

SYLLABUS

for Courses affiliated to the

Kerala University of Health Sciences

Thrissur 680596



MASTER OF SCIENCE IN

MLT –

(BIOCHEMISTRY)

Course Code:289

(2024-25 Academic year onwards)

2. COURSE CONTENT

2.1 Title of course:

Name of the course shall be the ‘‘Master of Science in Medical Laboratory Technology-Biochemistry’’ (MSc MLT- Biochemistry)

2.2 Objectives the course

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. Set up 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..

2.3 Medium of instruction:

Medium of instruction shall be English

2.4 Course outline

The course of study ensures student's knowledge and skills in several major categorical of medical laboratory technology. The post graduate degree in medical laboratory technology provides specialised skills to practicing laboratory professionals in health administration, leadership, quality assurance, managements and health informatics. It is a two year professional post graduate Degree course comprising four papers in first year and two papers and dissertation in second year. Total course duration is 4500 hours including 200 hours of training in reputed external Hospitals/institutes. There will be minimum three internal examinations conducted by the Institutes/Colleges and one public examination at the end of each academic year conducted by the University.

2.5 Duration

Course of study including the dissertation work shall be for a period of two year with 365 days/year.

Week/Year	-	52 weeks
Leave	-	20days.
Examination	-	2 weeks
Total regular working hours /week	-	48 hours
Total working hours/year,	-	48hrs x 47 weeks=2250hours/year
Total hours for two years	-	4500 hours.

2.6 Subjects

Paper-I	General Biochemistry & Chemistry of Biomolecules
Paper-II	Enzymology, Metabolism & Inborn errors of metabolism
Paper- III	Vitamins & Hormones
Paper- IV	General Physiology, Nutrition & Mineral metabolism

Paper-V	Molecular Biology & Immunology
Paper-VI	Diagnostic Biochemistry, Recent advances in clinical chemistry and Biostatistics
	Dissertation

The concept of health care counseling shall be incorporated in all relevant areas.

2.7 Total number of hours

Week/Year	-	52 weeks
Leave	-	20 days.
Examination	-	2 weeks
Total weeks available	-	47 weeks
Total regular working hours /week	-	48 hours
Total working hours/year,	-	48 hrs x 47 weeks = 2250 hours/year
Total hours for two years	-	4500 hours

2.8 Branches if any with definition:

Not applicable

2.9 Teaching learning 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 Group discussions/ review clubs.
- 6 Tutorials for BSc MLT students

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.
- 3 Teaching programme; MScMLT students shall engage in teaching programmes of B.ScMLT/DMLT programmes. Each student should take minimum 10 theory classes and attend minimum 20 practical classes for BSc.MLT/DMLT students under the supervision of the concerned faculty members.

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 (Molecular biology, virology techniques, mycology technique, vaccine preparation , laboratory animal handling, Milk analysis, water analysis, updates in bacteriological laboratory) .

Qualification of teacher

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

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 8 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).

2.10 Content of each subject in each year.

MSc (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, spectrophotometers, fluorimetry, flame photometry, Atomic absorption spectrophotometry,osmometry, nephelometry.Chromatography, electrophoresis, electrochemistry, Biosensors, Chemiluminescence, Flow cytometry. Homogenization, celldisruption, 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 aminoacids and proteins, structure of proteins, amino acid sequencing of proteins, proteomics..

Carbohydrates: Classification, Chemistry, isomerism and properties.

Lipids: Classification, Chemistry, and properties.Liposomes,

Bio-membranes:Chemistry,structure,Transportprocessacrossbio-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, coenzymes, cofactors, mechanisms of enzyme action, factors affecting enzyme action, enzyme kinetics, enzyme inhibition, regulatory enzymes, enzyme immobilization, Clinical enzymology. Enzyme assay and units, Applications of Enzymology, isoenzymes and alloenzymes

Metabolism: Bioenergetics, free energy, biological oxidations, electron transport, oxidative phosphorylation.

Carbohydrate metabolism: glycolysis, gluconeogenesis, uronic acid pathway, Cori's cycle, TCA cycle, HMP pathway, Polyol pathway of glucose.

Glycogen metabolism, galactose metabolism, fructose metabolism, metabolism of alcohol, metabolism of amino sugars, Regulation of blood glucose.

Amino acid metabolism: Transamination, deamination, oxidative deamination, ammonia transport, urea formation. Intracellular protein degradation, one carbon metabolism, 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, regulation. Degradation of Purine and pyrimidine nucleotides.

Hemoglobin metabolism: Heme synthesis, formation of hemoglobin, Hemoglobin derivatives, abnormal hemoglobins and hemoglobinopathies, metabolism of bilirubin, urobilinogen, and other bile pigments.

