- Number each figure in the text in consecutive order

Abbrevations and symbols

Use only standard abbreviations; use of non-standard abbreviations can be confusing to readers. Avoid abbreviations in the title of the manuscripts. The
Spelled-out abbreviation followed by the abbreviation in parenthesis should be used on first mention unless the abbreviation is a standard unit of measurement.

Abstract

Abstract provides a brief summary of the dissertation/thesis, summing up clearly the problem examined, the methods used, and the main findings. The abstract is a one-paragraph, self-contained summary of the most important elements of the paper. The abstract word limit is between 250 and 300 words. All numbers in the abstract (except those beginning a sentence) should be typed as digits rather than words. Key words (max.10) should be given, chosen from subject concerned headings. Each word should be separated by semicolon.

References

- The reference list should appear at the end of the paper and provide the full bibliographic information about the sources cited.

- List all reference in order by number, not alphabetically. Each reference is listed once only, since the same number is used throughout the paper. It should be numbered

consecutively in the order in which they are first mentioned in the text. Identify references in text and tables by Arabic numerals in parentheses.

- The titles of journals should be abbreviated according to the style used in the list of journals. The following information is included for journal articles: author(s), article title, abbreviated journal title, year, month(if applicable), day, volume number, issue number(if applicable), page numbers. For books author (s), title, Edition, place of publication, publisher and year.

- List each author's last name and initials; full first names are not included. List all authors, but if the number exceeds six, give the first six followed by " et al").

- For books with chapters written by individuals authors, list the authors of the chapter first, then the chapter title, followed by "In:" the editors'names, and the book title.

- Initials follow the family names of authors and editors, with no space or full stops between the intials of an author, e.g. Halpern SD, Ubel PA, Caplan AL.

- Commas are used to separate each author's name. Note that "and" is not used to separate the last two names.

- Minimal capitalization is used for the article title, ie only the first word and words that normally would begin with a capital letter are capitalized.

- Full stops are used after the last authors initials, after the article title, after the abbreviated journal title and at the end of the entry.
  Gerald Collee J,Andrew G Fraser,Barrie P Marmion,Anthony simmons. Mackie&Maccartney Practical medical microbiology.Newyork:Churchil Livingstone;1996.

- The date is followed by a semicolon (with no space after it) and the volume number or issue number is followed by a colon (with no space after it)
  Mardani M,Hanna HA,Girgawy,Raad I.Nosocomial candida guilliermondi fungemia in cancer patients.Infect control Hosp epidemiol.2000;21:336-337.

Reference: Examples

Book (one author)
John Bernad Hendry .Clinical diagnosis and management by Laboratory methods.19 th ed. Philadelphia:W B Saunders;1996.

Book (two or more authers)
Betty A Forbes, Daniel F Sahm,Alice S.Weissfeld.Bailey & sciott's Diagnostic Microbiology. 10th ed.Mosby: Elsevier;2007.

Chapter in edited book

Leslie Collier, Albert BalowsMax sussman.Microbiology and microbial infections.In:Virology. Brain W J Mahy, Leslie Collier, editors. The immune response to viral infections.
New York: Arnold; 1998.p173-192.

Journals

- List up to the first 6 Authors;1-6 – authors:Eg: Growther RA,Kiselev NA.Three diamontional structure of Hepatitis B virus core particles determined by electron cryomicroscopy.J Bio chem. cell. 1994; 77: 943-50

- If the article has more than 6 authors, list the first six, followed by et al. Give the first six names in full and add "et al". The authors are listed in the order in which they appear on the title page.

- If the journal carries continuous pagination throughout a volume, the month and or issue number may be omitted.

- Halpern SD Ubel PA,Caplan AL.Solid-organ transplantation in HIV infected patients.N Engl J Med.2002;347:284-87.

