Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore

The Emblem

The Emblem of the Rajiv Gandhi University of Health Sciences is a symbolic expression of the confluence of both Eastern and Western Health Sciences. A central wand with entwined snakes symbolises Greek and Roman Gods of Health called Hermis and Mercury is adapted as symbol of modern medical science. The pot above depicts Amrutha Kalasham of Dhanvanthri the father of all Health Sciences. The wings above it depicts Human Soul called Hamsa (Swan) in Indian philosophy. The rising Sun at the top symbolises knowledge and enlightenment. The two twigs of leaves in western philosophy symbolises Olive branches, which is an expression of Peace, Love and Harmony. In Hindu Philosophy it depicts the Vanaspathi (also called as Oushadi) held in the hands of Dhanvanthri, which are the source of all Medicines. The lamp at the bottom depicts human energy (kundalini). The script "Devahitham Yadayahu" inside the lamp is taken from Upanishath Shanthi Manthram (Bhadram Karnebhi Shrunuyanadev…), which says "May we live the full span of our lives allotted by God in perfect health" which is the motto of the Rajiv Gandhi University of Health Sciences.

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES

Ordinance Governing

M.Sc. MLT COURSE

Regulations and Curriculum - 2006

RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES KARNATAKA

4th 'T' Block, Jayanagar, Bangalore 560041

Ordinance Governing

M. Sc. MLT Course

Regulations and Curriculum - 2006

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CONTENTS

CONTENTS

Rajiv Gandhi University of Health Sciences, Karnataka
ರಾಜೀವ್ ಗಾಂಧಿ ಆರೋಗ್ಯ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕರ್ನಾಟಕ

Ref.: UA/SYN/ORD-M-Sc.MLT/38/2006-2007 Date : 02/04/2007

NOTIFICATION

Sub: Ordinance Governing 1st year M.Sc. Medical Laboratory Technology course Regulations and curriculum 2006.

Ref: Minutes of the Syndicate meeting held on 16/03/2007.

In exercise of the powers conferred under section 13(2) of RGUHS Act 1994, the Syndicate at its meeting held on 16/03/2007, has been decided to please to notify the Ordinance relating to 1st year M.Sc. Medical Laboratory Technology Course Regulation and Curriculum 2006 as per the schedule annexed.

The above Ordinance relating to 1st year M.Sc. Medical Laboratory Technology course 2006 shall come into force the Academic year 2006-2007.

By Order,

Sd/-
REGISTRAR

To
The Principals of all colleges of RGUHS (offering M.Sc. MLT course)

Copy to :
1. The Secretary to Governor, Governor's Secretariat, Raj Bhavan, Bangalore - 500001.
2. The Secretary to Government, Health and Family Welfare Department, (Medical Education), Vikasa Soudha, Dr. B. R. Ambedkar Veedhi, Bangalore - 560001.
3. All Members of Syndicate of RGUHS.
4. PA to VC/Registrar / Registrar (Evaluation) / Finance Officer.
5. Director, C.D.C. of the University.
6. Deputy Registrar, Admission / Affiliation / Examination / Evaluation.
7. All Officers of the University.
8. Public Information Officer.
9. Office Copy / Guard File.

SECTION I

REGULATIONS GOVERNING M.Sc. MLT COURSE

1. Title of the Courses

Master of Science in Medical Laboratory Technology Course is available in the following three specialties:

a. M.Sc. Clinical Biochemistry
b. M.Sc. Microbiology &Immunology
c. M.Sc. Haematology & Blood Transfusion

2. Duration of the Course:

The duration of the Master's Degree in Medical Laboratory technology including submission of project work on the topic registered shall be for a period of two years from the commencement of the academic term on full time basis.