Inborn errors of metabolism:

Inborn errors of carbohydrate, amino acid, lipid, Purine and pyrimidine, heme, hemoglobin 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/ Spingo myelin 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.

CSF analysis: Protein, glucose, chloride. Special tests for globulins, immunoglobulins and lactate.

Paper-III-Vitamins and Hormones

Vitamins: Classification of vitamins.

Chemistry, properties, biological importance metabolic functions and deficiency manifestations of fat soluble vitamins.

Chemistry, properties, biological importance, metabolic functions, deficiency manifestations and coenzyme functions of water soluble vitamins.

Hormones: Classification of hormones, mechanism of hormone action, regulation of hormone secretion, Hormone assays

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, nucleic acids.

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, Biotransformation, 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, diet for diabetic patients, diet of heart patients, obesity, Human microbiota and microbiome.

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. Inhibitors of DNA replication
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 tests, Intestinal function tests, Gastric function tests,

Thyroid function tests, Cardiac function tests, Feto-Placental function tests.

Water balance and Acid-base balance .Diagnostic tests for acid-base disorders .

Diseases of CNS Renal and pancreatic calculi.

Acute phase proteins:-Diagnosis and significance of C-reactive proteins, alpha fetoproteins, 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, antiHIV drugs, prevention, Biochemistry of ageing, Alzheimer's disease, Prions, Beta amyloid.

Biochemistry of COVID, Complications and laboratory diagnosis.

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: Electrochemistry, Mass Spectrometry, fluorimetry, Biosensors.

Automation in clinical chemistry.

Automatic Clinical Chemistry Analyzers,

comparative study of new generation automated clinical chemistry analyzers,
Point Of Care Test (POCT)

Bio statistics :

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, WH Freeman And Company, New York, USA, 2005
6. Textbook of Biochemistry by West and Todd, Fourth Edition, 1966
7. Textbook 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–Marshall
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, WH Freeman Company, USA (2000)
18. Essential Immunology: Ivan Roitt (Blackwell Science Publishers, UK, 1997)
19. A Hand Book of Practical Immunology: GPTalwar (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, specter photometry, fluorimetry,

flame photometry, atomic absorption spectroscopy, nephelometry, osmometry, chemiluminescence ,ion selective electrodes, flow cytometry.

Chromatography:-Paper, Thinlayer, Gelfiltration, Ionexchange, HPLC, GLC, Separation of various sugars, amino acids, lipids, drugs toxins etc.

Urine amino gram.

Electrophoresis:-Paper, Agarosegel, Celluloseacetate, PAGE, SDS-PAGE. Separation of serum proteins, lipoproteins, haemoglobin, globin chain and iso enzymes

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, phosphor lipids 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 Km and Vmax 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 glutamyl trans 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, Immuno fixation, Migration inhibition factor, ELISA,

Nephelometric immunoassays, Chemiluminescence immunoassays, Immuno fluorescence,

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 the body and detection of Toxins Collection and tabulation of data Graphical representation of data Correlation and regression analysis

Student's 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 (Black well Science Publishers, UK, 1997)
6. A Hand Book of Practical Immunology: GP Talwar (Vikas Publishing House, 1983)
7. Principles of Statistics.

<i>Paper</i>	<i>Subject</i>	<i>Theory hours</i>	<i>Practical hours</i>	<i>Clinical Laboratory Practice</i>	<i>Total hours</i>
FIRSTYEAR					
Paper-I	General Biochemistry & Chemistry of Biomolecules	100 hrs	600hrs	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	100 hrs			
	Dissertation				600 hrs
Total First and second year including dissertation					4500hrs

2.12 Practical training

As per “No. of hour’s per subject” above

2.13 Records:

To be maintained for all Practical Work

2.14. Dissertation:

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 MSc (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 dissertation

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

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.

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

2.15 Speciality training if any:

Specialty training is not applicable for MSCMLT Biochemistry.

2.16 Project work to be done if any;

No additional project work other than dissertation.

2.17 Any other requirements [CME, Paper Publishing etc.]

A minimum of 2 CME should be attended during the period of study.

2.18 Prescribed/recommended textbooks for each subject

As given under clause “Content of each subject in each year.”

2.19 Reference books

As given under clause “Content of each subject in each year.”

2.20 Journals

As given under clause “Content of each subject in each year.”

2.21 Logbook

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.

3. EXAMINATIONS

3.1 Eligibility to appear for exams [including Supplementary]

(a) Attendance and condonation option

All the candidates joining the postgraduate programme should have 80% attendance to appear the University examination.

No condonation option for MSc MLT course

(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 50%. 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.

3.2 Schedule of Regular/Supplementary exams

- **Theory Examination**

Duration of theory examination for all the papers will be three hours each.