Journal article on the internet:
Sun Ah Lee, Jimin Kahng, Yonggoo Kim, Yeon-Joon Park, Kyungja Han, Seung-Ki Kwok.et al. Comparative Study of Immunofluorescent Antinuclear Antibody Test and Line Immunoassay Detecting 15 Specific Autoantibodies in Patients With Systemic Rheumatic Disease.J CLA.2012. July 26(4) p. 307–314[cited 2012 July 18].available from: http://onlinelibrary.wiley.com/doi/10.1002/jcla.2012.26.issue-4/issuetoc

Books on the internet
Joel D Hubbard.A concise review of clinical laboratory science .2nd ed.Philadelphia : Wolters Kluwer Health/Lippincott Williams & Wilkins;c2010.Available from: http://www.docin.com/p-294624555.html.

General principles

Paper

Use only one side of high quality, plain white (unlined in any way) bond paper, minimum 20-lb weight, and 8 ½ " x 11" in size. Erasable paper should not be used.

Type size and print

The fond size should be visible to the reader, preferably
Times New Roman 12 pt .No italicization.

Size of the title should be 14 and bold,the size of sub-title should be 12 and bold. Print should be letter quality or laser (not dot matrix) printing with dark black characters that are consistently clear and dense. Use the same type of print and print size throughout the document.

Pagination

Number all of the pages of your document, including not only the principal text, but also all plates, tables, diagrams, maps and so on. Romam numerals are used on the preliminary pages (pages up to the first page of text) and Arabic numerals are used on the text pages. The numbers themselves can be placed anywhere on the page, however they should be consistent.

Spacing

Use double spacing except for long quotations and foot notes which are single spaced.

Margins

Margin size; "generous'- Use plenty of room on the top,bottom,left&right(1"minimum).
To allow for binding, the left hand margin must be 1.5". other margin should be 1.0". Diagrams or photographs in any form should be a standard page size, or if larger, folded so that a free left-hand margin of 1.5" remains and the folded sheet is not larger than the standard page.

Photographs

Professional quality black-and-white photographs are necessary for clear reproduction.colors are allowed,but you should be certain the colored figure will copy clearly and will not be confusing when printed in black and white.

File Format

Dissertation format should be in Doc (Ms word document) or PDF(portable document fomat),Image file in JPG or TIFF format and audio visual in AVI(Audio Video Interleave),GIF,MPEG (moving picture expert) files format.

Labeling on CD

CD-ROM labeling should be standard and should contain title, Name of the candidate , degree name ,subject name, Guide name, name of the department, College, place and year.

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Annexure-VIII

MODEL QUESTIONS

KERALA UNIVERSITYOF HEALTH SCIENCES
FIRST YEAR M.Sc (MLT) - BIOCHEMISTRY
DEGREE EXAMINATION

PAPER - I GENERAL BIOCHEMITRY & CHEMISTRY OF BIOMOLECULES

Time: 3 hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks

1 Write brief on:
   (a) Different forms of DNA
   (b) Various mode(s) proposed to elucidate the structure of biological membrane.

2. Define pH. Derive Henderson – Hasselbalch equation. Explain pH meter.

3. Enumerate the role of radio isotopes in biochemistry. Explain the disposal of radioactive wastes.

4. Write briefly on:
   (a) Donnan's membrane equilibrium.
   (b) Buffers.

5. Discuss the secondary structure of protein in detail. What forces hold the secondary structure together? What are the main differences between secondary structures of globular and fibrius proteins?

6. Draw the chemical structure of purines and pyramidines found in nucleic acids. Discuss the chemical differences in the structure of DNA and RNA. Why is uracil not found in DNA?

7. Explain Ion exchange chromatography and Affinity chromatography. Which type of macromolecules are generally separated by these types of chromatography and why?

8. Discuss SDS-PAGE in detail.

9. What are carbohydrates? Define isomers, anomers and epimers with the help of chemical structure giving specific examples.