3. Eligibility for Admission

a. The students who have passed B.Sc. MLT Course from Institutions affliated to RGUHS are eligible for this course.

b. Students who have passed B.Sc MLT course from other Universities considered equivalent by RGUHS are eligible for this course.

c. Candidates passing B.Sc MLT through Correspondence course shall not be eligible

4. Selection Criteria

Selection shall be based on merit in the qualifying examination.

5. Eligibility certificate:

No candidate shall be admitted for the postgraduate degree course unless the candidate has obtained and produced the eligibility certificate issued by the university. The candidate has to make the application to the university with the following documents along with the prescribed fee.

Pass / degree certificate issued by the university.
Marks cards of all the university examinations passed.

Migration certificate.
Certificate of conduct.
Proof of SC/ST or category I as the case may be

Candidates should obtain the eligibility certificate before the last date for admission as notified by the university.

A candidate who has been admitted to post-graduate course should register his/her name in the university within a month of admission after paying the registration fee.

6. Medium of instruction

English is the medium of instruction for the subjects of study as well as for the examination.

7. Course of study

There are three specialties in M.Sc MLT course. Both main & subsidiary subjects in first year shall be common to all the three specialties. In the second year the student will study subject of his/ her specialization.

Subjects for study in 1st year M.Sc MLT course are shown in Table - I .

Table - I Distribution of teaching hours in 1st year M.Sc MLT subjects

Sl.No.	Main Subjects	Theory No. of hours	Practical No. of hours	Total
1.	Biochemistry	150	250	400
2.	Clinical Pathology&Haematology	80	100	180
	Immunopathology	40	100	140
3.	General Microbiology and Immunology	60	100	160
	and Immunological Techniques	60	100	160
	Total	**390**	**650**	**1040**

Sl.No.	Subsidary Subjects	Theory No. of hours	Practical No. of hours	Total
1.	Biochemistry	30	20	50

Subjects of specialization & hours of teaching for 2nd year M.Sc MLT course are shown in

Table - II.

Table- II Distribution of teaching hours in 2nd year M.Sc MLT subjects of specialization

Sl.No.	Subsidary Subjects	Theory No. of hours	Practical No. of hours	Total
1.	Biochemistry	360	720	1080
1.	Clinical Pathology&Haematology	360	720	1080
1.	General Microbiology and Immunology	360	720	1080

8. Attendance

Every candidate should have attended at least 80% of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year separately in theory and practical .Only such candidates are eligible to appear for the university examinations in their first attempt.Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility.

A candidate lacking in prescribed percentage of attendance in any one or more subjects either in Theory or Practical in the first appearance will not be eligible to appear for the University Examination either in one or more subjects .

9. Monitoring Progress of Studies

Work Diary/Log Book- Every candidate shall maintain a work diary and record his/her participation in the training programmes- Field work, Clinical work, Seminars, Field work records and Case records etc. (Refer section III for model check lists and log book copy). Special mention may be made of the presentations by the candidate as well as details of Field/Clinical work conducted by the candidate. The work diary shall be scrutinized and certified by the concerned faculty members.

Periodic Tests: The College shall conduct three tests each in First and Second year for Internal Assessment. The Third test shall be conducted one month prior to the annual university examination so that it also serves the purpose of preparatory examination. These tests will be considered for internal assessment.

Records: Records and marks obtained in tests will be maintained by the college and made available to the university.

10. Dissertation/Research project

Each candidate pursuing M.Sc. MLT Course is required to carry out work on selected research project under the guidance of a recognized post graduate teacher. The results of such a work shall be submitted in the form of dissertation/ research project.

The dissertation/ research project is aimed to train a graduate student in research methods and techniques. It includes identification of problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, interpretation of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed Performa, a synopsis containing particulars of proposed dissertation/ research project work within six 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 University will register the dissertation/ research project topic. No change in the dissertation topic/ research project or guide shall be made without prior approval of the University.