Maximum marks of each paper shall be 100.

- **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.

- Supplementary Examination

No supplementary batch will be conducted for MSc (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.

Maximum number of attempts per subject is three inclusive of first attempt

3.3 Scheme of examination showing maximum marks and minimum marks

Scheme of evaluation

Evaluation system for MSc (MLT) Degree is Centralized double valuation by examiners of affiliated Colleges. The average of marks of the two valuations is taken as the mark of the theory paper. There will be third valuation if the average marks of first and second valuation is at or between 45% and 49% marks and the discrepancy of not less than 15% marks should undergo a third valuation, and the average of aggregate of the highest 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.

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 (Part I)	Paper-I		
	General Biochemistry & Chemistry of Biomolecules	100	50
	Theory Internal assessment	50	25
		150	75
	Paper-II		
	Enzymology ,Metabolism and Inborn errors of metabolism	100 50	50 25
	150	75	
	Paper- III		
	Vitamins & Hormones	100	50
	Theory Internal	150	75
	Paper- IV	100	50

	General Physiology, Nutrition & Mineral Metabolism	50	25
		150	75
	Practical	300	150
	Internal assessment	50	25
	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	25
		150	75
	Paper –VI		
	Diagnostic biochemistry, Recent advances in clinical chemistry and Biostatics,	100	50
		50	25
		150	75
	Practical	200	100
	Internal assessment	50	25
Viva voce	50		
Total	300	150	
Dissertation	400	200	
	TOTAL for PART II	1000	500
GRAND TOTAL (first & second year)		2000	1000

3.4 Papers in each year:

As per ("Papers in each year ") above

3.5 Details of theory exams

As per ("Papers in each year ") above

3.6 Model question paper for each subject with question paper pattern

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.

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.

MODEL QUESTIONS

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

PAPER - I GENERAL BIOCHEMISTRY & 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 fibrous proteins?
6. Draw the chemical structure of purines and pyrimidines 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 UNIVERSITY OF 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 Lineweaver- 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) Prostaglandins
 - (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 UNIVERSITY OF 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 riboflavin.
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 UNIVERSITY OF 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 UNIVERSITY OF 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 UNIVERSITY OF 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.

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. Chemiluminescence assay
10. Methods of assessing analytical sensitivity, specificity and standardization

QP Code:

Reg. No.:.....

Second Year M.Sc MLT Degree Examination (Biochemistry)

(Model Question Paper)

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

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

3.7 Internal assessment component

As mentioned in item “Eligibility to appear for exams “

3.8 Details of practical/clinical practicum

As per (“Papers in each year “) above

3.9 Number of examiners needed (Internal & External) and their qualifications

External Examiners-

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

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.

3.10 Details of viva:

As per (“Papers in each year “) above

4. INTERNSHIP

4.1 Eligibility for internship

The students shall do One year internship/service after successful completion of the course as per the Govt. norms.

4.2 Details of internship Training

Duration: The students shall do One year internship/service after successful completion of the course as per the Govt. norms.

Internship posting: Internship posting will be on rotation

Maintenance of records by students: A practical should be maintained

4.3 Model of Internship Mark lists

Internship completion certificate:

It will be decided by KUHS when the internship is implemented by the Govt.

- a. ***Extension of internship:*** Internship shall be extended by the number of days the students remains absent. These extended days of Internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal.

4.4 Extension rules:

Any other leave other than eligible leave has to be compensated by extension granted by the Principal. However the course shall be completed within double the duration of the course.

4.5 Details of Training given

Tutorials in Lecture and practical classes

Regular clinical Laboratory practice to ensure practical skill in diagnostic investigations, laboratory responsibility, quality evaluations, managements and supervision.

Students should present seminars in various clinical subjects in medical laboratory technology to attain presentation skill.

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution

5.2 Any detils which are not mentioned in the above will be decided by the KUHS after considering the KUHS ACT and Statues, Governing Council decisions, Guidelines of the respective Councils, the government and directives of the Hon'ble Courts.

Annexure-I

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:
6	Present Residential Address

6. QUALIFICATION:

(Attested Xerox copies of all the certificates to be enclosed)

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

7. Teaching Experience

Designation	Name of the Institution	Duration of teaching		Subject / „s taught
		UG	PG	

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 f o r 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-II

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:

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

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.