10. Write short notes on:
   (a) Atomic absorption spectrophotometry
   (b) Chemiluminescence

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR MSc (MLT) - BIOCHEMISTRY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER- II ENZYMOLOGY, METABOLISM AND INBORN ERRORS OF METABOLISM

Time: 3 hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks

1. Enumerate different types of glycogen storage diseases.

2 Explain the enzyme defects of urea cycle which leads to aminoaciduria.

3 Analysis of cerebrospinal fluid

4 Explain briefly
   (a) Abnormal urine composition.
   (b) Amniotic fluid analysis

5 What is meant by enzyme inhibition? With the help of Loneweaver- Burk plot, differentiate between competitive, non-competitive and uncompetitive type of inhibition.

6 Name the different pathways of fatty acid catabolism. Discuss the various steps involved in Beta oxidation of fatty acids. Calculate the number of moles of ATP formed when stearic acid undergoes Beta oxidation.

7 Write short notes on:
   (a) Prostagladins
   (b) Salvage pathway of purine synthesis

8 Describe the various steps of HMP shunt pathway. Under what conditions a cell metabolises glucose preferentially through HMP shunt? Which products of HMP shunt are important and why?

9 Discuss clinically important enzymes associated with liver diseases.

10 Write briefly on:
   (a) Heme synthesis
   (b) Disorders of purine metabolism.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - BIOCHEMISTRY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER - III VITAMINS AND HORMONES

Time : 3 Hours **Maximum marks : 100**

Answer all questions. Each question carries 10 marks

1. How do vitamin C and E deficiency effect the antioxidant defense system of the body?

2. Enumerate disorders of hyper function of adrenal cortex. Give the diagnostic criteria for evaluation of patients suspected of Cushing's syndrome.

3. Mechanism of action of hormones.

4. Write short notes on:
   (a) Cyclic AMP
   (b) Co-enzyme forms of niacin, pyridoxine and riboflavine.

5. Briefly explain the chemistry, sources, daily requirement, functions and deficiency symptoms of vitamin D.

6. Write briefly on the synthesis and biochemical function of thyroid hormones.

7. Write short notes on:
   (a) Hypothalamic hormones..
   (b) 5 HIAA.

8. Write an account of folic acid involvement in one carbon metabolism.

9 Explain briefly on:
   (a) Vitamin K in carboxylation
   (b) Vitamin A

32. Explain the methods for the determination of VMA and its interpretation

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - BIOCHEMISTRY
DEGREE EXAMINATION
MODEL QUESTIONS

PAPER - IV GENERAL PHYSIOLOGY, NUTRITION & MINERAL METABOLISM

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks

1. Define anaemia. What are the laboratory findings in anaemia? What is the mechanism of iron deficiency anaemia?

2. Write on the Biochemical importance and disease states of fluorine and selenium.
3. Discuss the cascade of blood coagulation process

4. Write short notes on:
   (a) Protein malnutrition
   (b) Wilson's disease

5. Write briefly on:
   a) Oxygen dissociation curve
   b) Antioxidants

6. Write briefly on:
   (a) Mechanism of detoxification.
   (b) Digestion and absorption of lipids

7. Write briefly on calcium homeostasis and deficiency diseases.

8 Explain briefly on:
   (a) Iodine
   (b) Magnesium

9. Describe the various components of electron transport chain. Add a note on inhibitors of this chain.

10. Define a balanced diet. Formulate a diet for a college student

KERALA UNIVERSITYOF HEALTH SCIENCES

SECOND YEAR M.Sc (MLT) - BIOCHEMISTRY DEGREE EXAMINATION

MODEL QUESTIONS
PAPER - V. MOLECULAR BIOLOGY AND IMMUNOLOGY

Time : 3 Hours **Maximum marks : 100**

Answer all questions. Each question carries 10 marks

1. Explain briefly:
   (a) Restriction endonucleases
   (b) Use of DNA polymorphism for pre-natal diagnosis.

2. How does glucose, lactose and CRP regulates expression of lac operon?

3. Give the principle and application of ELISA and Immunoelectrophoresis.

4. What is the principle of Hybridoma Technology? Enumerate its uses in medical sciences.

5. Write short notes on:
   (a) Regulation of gene expression.
   (b) DNA finger printing and its significance.

6. Explain briefly:
   (a) Mutations
   (b) Repair mechanisms of DNA.

7. Write short notes on:
   (a) RFLP.
   (b) Reverse transcriptase and its significance.

8. Explain the Blotting of DNA and the detection of blot.

9. Write briefly on:
   (a) Ribozymes.
   (b) Cosmids.
10. Write short notes on:
   (a) Genetic code.
   (b) Transgenic organisms.