The dissertation/ research project should be written under the following headings:
Introduction
Aims or objectives of study
Review of literature
Material and methods
Results
Discussion
Conclusion
Summary
References
Tables
Annexure

The written text of dissertation/ research project shall not be less than 50 pages and shall not exceed 100 pages excluding references, tables, questionnaires and other annexure. It should be neatly typed in double line spacing on one side of paper (A4 size, 8.27" x 11.69") and bound properly. Spiral binding should be avoided. A declaration by the candidate for having done the work should also be included, and the guide, head of the department and head of the institution shall certify the dissertation/ research project.

Four copies of Dissertation/ research project shall be submitted to the university, through proper channel, along with a soft copy (CD), 6 months before the final examination. It shall be assessed by two examiners appointed by the university, one internal and one external. No marks shall be awarded for Dissertation/ research project. Acceptance of the dissertation/ research project is a pre-requisite for a candidate to be permitted to appear for final examination. If there are corrections in the dissertation / research project suggested by the examiner(s), the candidate may make such corrections and may be allowed to re-submit in time and if approved can appear for the examination.

11. Guide

The academic qualification and teaching experience required for recognition as Guides by the

University are:

a. M.D. in Biochemistry/M.Sc in Clinical Biochemistry[Medical] and three years teaching experience after the PG qualification in a recognized Institution, or Ph.D. in Medical Biochemistry /Clinical Biochemistry/Clinical Research with teaching experience of at least two years in a recognized institution, or M.Phil. in ClinicalBiochemistry with five years of teaching experience after M.Phil. qualification from a recognized institution, or M.Sc. MLT with five years of teaching experience after the postgraduate qualification in a recognized Institution.

The age of guide/teacher shall not exceed 63 years.

The guide student ratio shall be 1:5.

Relaxation criteria: In view of acute shortage of teachers in this new specialty, those having three years full time teaching experience, after post graduation, may be considered as PG teachers. They may be permitted to be guides and examiners for the next three-years from the time of this notification. Similarly, persons aged more than 63 years may be considered as eligible to guide at the discretion of the University for at least three more years from the time of this notification.

Eligibility for guide for each speciality

Full time faculty involved in teaching in the same college/institution
MD - in respective subjects -8yrs experience after MD.

M.Sc. - in respective subjects (only Medical Microbiology/Medical biochemistry degrees acceptable with minimum 8 yrs experience
Student : Guide ratio - 5:1.

12. Schedule of examination

a. University Examination will be held in two parts - Part I and Part II, at the end of I year and at the end of II year respectively. Candidates will not be allowed to take the Part II examination unless he/she has passed all papers of the Part I examination. The prescribed examination fee as laid down by the University from time to time for each entry to Part I and Part II examination shall be paid.

b. The University examination will be conducted at the end of each year on a date notified by the university from time to time. Not more than two examinations shall be conducted in an academic year.

c. Failed candidates may appear in the subsequent examination after paying the required fee.

d. Carry over: A candidate who has appeared in all the subjects of I year in the university examination is eligible to go to 2nd year provided he/she has passed in any two subjects. However the candidate has to pass in the failed subjects to become eligible to appear for 2nd year university examination.

A failed candidate in any subject has to appear for both theory and practical examination in the subsequent examination.

A candidate is permitted not more than four attempts (actual appearance) to clear the first year or pass the first year examination within three academic years, from the year of admission, whichever is earlier. A candidate will not be allowed to continue the course if he/she fails to comply with the above stipulation.

The number of examiners for clinical and viva-voce shall be two, comprising of one internal and one external examiner.

13. Scheme of examination

a. Internal Assessment

1. Internal Assessment marks shall be awarded to the candidates in each paper as detailed in the scheme of examination.. The marks secured by the candidates in each subject shall be forwarded to the University 15 days before the University Examinations.

