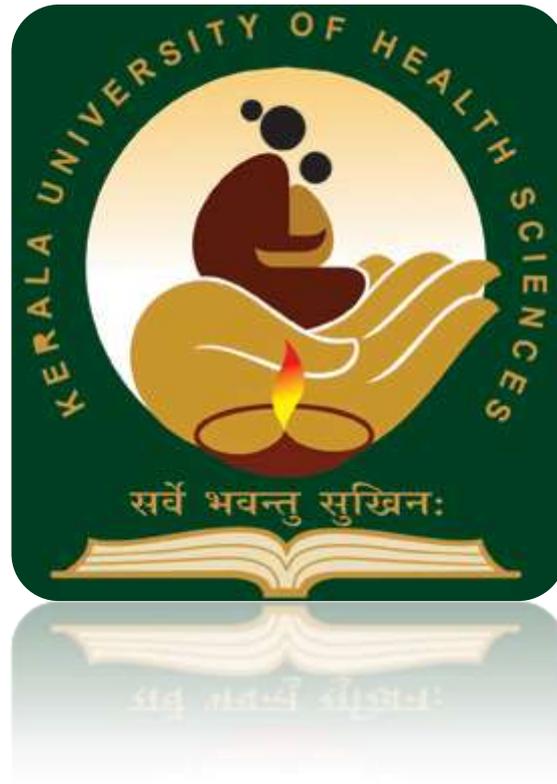


KERALA UNIVERSITY OF HEALTH SCIENCES

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/ equivalency 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

<i>Paper</i>	<i>Subject</i>	<i>Theory hours</i>	<i>Practical hours</i>	<i>Clinical Laboratory Practice Hrs</i>	<i>Total hours</i>
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

<i>Paper</i>	<i>Subject</i>	<i>Theory hours</i>	<i>Practical hours</i>	<i>Clinical Laboratory Practice hours</i>	<i>Total hours</i>
First year			600 hrs	1250 hrs	2250 hrs
Paper-I	General Microbiology	100 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	300 hrs	1150 hrs	1650 hrs
Paper -VI	Applied Medical Microbiology and Recent Advances	100 hrs			
	Dissertation				600 hrs
Total	First and second year including Dissertation				4500 hrs

14. Hour distribution for MSc(MLT) Pathology

<i>Paper</i>	<i>Subject</i>	<i>Theory hours</i>	<i>Practical hours</i>	<i>Clinical Laboratory Practice hours</i>	<i>Total hrs</i>
FIRST year					
Paper-I	Haematology	100 hrs	600 hrs	1250 hrs	2250 hrs
Paper-II	Histopathology	100 hrs			
Paper -III	Clinical Pathology & 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-totalling can be allowed on request by the candidate.

18. Scheme of Examination of MSC MLT –Biochemistry

First year

<i>Year</i>	<i>Paper- theory</i>	<i>Maximum</i>	<i>Minimum</i>
1 st 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	100	50
	Theory Internal assessment	50	20
	Total	150	75
	Practical	300	150
(Part I)	Internal assessment	50	20
	Viva voce	50	
	Total	400	200
	TOTAL for PART	1000	500

Second year

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

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

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

1 st 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
2 nd 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

<i>Year</i>	<i>Paper</i>	<i>Maximum Marks</i>	<i>Minimum Marks</i>
1 st 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	300	150
	Internal Assessment	50	20
	Viva voce	50	
	Total	400	200
	Total for PART I	1000	500
2 nd Year (Part II)	Paper -V		
	Blood Banking & Immunopatholgy	100	50
	Internal Assessment	50	20
	Total	150	75
	Paper -VI		
	Laboratory Organization ,QC, and Recent Advances in Pathology	100	50
Internal Assessment	50	20	
Total	150	75	
	Practical	200	100
	Internal Assessment	50	20
	Viva voce	50	
	Total	300	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 amino acids

Biosynthesis of catecholamines, 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, Lecithin / 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 - Vitamins and Hormones

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, Chemiluminescence 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,

alpha₁-anti trypsin, alpha₂-macroglobulin, haptoglobin 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 – Lubert Stryer
4. Harper's Biochemistry by Murray et al. Appleton and Lange Publishers, 27th 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- I

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, spectrophotometry, fluorimetry,

flame photometry, atomic absorption spectroscopy, nephelometry, osmometry, chemiluminescence ,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 lactic acid 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- II

Study of factors influencing enzyme reaction .

Type of inhibition shown by various inhibitors

Determination of K_m and V_{max} of enzyme.

Determination of activity of clinically important enzymes – Alkaline phosphatase,

Acid phosphatase, AST, ALT, Amylase, Lipase, LDH, CK, G⁶PD, Pyruvate kinase,

Aldolase, 5¹- Nucleotidase, Leucine amino peptidase, Gamma glutamyltrans peptidase,

Choline esterase, Enolase, Isocitrate dehydrogenase, Catalase, various isoenzymes etc.

Estimation and standardization of Glucose, Urea, Cholesterol, Triglycerides, Phospholipids,

Total lipid, Uric acid, Creatine , Creatinine, Ammonia, Ketone bodies, Glycosylated haemoglobin, Bilirubin., Plasma haemoglobin , Myoglobin

Investigations of Alkaptonuria, 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- III

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, Chemiluminescence 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 its 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

Streptococcal 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 parasitology

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, Echinococcus, 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, Phaeohyphomycosis, Rhinosporidiosis, Lobomycosis.

Systemic Mycosis- Histoplasmosis, Blastomycosis, Coccidiomycosis, Para Coccidiomycosis

Opportunistic Mycosis – Candidiasis, Aspergillosis, Zygomycosis, Penicillin marneffeii, 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 and interferons, immune responses and cells involved, immunity and infection, tumor immunology, hypersensitivity reactions, autoimmunity and autoimmune diseases, immunodeficiency, transplantation and rejection, immunomodulation including vaccines with recent developments.

Clinical laboratory methods for detection of antigens and antibodies-

Precipitation reactions-immunodiffusion, immunoelectrophoresis,

Agglutination, complement fixation, neutralization.

Binder ligand assay- ELISA, RIA, Immunofluorescence, 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, Hepatitis 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

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 Haematology

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 Immunohaematology

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 & Complement
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 Instrumentation
Automation in Hematology, 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 management

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. Wintrob's 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

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References

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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)

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LIST OF TABLES
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1.

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1.

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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 of 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} .
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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 example, 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.
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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

Abbreviations 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.
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Gerald Collee J, Andrew G Fraser, Barrie P Marmion, Anthony Simmons, Mackie & McCartney Practical medical microbiology. New York: Churchill 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 authors)

Betty A Forbes, Daniel F Sahn, Alice S. Weissfeld. Bailey & Scott's Diagnostic Microbiology. 10th ed. Mosby: Elsevier; 2007.

Chapter in edited book

Leslie Collier, Albert Balows, Max 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-dimensional structure of Hepatitis B virus core particles determined by electron cryomicroscopy. J Biochem. 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.
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- 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>.

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Spacing

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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.

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