KERALA UNIVERSITYOF HEALTH SCIENCES

SECOND YEAR MSc (MLT) - BIOCHEMISTRY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER -VI DIAGNOSTIC BIOCHEMISTRY, RECENT ADVANCES IN CLINICAL CHEMISTRY&BIOSTATICS

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks

1. Enumerate the liver function tests and write briefly the differential diagnosis of jaundice.

2. Write short notes on :
   (a) Clinically useful tumour markers.
   (b) Hypothyroidism

3. Give an account of the various laboratory tests to evaluate pancreatic function.

4. Describe the salient features of Random Access Analyzers.

5. What is the role of external and internal Quality control in clinical chemistry?

6. Discuss the following
   (a) Immunological defects in AIDS.
   (b) The addition rule and the multiplication rule of probability.

7. Write short notes on :
   (a) Diagnostic value of iso enzymes of alkaline phosphatase.
   (b) Point of care test (POCT)

8. Describe the various acid-base parameters measured in a clinical Biochemistry laboratory. Discuss their significance.

9. Write short notes on:
   (a) Analysis of calculi
   (b) Mass spectrometry.

10. (a) Discuss the assay of alcohols and barbiturates.
    (b) Automation in clinical laboratory.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR MSc (MLT) - MICROBIOLOGY
DEGREE EXAMINATION
MODEL QUESTIONS

PAPER - I. GENERAL MICROBIOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Universal safety precautions in laboratory practice.
2. Anaerobic culture techniques.
3. Confocal microscope.
4. Methods of viable bacterial counting.
5. ONPG test.
6. Cell wall of bacteria.
7. Determinants of bacterial virulence.
8. R factor.
9. Hydroclave.
10. Gnotobiotic animals.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - MICROBIOLOGY
DEGREE EXAMINATION
MODEL QUESTIONS

PAPER -II SYSTEMATIC AND DIAGNOSTIC BACTERIOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Atypical Mycobacterium.
2. Epidemiological typing of Salmonella.
3. Laboratory. diagnosis of plague.
4. Detection of enterotoxin.
5. Pathogenesis and laboratory diagnosis of Rheumatic fever.
6. CAMP test.
7. Fluorescent Treponemal Antibody test.
8. Bartonellosis.
9. Laboratory diagnosis of non- fermentative Gram negative bacilli.
10. Bacterial vaginosis.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - MICROBIOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER - III MEDICAL PARASITOLOGY AND MYCOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Preservation of fecal specimen for parasites.
2. Cultivation of Entamoeba histolytica.
3. Laboratory diagnosis of toxoplasmosis.
4. Tissue nematodes.
5. Serodiagnosis of malaria.
6. Fungal aetiology of mycetoma.
7. Selective media for fungi.
8. Identification of yeast.
9. Asexual conidiogenesis.
10. Chromomycosis.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - MICROBIOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER - IV IMMUNOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Principle of production of monoclonal antibodies.
2. Immunological memory.
3. Sub populations of T cells.
4. Macrophage migration inhibition test.
5. Adjuvants.
6. Counter current immune electrophoresis and its applications in bacteriology.
7. MHC molecule.
8. Theories of antibody synthesis.
9. Hypersensitivity reactions.
10. Current concepts of antigen presentation.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - MICROBIOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER -V. MEDICAL VIROLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Viral inclusion bodies.
2. Tissue culture and its use in virology.
3. Live viral vaccines.
4. Pathogenesis and laboratory diagnosis of Rota virus.
5. H_1N_1 Influenza.
6. Transport and storage of samples for viral isolation.
7. Serodiagnosis of viral hepatitis.
8. Antiviral agents.
9. Epstein – Barr virus.
10. Immuno fluorescent techniques in viral diagnoses.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - MICROBIOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER - VI APPLIED MEDICAL MICROBIOLOGY AND RECENT ADVANCES