2. The marks of the internal assessment must be published on the notice board of the respective colleges.

3. If a candidate is absent from the test due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

   There shall be minimum of two internal assessment examination in 1st year & subject of specialty in 2nd year conducted by the colleges at regular intervals both in theory & practical which includes seminars. The average of best two examination Marks shall be taken into consideration by calculating marks for the internal assessment.

b. University examination

The University conducts two examinations in a year at an interval not less than four to six months.

i. First year M.Sc MLT
Both the main and subsidiary subjects for M.Sc. MLT course will be common in the first year.

i. Written examination : - Written examination shall consist of three theory papers each of three hours duration. Each paper shall carry 100 marks.

ii. Practical examination : -
There shall be one practical examination in each of first year subject. The duration of each practical examination is of three hours which carries 100 marks.

iii. Viva- voce : - This shall aim at assessing depth of knowledge, logical reasoning, confidence & oral communication skills. Total marks shall be 30. Both internal & external examiners shall

conduct the viva- voce.

The particulars of subjects for examination and distribution of marks are shown in the Table -III

Sl. No.		Biochemistry	Haematology & Blood Transfusion	Microbiology
A. 1.	Theory Written paper No of papers and maximum marks for each paper	One 1x100	One 1x100	One 1x100
2.	Internal Assessment [Theory]	20	20	20
	Total Theory	120	120	120
B. 1.	PRACTICAL Practical	100	100	100
2.	Viva -Voce	30	30	30
3.	Internal assessment	20	20	20
4.	* Record	30	30	30
	Total Practicals	180	180	180
	Grand Total	**300**	**300**	**300**

*Records -To be assessed by the external examiners during University Practical examination.

Subsidiary subject for Ist year M.Sc. MLT: -

** Biostatatics: Theory 100 marks
Pass Percentage 35
**Examination to be conducted by respective colleges

ii. Second year M.Sc MLT

In the second year the student will appear for the examination in the subject of his/ her specialization.

i. **Written examination :** Written examination shall consists of two theory papers in his/her specialization & each of three hours duration. Each paper shall carry 100 marks.

ii. **Practical examination :** There shall be one practical examination in each of the specialization subject of 2nd year M.Sc MLT course. The duration of each practical examination is of three hours which carries 100 marks.

iii. **Viva- voce :** This shall aim at assessing depth of knowledge, logical reasoning, confidence & oral communication skills. Total marks shall be 40. Both internal & external examiners shall conduct the viva- voce.

The particulars of subjects for examination and distribution of marks are shown in the Table -IV

Table-1V Examination and Distribution of marks for Subjects of Specialization in Second year M.Sc MLT course.

Sl. No.		Biochemistry	Haematology & Blood Transfusion	Microbiology
A. 1.	Theory Written paper No of papers and maximum marks for each paper	Two 2x100	Two 2x100	Two 2x100
2.	Internal Assessment [Theory]	20	20	20
	Total Theory	220	220	220
B. 1.	PRACTICAL Practical	100	100	100
2.	Viva -Voce	40	40	40
3.	Internal assessment	20	20	20
4.	* Record	20	20	20
	Total Practicals	180	180	180
	Grand Total	**400**	**400**	**400**

*Records -To be assessed by the external examiners during University Practical examination.

14. Eligibility for the examination

a. A candidate shall register for all the subjects of a year when he/she appears for the examination of that year for the first time.

b. A candidate shall not be admitted to the practical examinations for the first time unless he/she produces the class record book certified by the Head of the Department. At subsequent practical, the marks awarded for the class records at the first appearance in that subjects will be taken for declaration of results.

15. Pass criteria

Theory 50%, which includes marks, obtained in written examination and internal assessment.

Practical 50% which includes marks obtained in practical examination, viva-voce, internal assessment and records.

A candidate has to pass in theory and practical separately to pass in a subject in the university examination.