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 MSc (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

In partial fulfillment
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

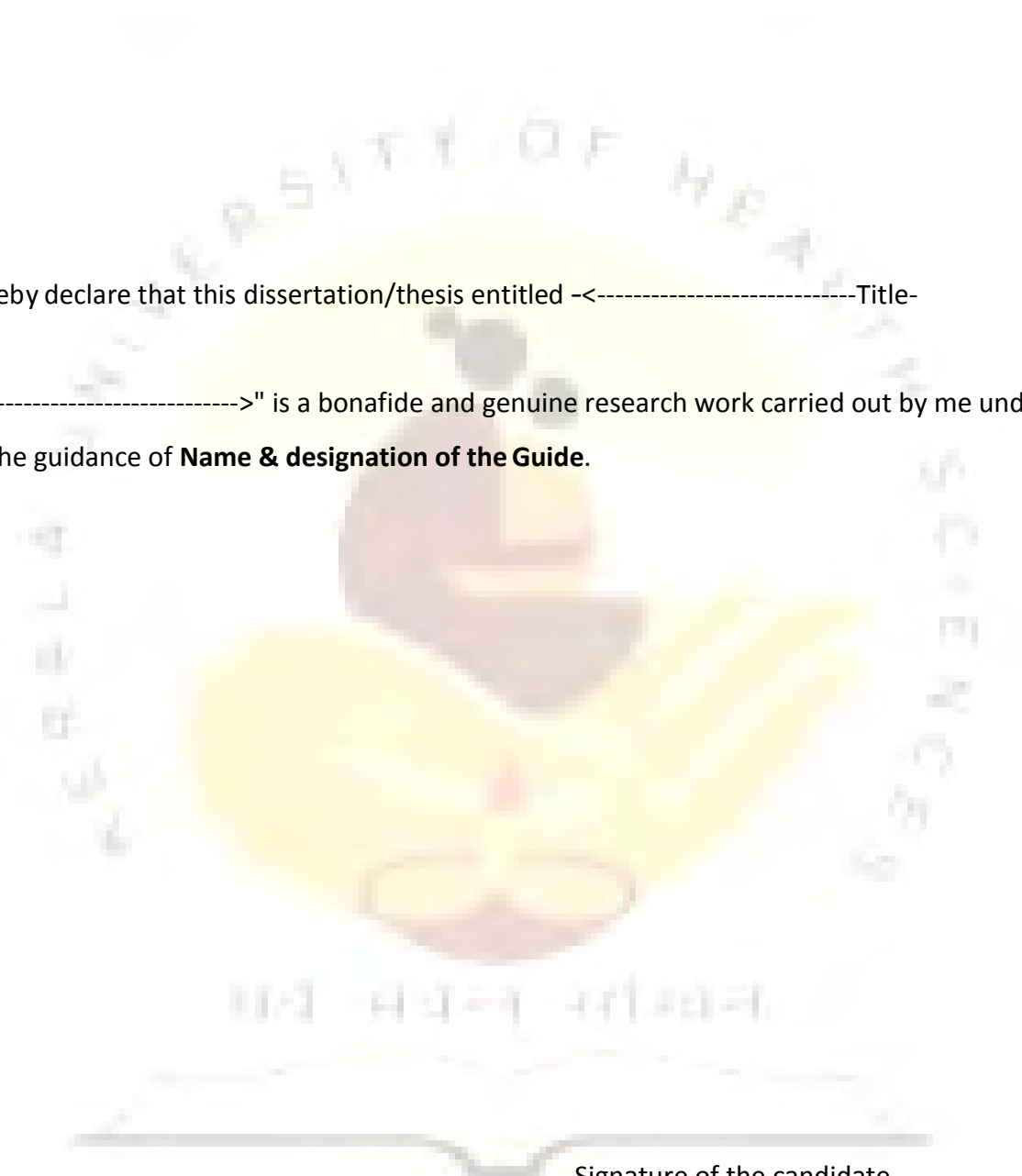
Year



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

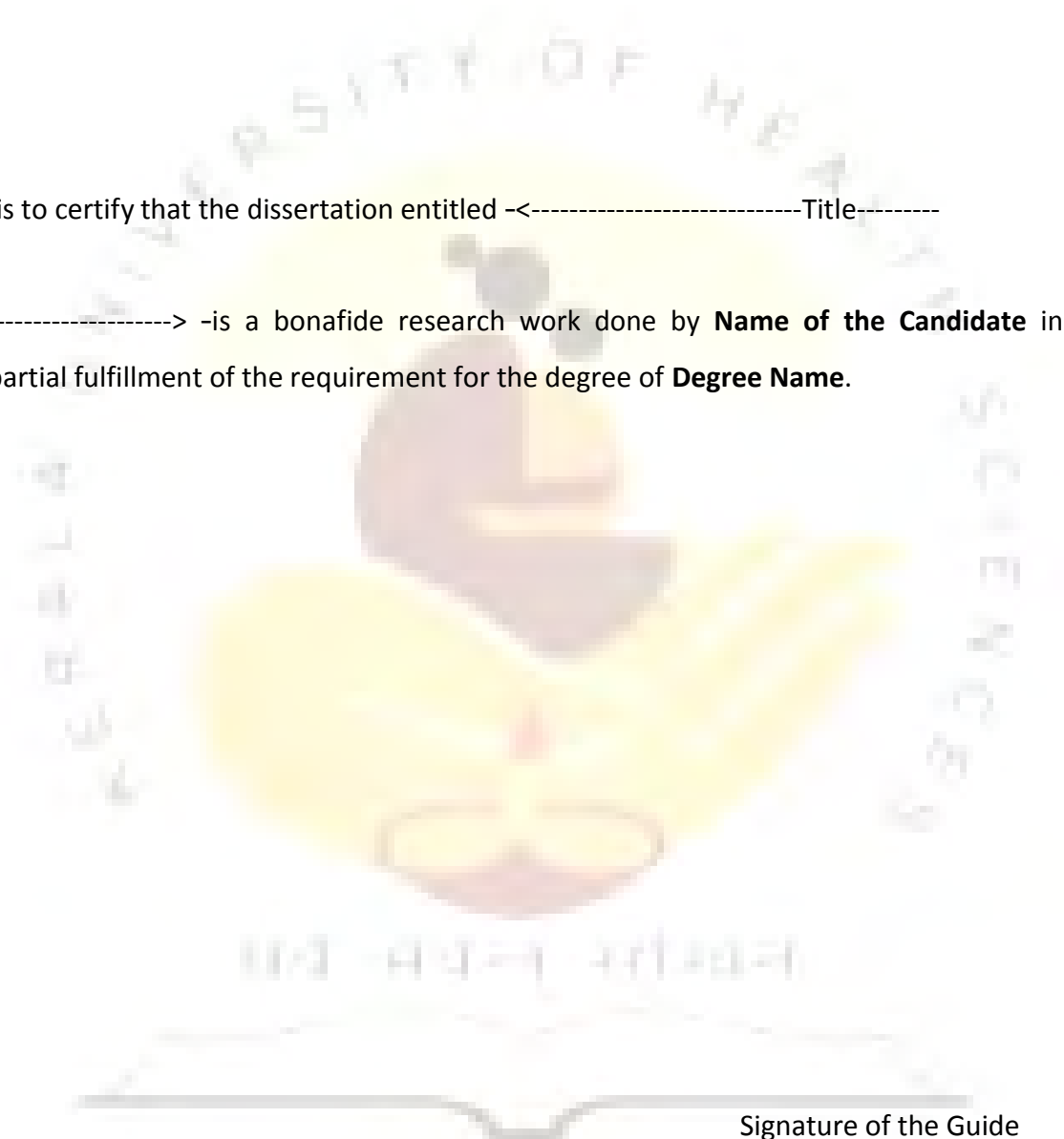
Place:

Date :

CERTIFICATE BY THE GUIDE

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

-----> -is a bonafide research work done by **Name of the Candidate** in partial fulfillment of the requirement for the degree of **Degree Name**.



Signature of the Guide

Place

Date :

Name and Designation

ENDORSEMENT BY THE HOD, PRINCIPAL/HEAD OF THE INSTITUTION

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

----- is a bonafide research work done by **Name of the Candidate** partial fulfillment of the requirement for the degree of **Degree Name**.

Seal & Signature of the HOD

Seal & Signature of the Principal

Name

Name

Place:

Place:

Date:

Date:

COPYRIGHT

Declaration by the Candidate

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.

Date :

Signature of the candidate

Place:

Name

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
iii. List of Graphics	iii

1. Introduction Page No.

2. Objectives Page No.

3. Review of Literature Page No.

4. Methodology Page No.

5. Results Page No.

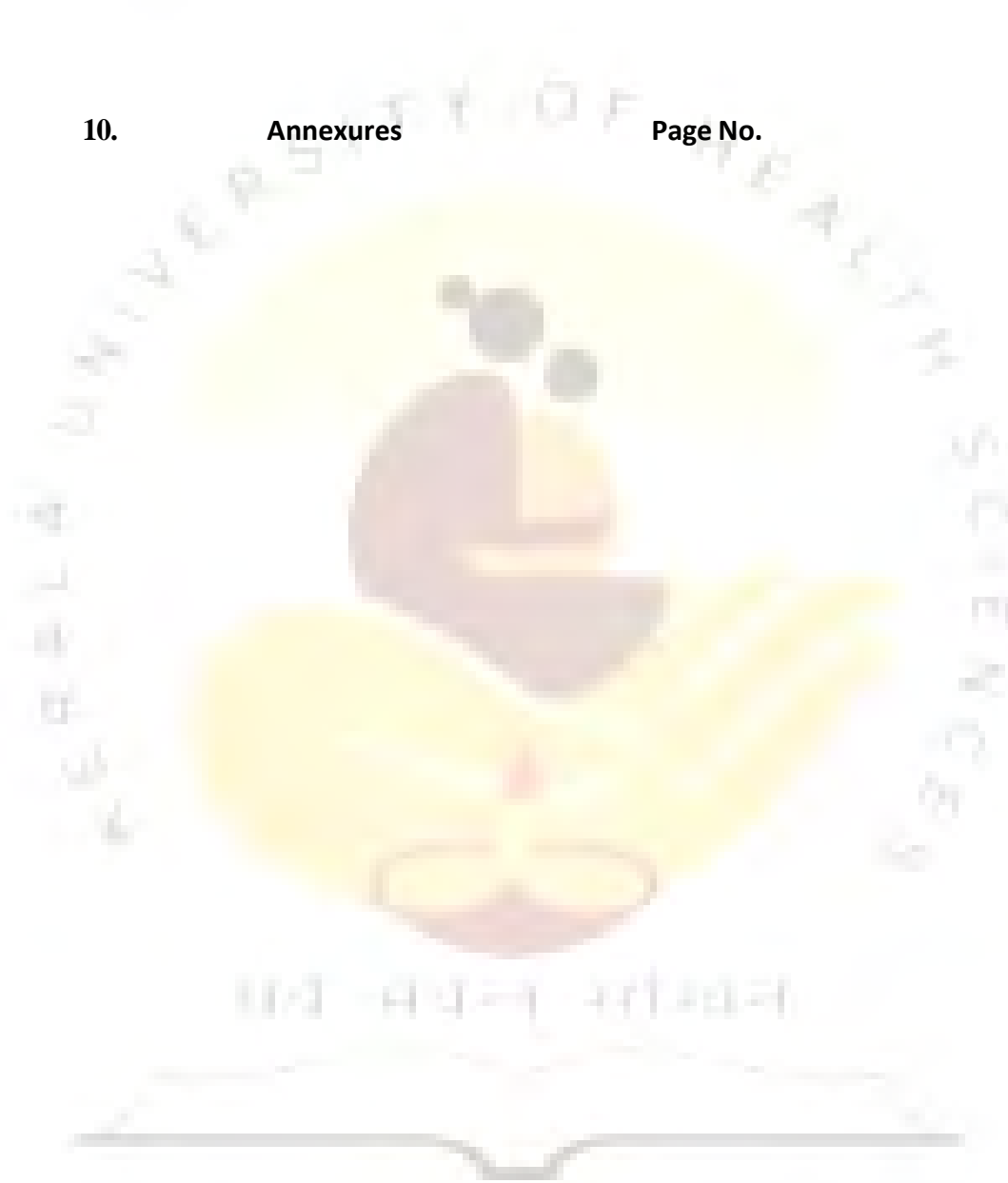
6. Discussion Page No.