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Biofilms.
2. E-test and its use.
3. Nosocomial infections.
4. Laboratory investigations to contain MRSA outbreak.
5. DNA probes and its diagnostic applications.
6. Automation in microbiology.
7. Monitoring of operation theatre sterility.
8. Restriction fragment length polymorphism.
9. COSMIDS.
10. Immuno blot assay.

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - PATHOLOGY
DEGREE EXAMINATION

MODEL QUESTIONS

PAPER I – HAEMATOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Classify Anaemia. Describe the laboratory diagnosis of iron deficiency anaemia
2. Romanowsky stains
3. Trouble shootings of Hematology analyzers
4. Applications of PCR in Haematology
5. Total leucocytes counting techniques
6. APAAP technique
7. Histograms
8. Laboratory investigations required prior to Bone marrow transplantation
9. Applications of fluorescent dyes in Haematolog)
10. Anticoagulants

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - PATHOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER II - HISTOPATHOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Reception of histology specimen in a histopathology laboratory
2. Micro anatomical fixatives
3. Dehydrating agents
4. Embedding techniques
5. Faults and remedies in section cutting
6. Use of microwave oven in histopathology and its advantages
7. In situ hybridization
8. Direct Immuno flourscent techniques in histopathology
9. Autopsy techniques
10. Flow cytometry

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - PATHOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER III CLINICAL PATHOLOGY & CYTOGENTICS

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Fluorescent In situ Hybridization for chromosome analysis
2 Microscopic Examination of urine
3. Various methods of detecting HCG levels
4. Collection and examination of CSF
5. Klinefelter syndrome
6. Concentration techniques for the detection of Ova & Cysts
7. Barr Body
8. Examination of synovial fluid
9. Semen analysis
10. Detection of Bence-Jones protein (10X10=100 marks)

KERALA UNIVERSITYOF HEALTH SCIENCES

FIRST YEAR M.Sc (MLT) - PATHOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

PAPER IV - CYTOLOGY

Time : 3 Hours **Maximum marks : 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Normal cytology of female genital tract
2. Collection, preservation and processing of pleural fluid
3. Cytocentrifuge preparations
4. Automation in cytology
5. Fine needle aspiration cytology
6. Shorr's staining
7. Quality control in cytology
8. Density gradent sepearation of malignant cells
9. Spray fixatives
10 Immunocyto chemistry (10x10 = 100 marks)

KERALA UNIVERSITYOF HEALTH SCIENCES

SECOND YEAR M.Sc (MLT) - PATHOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

Paper - V: BLOOD BANKING AND IMMUNOPATHOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. ABO blood group system.

2. Blood Component Preparation.

3. Quality Assurance in Tansfusion Service *S*

4. Transfusion Reactions

5. Screening tests

6. Recombinant DNA Technology

7. Molecular genetic techniques for clinical Analysis of the immune systems.

8. Type I hyper sensitivity Reactions

9. Experimental Animal methods to raise Antibodies

10. AIDS

KERALA UNIVERSITYOF HEALTH SCIENCES

SECOND YEAR M.Sc (MLT) - PATHOLOGY DEGREE EXAMINATION

MODEL QUESTIONS

Paper- VI: LABORATORY ORGANIZATION, QUALITY CONTROL AND RECENT ADVANCES IN PATHOLOGY

Time: 3 Hours **Maximum marks: 100**

Answer all questions. Each question carries 10 marks
Draw diagrams wherever necessary

1. Open and closed system analyzers,
2. Purchasing of laboratory equipments and chemicals
3. Quality control systems.
4. Molecular Techniques in Histopathology.
5. Computerization in histopathology laboratory use of software's.
6. Laboratory safety.
7. Organization of Central Laboratory in 300 bedded hospital
8. Recent advances in cytogenetic.
9. New generation equipments used in Blood Bank.
10. Maintenance of laboratory records and statistics.