SECTION II

GOALS AND OBJECTIVES

1. Goals:

The goals of postgraduate training in various specialties in M.Sc MLT are to train graduates who will:

- Practice respective specialty efficiently and effectively, backed by scientific knowledge and skill.
- Exercise empathy and a caring attitude and maintain high ethical standards.
- Continue to evince keen interest in continuing professional development in the specialty and allied specialties irrespective of whether in teaching or practice.
- Willing to share the knowledge and skills with any learner, junior or a colleague.
- To develop faculty for critical analysis and evaluation of various concepts and views & to adopt most rational approach.

2. Objectives:

The objective is to train a candidate so as to ensure higher competence in both general and special area of interest and prepare him/her for a career in teaching, research and specialty practice. A candidate must achieve a high degree of professional proficiency in the subject matter and develop competence in research and its methodology as related to the field concerned.

The above objectives are to be achieved by the time the candidate completes the course. The objectives may be considered as under -

1. Knowledge (Cognitive domain)
2. Skills (Psycho motor domain)
3. Human values, ethical practice and communication abilities (affective domain)

2.1 Knowledge:

- Demonstrate understanding of basic sciences relevant to specialty.
- Acquire the detailed knowledge about the fundamentals and advances of the respective specialty.
- Update knowledge by self-study and by attending courses, conferences and seminars relevant to specialty.

- Undertake audit, use information and carryout research both basic and professional with the aim of publishing or presenting the work at various scientific gatherings.

2.2 Skills :

Acquire adequate skills and competence in performing various tasks as required in the specialty.

2.3 Human values, ethical practice and communication abilities:

- Adopt ethical principles in all aspects of the professional practice.
- Foster professional honesty and integrity
- Discharge the duties irrespective of social status, caste, creed or religion of the customer/client.
- Develop oral and written communication skills.
- Provide leadership and get the best out of his or her team in a congenial working atmosphere.
- Apply high moral and ethical standards while carrying out human or animal research.

Be humble and accept the limitations in his or her knowledge and skill and to ask for help from colleagues when needed.

SECTION *III*

COURSE DESCRIPTION

A. Minimum requirment of infrastructure, staff, laboratory facilities for M.Sc. MLT course

1. Basic Infrasructure applicable to all three specialities:

1. Institute should have its own Hospital with full fledged Clinical Laloratory or its own diagnostic centre or own independent Clinical laboratory provided the above mentioned facilities fullfill the minimum work load criteria for each of the subject speciality mentiond here under.

Basic Laboratories:

1. Three labs with area of 800sq.ft each
2. One lab for Immunopathology 10x10 sqft Electricity with back-up
3. One class room with capacity for 30 students measuring 500sq.ft.
4. One departmental Seminar room measuring 250sq.ft for each specilaty with A. V aids - OHP,Slide projector and computer with accessories are compulsory.
   LCD Projector (optional)
   Other infrastructure criteria- Principals room, students common room, staffroom, Library, office room, Store room, preparation room etc will be as per minimum criteria. Norms of B.Sc MLT course.

II. Infrastructure subject wise:
Biochemistry
a. Laboratory equipments

1. Chemical Balance/single Pan Balance
2. Coloriemeter
3. Spectro Photometer
4. Flame Photometer/ ISE Electrolyte analyser
5. pH meter
6. Chromatography instruments
7. Electrophoresis unitG
8. Semi auto analyser
9. Auto analyser
10. Electro Chemiluminescence / Drug and Harmone analyser (optional)
11. Blood gas analyser
12. Refrigerator

Apart from the above mentioned equipements ,necessary glass ware, kits, chemicals, as per the syllabus requiremnts should be made available in adequate quantity.

b. Minumum work load criteria for conducting M.Sc MLT.in Clinical Biochemistry.