7. Conclusion Page No.

8. Summary Page No.

9. References Page No.

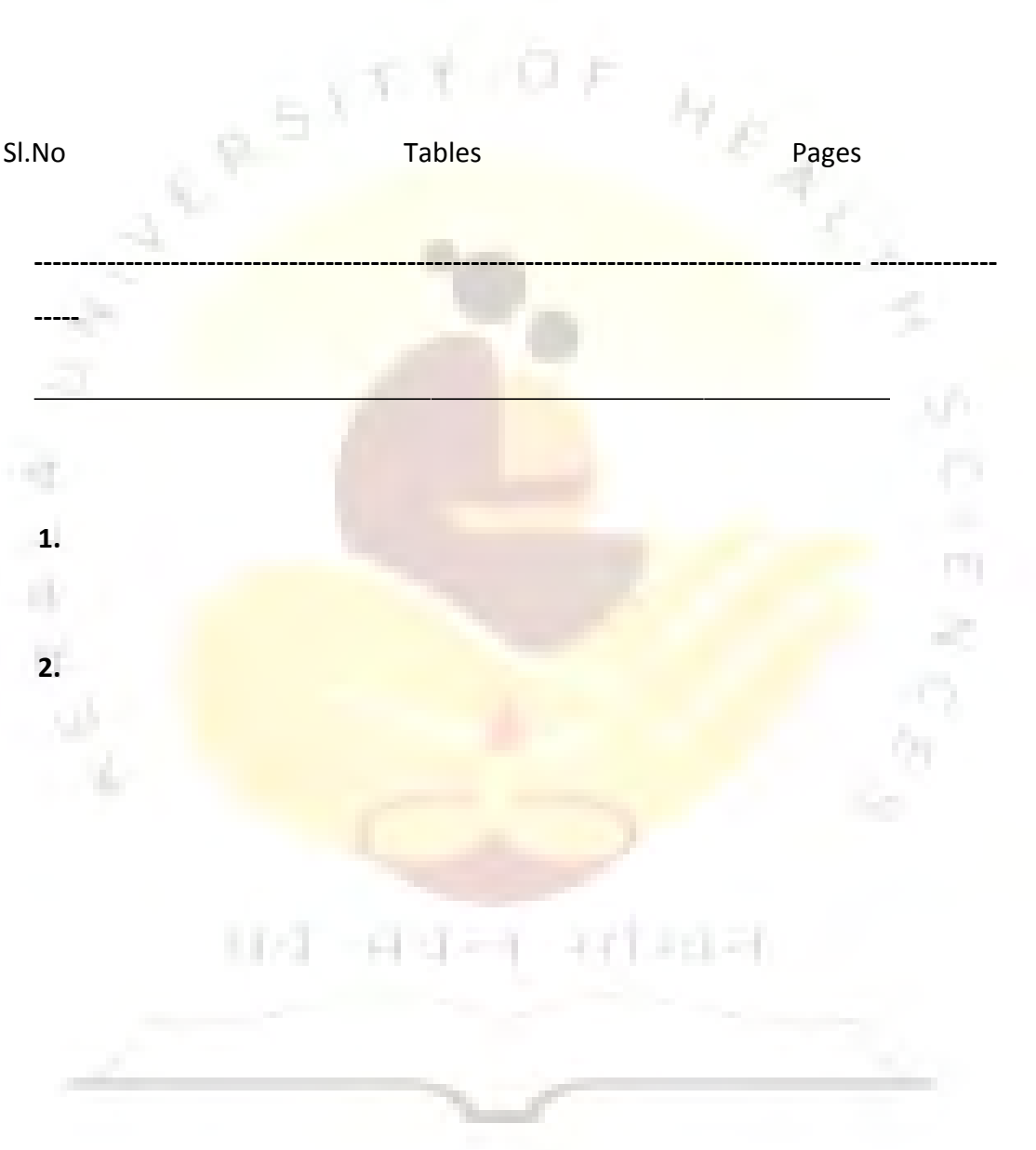
10. Annexures Page No.



LIST OF TABLES

(14 size bold)

Sl.No	Tables	Pages
1.		
2.		



UNIVERSITY OF HEALTH SCIENCES
विद्यया चिकित्सा

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

The logo of the University of Kashmir is a circular emblem. It features a central lamp with a flame, set against a background of a book. The lamp is flanked by two hands, one holding the lamp and the other holding a pen. The entire emblem is surrounded by the text 'UNIVERSITY OF KASHMIR' at the top and 'SHEENOG' at the bottom. The text is in a serif font and is slightly faded.

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)

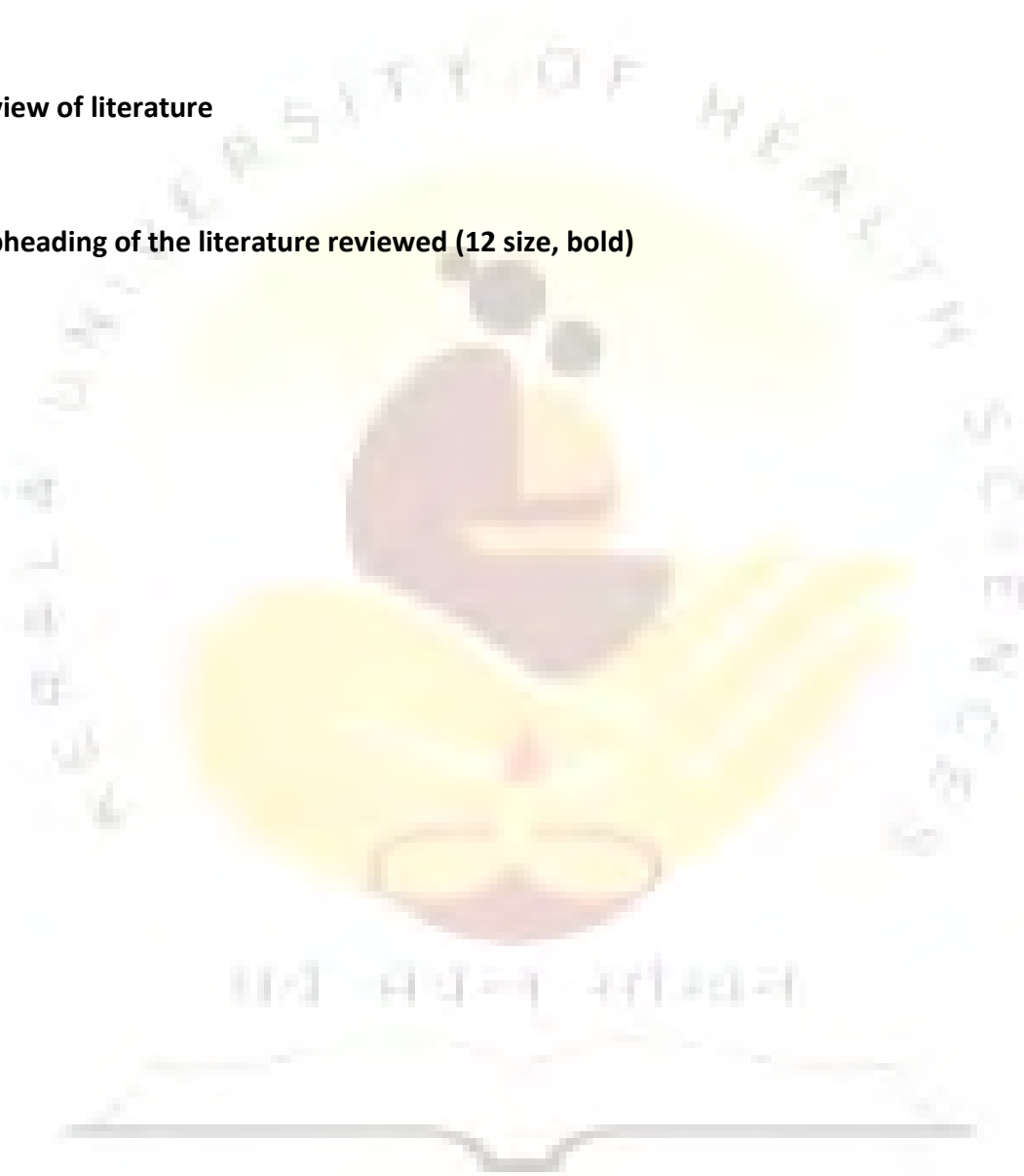
Hypothesis (write research hypothesis)