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Biochemistry)

(Model Question Paper)

PAPER - V Molecular Biology and Immunology

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. How does glucose, lactose and CRP regulates expression of lac operon.
2. Explain the principle & application of ELISA and immuno electrophoresis.
3. What is the principle of hybridoma technology. Enumerate its uses in medical sciences.
4. Explain the blotting of DNA and the detection of blot.
5. Replication
6. Protein synthesis
7. Recombinant DNA technology
8. Prenatal diagnosis of genetic disorders
9. Chemiluminesence assay
10. Methods of assessing analytical sensitivity, specificity and standardization

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Biochemistry)

(Model Question Paper)

PAPER- VI Diagnostic Biochemistry, Recent Advances in Clinical Chemistry & Biostatics

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. Enumerate the liver function tests and mention the differential diagnosis of jaundice.
2. Explain the various laboratory tests to evaluate pancreatic function.
3. Describe the salient features of random access analyzers.
4. Discuss the role of external and internal quality control in clinical chemistry.
5. Acid base disorders and its diagnostic test
6. Tumor markers - its biochemical and pathological significance
7. Mass spectrometry
8. Biochemistry of AID and its laboratory analysis
9. Reference intervals and clinical decision limits
10. Patho physiology and diagnostic test of diabetes mellitus

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Microbiology)

(Model Question Paper)

PAPER - V Medical Virology

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. Viral inclusion bodies.
2. Tissue culture and its use in virology.
3. Live viral vaccines.
4. Pathogenesis and laboratory diagnosis of rota virus.
5. H1N1 Influenza.
6. Transport and storage of samples for viral isolation.
7. Serodiagnosis of viral hepatitis.
8. Antiviral agents.
9. Epstein – Barr virus.
10. Immuno fluorescent techniques in viral diagnoses.

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Microbiology)

(Model Question Paper)

PAPER - VI Applied Medical Microbiology & Recent Advances

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. Biofilms.
2. E-test and its use.
3. Nosocomial infections.
4. Laboratory investigations to contain MRSA outbreak.
5. DNA probes and its diagnostic applications.
6. Automation in microbiology.
7. Monitoring of operation theatre sterility.
8. Restriction fragment length polymorphism.
9. COSMIDS.
10. Immuno blot assay.

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Pathology)

(Model Question Paper)

PAPER V – Blood Banking & Immuno Pathology

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. ABO blood group system.
2. Blood component preparation.
3. Quality assurance in transfusion services
4. Transfusion reactions
5. Screening tests
6. Recombinant DNA technology
7. Molecular genetic techniques for clinical analysis of the immune systems.
8. Type I hyper sensitivity reactions
9. Experimental animal methods to raise antibodies
10. AIDS

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QP Code: **Reg. No.:……**

Second Year M.Sc MLT Degree Examination (Pathology)

(Model Question Paper)

PAPER VI. Laboratory Organization, Quality Control, and Recent Advances in Pathology

Time: 3 hrs Maximum marks: 100

- ***Answer all questions***
- ***Draw diagrams wherever necessary***

Essays **(10x10=100)**

1. Open and closed system analyzers,
2. Purchasing of laboratory equipments and chemicals
3. Quality control systems.
4. Molecular techniques in histopathology.
5. Computerization in histopathology laboratory use of software's.
6. Laboratory safety.
7. Organization of central laboratory in 300 bedded hospital
8. Recent advances in cytogenetic.
9. New generation equipments used in blood bank.
10. Maintenance of laboratory records and statistics.

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