100 different bio-chemical tests per day [Routine and special tests]

Infrasctructure - Microbiology

a. Laboratory equipments

1. Auto clave
2. Hot air oven
3. Incubator
4. Centrifuge
5. Water distillation/Purification unit
6. PHmeter
7. B.O.D. Incubator
8. Physical Balance
9. Digital Balance
10. Refrigerator
11. Microscope
    - Monocular 10
    - Binocular - 5
    - Dark field Microscope - 1
    - Fluroscent microscope - 1
12. ELISA reader
13. Electrophoresis unit
14. Anaerobic Jar
15. Micropipettes
16. Pressure cooker
17. Laminar air flow
18. Water bath
19. VDRL shaker
20. Deep freezer - 1

Apart from the above mentioned equipments necessary glassware, kits, chemicals as per the syllabus requirements should be made available in adequate quantity

b. Minimum work load criteria for conducting M.Sc MLT course in Microbiology and Immunology

100 different types of samples per day including serological tests

i. Serological tests - 50/day
ii. Cultures - 20/day

INFRASTUCTURE -HAEMOTOLOGY

a. List of Equipments [Haematology]

Name of the Equipment

1. Blood cell counter -	1
2. Coagulometer	1
3. Spectrophotometer	1
4. Refrigerator - 165 lit	2
5. Hot air oven	2
6. Electronic Balance (Libror)	1
7. Water bath	1
8. Distilled water unit	1
8. Centrifuges	2
9. QBC RM12C	1
I. Becton Dickinson Illuminator	1
ii. Centrifuge - Vanguard V6500 1 6cups [Roche Biomedical Lab]	
iii. Centrifuge - Lab Corp. of America 6cups [110v supply]	1
10. Hb Electrophoresis Machine (Tank, Scanner, monitor Printer, CPU)	1
11. ELISA reader	1
12. pH meter	1
13. Autoclave	1
14. Microscope - Binocular	10 [One for each Student]

15. Haemocytometer	One per student
10. Westergren pipette	One per student
11. D C counter	One per student
12. Calorimeter	1
13. Urinometer	1
14. Albuminometer	1

Apart from the above mentioned equipments necessary glassware, chemicals,kits, should be made available in adequate quantity.

b. Minimum work load criteria for conducting M.Sc MLT course- Haematology

100 samples per day Haematology Including Clinical Pathology samples
Haematology samples should include following Special type of investigations

1. Haemolytic work up
2. Coagulation work up
3. Thrombotic work up

4. Bone marrow Aspiration and Trephine biopsy.

BLOOD TRANSFUSION

INFRASTUCTURE - College/Institute should have its own Licenced Blood Bank and should be as per the guide lines laid down by the drug controller.

a. List of Equipments -Blood Bank

Name of the Equipment

1.	Blood Bank Refrigerator		2
2.	Domestic Refrigerator		1
3.	Centrifuge - 16 tube capacity		1
	8 tube capacity		1
4.	Water bath		1
5.	Thawing bath		1
6.	Microscope		1
7.	Photoelectric Colorimeter		1
8.	view box		1
9.	Weighing Machine		1
10.	Hot air Oven		1
11.	Elisa Reader with washer		1
12.	VDRL Rotator		1
13.	Donor cots with mattress and pillows		2 (ICU cots)
14.	Blood collection Monitor		1
15.	Spring Balance		2
16.	Deep Freezer	- 300C Horizontal	1
17.	Deep Freezer	- 700C Horizontal / Vertical	1
18.	Platelet Agitator with Incubator		1
19.	Refrigerated Centrifuge		1
20.	Laminar Flow		1
21.	Tube sealer		2
22.	Cobe Spectra Cell Seperator		1 }
23.	Couch		1 } Optional
24.	Automatic component extractor		1 }
25.	Component weighing scale		1
26.	Rough Balance		1
27.	Oxygen cylinder		1

b. Minimum work load criteria for conducting M.Sc MLT course in Blood Transfusion

10 -Transfusion per day

30 blood samples/day for- i grouping & typing
ii crossmatching
iii Special Tests - Coomb's Test [Direct &Indirect]
ABO antibodyTitre , Cold antibody Titre.etc

Component preparation unit (optional) - However Students should be posted for 1month to a Blood bank where Component preparation facility is available.