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} .
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 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 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.

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 numerical 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

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.
- 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 booktitle.
- Initials follow the family names of authors and editors, with no space or full stops between the initials 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 & 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 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 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.
- 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 font 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. 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 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 format),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.

5.3 Template for Mark List showing Maximum & Minimum

First Year M.Sc. MLT Biochemistry Exam

Sl.No	Subject		Theory			Practical			Total			Result	
	Paper		Max	Min	Awarded	Max	Min	Awarded	Max	Min	Awarded		
1	General Biochemistry	IA	50	20		-	-	-	150	75			
		University	100	50		-	-	-					
	& Chemistry of Biomolecules		Viva	-	-		-	-					-
	Group		150	75		-	-	-					

		Total										
2	Enzymology, Metabolism And Inborn Errors Of Metabolism	IA	50	20		-	-	-	150	75		
		University	100	50		-	-	-				
		Viva	-	-		-	-	-				
		Group Total	150	75		-	-	-				
3	Vitamins & Hormones	IA	50	20		-	-	-	150	75		
		University	100	50		-	-	-				
		Viva	-	-		-	-	-				
		Group Total	150	75		-	-	-				
4	General Physiology, Nutrition & Mineral Metabolism	IA	50	20		-	-	-	150	75		
		University	100	50		-	-	-				
		Viva	-	-		-	-	-				

		Group Total	150	75	-	-	-				
5	Biochemistry Practical	IA	-	-	-	50	20		400	200	
		University	-	-	-	300	150				
		Viva	-	-	-	50	-				
		Group Total	-	-	-	400	200				
Grand Total									1000	500	
(Grand Total in Words)											

Second Year M.Sc. MLT Biochemistry Exam

Sl. No.	Subjects Paper	Theory			Practical			Total			Result
		Max	Min	Award	Max	Min	Award	Max	Min	Award	
1	Molecular Biology & Immunology	IA	50	20		-	-	-	150	75	
		University	100	50		-	-	-			
		Viva	-	-		-	-	-			
		Group	150	75		-	-	-			

		Total									
2	Diagnostic	IA	50	20		-	-	-	150	75	
	Biochemistry,	University	100	50		-	-	-			
	Recent										
	Advances in										
	Clinical	Viva	-	-		-	-	-			
Chemistry &	Group										
Biostatics	Total	150	75		-	-	-				
3	Biochemistry - Practical	IA	-	-	-	50	20		300	150	
		University	-	-	-	200	100				
		Viva	-	-	-	50	-				
		Group									
		Total	-	-	-	300	150				
4	Dissertation	IA	-	-	-	50	-		400	200	
		University	-	-	-	350	-				
		Viva	-	-	-	-	-	-			
		Group									
		Total	-	-	-	400	200				
GRAND TOTAL									1000	500	
(Grand Total in Words)											