Apart from the above mentioned equipments necessary glassware, chemicals,kits, should be made available in adequate quantity.

INFRASTRCTURE - IMMUNOPATHOLOGY

a. LAB EQUIPMENTS FOR IMMUNO HISTOCHEMISTRY

1. Refrigerator
2. Micro oven
3. Microtome
4. Hotair oven
5. Waterbath
6. Coil stove
7. Cooker - 7.5 ltr
8. Physical balance
9. Binocular Bright field Microscope.
10. Cryostat(opitonal) in case immunoflurosecsence is required.

b. Staff requirements applicable for all the speicalities - MSc MLT

1. Biochemistry
2. Microbiology and Immunology
3. Haematology and Blood transfusion

Staff requirement for each department
Teaching staff : Should actively involve in teaching the particular subject
Qualification : 1. MD in respective subject

1. MSc -[only Medical Microbiology/Medical Biochemistry degree acceptable)
   - 3 yrs experience after MSc.
2. D.C.P - 2 yrs experience
3. Bio-technologist - MSc in Biotechnology

Teaching staff requirement for each speciality

1. Professor	-	1		
2. Associate Professor	-	1	-	5yrs teaching experience
3. Assistant Professor	-	1	-	3yrs teaching experience
4. Lecturer	-	2		
5. Tutors	-	2		MBBS, MSc.

Technical staff	-	Senior technician	- 1
		Junior technician	- 2
		Peon	- 1

FIRST YEAR M.Sc. MLT

Course Contents
Haematology and Clinical Pathology

THEORY

1. Haemotopoesis - Origin, development, function and fate of blood cells.

2. Erythropoiesis - Origin, development of RBCs, biosynthesis of Hb, control of Erythropoiesis.

3. Disorder's of Red blood cells
   Anaemia, definition, Pathophysiology, classification -morphologic and Etiologic classification and clinical features. Investigations in a case of anaemia.
   Morphologic - Microcytic hypochromic anaemia, macrocytic anaemia.
   Haemolytic anaemias - Definition, classifiction, clinical features.
   Investigations to establish a case of hemolytic anaemia.
   Tests done - i. Peripheral smear - specific morphologic abnormalities
   ii. Osmotic fragility test
   iii. Coomb's test
   iv. Sickling phenomenon
   v. Kleihauer acid Elution test
   vi. Alkali denaturation test
   vii. Ham's test, Sucrose lysis Test
   viii. Electrophoresis - HbF & Hb A2 estimation
   ix. Test for G6PD deficiency
   Aplastic anemia. Pancytopenia
   Polycythaemia.

4. Disorders of white Blood cells - Leucocytosis, Leukopenia, Leukaemoid reaction,
   Myelodysplastic syndrome(MDS) .
   Leukaemias -Definition ,Etiology ,Clinical features.
   Classification- [French American British- FAB classification] Lab Investigations
   Cytochemistry of Acute leukaemias
   Chronic myeloid leukaemia -clinical presentation. Investigations. Philadelphia chromosome.
   Leucocyte Alkaline Phosphatase [LAP score.]
   Chronic lymphocytic leukaemia

5. Plasma cell disorders - classification
   Plasma cell myeloma - definition ,clinical features, investigations.

6. Myelo Proliferative disorders - general features ,classification - investigations

7. Lympho Proliferative disorders - general features, classification , Investigations

8. Lipid Storage Disorders

9. Haemoparasites

10. Bone marrow examination

11. Haemorrhagic disorders
    Definition - Pathogenisis,Clinical fearture ,Classification. - vascular disorders, Platelet disorders, coagulation disorders, Fibrinolysis.
    Normal haemostasis.
    Investigation of heamorrhagic disorders
    Tests of vascular and Platelet function - Bleeding time , Clot retraction, Platelet count
    B..M Aspiration , Platelet Aggregation Studies.
    Tests for Coagulation Disorders
    Screening test - First line tests
    Prothrombin time (PT), Activated Partial Thromboplastin Time(APTT), Thrombin Time (TT)
    Second line tests - Mixing experiments. Urea Solubility Test[Test for Factor XIII]
    Coagulation Factor assay. Factor VIII: C Inhibitor Study.
    Disseminated Intravascular Coagulation [DIC]-Definition ,Pathophysiology, Clinical Feartures and Laboratory Investigations.
    Fibrinogen assay

12. Thrombotic disorders -Classification, Pathogenisis, Clinical Feartures and Laboratory Investigations.
    Antiphospholipd Antibody Syndrome.

13. Automation in Haematology

14. Organization & quality control in the laboratory

15. Cleaning of glassware

16. Biomedical waste management

Practical

1. Blood collection. Anticoagulants used in Haematology

2. Red cell indices

3. E.S.R., PCV, Platelet count, Absolute Eosinophil count

4. Reticulocyte count

5. Stains used in Haematology
   Preparation of blood film

Preparation of Leishman's stain, Giemsa stain and MGG stain

6. Peripheral smear staining by leishman's stain. Interpretation of peripheral smear. Differential count.

7. Microcytic hypochromic anemia -
   Investigations including serum Iron & TIBC

8. Macrocytic anemia - Investigations including B12 & folate assay, schilling test

9. Haemolytic anemia - General Lab investigations

10. Haemolytic anemia - Special Tests.
    Osmotic fragility test
    Alkali denaturation test
    Sickling test
    Hb electrophoresis
    Investigations of G6PD deficiency
    Auto immune haemolytic anemia investigations
    Coomb's test

11. Blood Parasites

1. Bone marrow - preparation of bone marrow smears , Trephine biopsy smears
   Staining of B.M Aspiration Smears. Demonstration of Iron stain
2. Leukaemias - Interpretation of Peripheral smear in Leukaemias.
   Cytochemical stains - Demonstration
3. Haemorrhagic disorders
   Collection and anticoagulants used - Demonstration
   BT, CT - Demonstration Demonstration
   PT,INR, APTT, TT- Demonstration
   Mixing experiments - Demonstration
   Test for D-Dimers- Demonstration
   Assay of coagulation factors - Demonstation
   Factor VIII: C Inhibitor Study - Demonstration
   Urea Solubility Test for Factor XIII- Demonstration
   Fibrinogen assay - - Demonstration

16. Thrombotic work up - Demonstration
    Investigation for Antiphospholipid Antibody- Demonstration

17. Automation in haematology - demonstration

18. Cleaning of glassware

9. Bio-medical waste management - demonstration.

20. Organization and quality control in the laboratory.

21. Preperation of Stains,Reagents,Diluting fluids.

Clinical Pathology

1. Collection, transport, preservation and processing of various clinical specimens
2. Urine examination, Physical, chemical and microscopic. Urine analysis by Strip method .
3. Test for haemosiderin pigment.
4. Renal function tests.
5. Stool examination - collection of specimen of feaces
   a. Macroscopic (Naked eye) inspection
   ii. Concentration method ,Flotation method .
   iii. Microscopic examination
   iv. Chemical examination
   v. Strip method
   vi. Test for Occult blood - Benzidine Test
6. Sputum examination - collection of specimen
   i. Physical examination
   ii. Microscopic - Gram's stain, Ziehl Neelsen stain for AFB
   iii. Chemical examination
7. Gastric analysis
   Indications ,contra indication. Method of collection. Fasting gastric juice - Macroscopic and microscopic examination.
   I. Fractional test meal
   ii. Augumented Histamin test
   iii. Hollander's test
8. Cerebrospinal fluid analysis
   Method of obtaining CSF, indications, contra indications.
   Examination of CSF : i. Physical examination
   ii. Biochemical examination
   iii. Microscopic examination
   a. Cytological examination
   b. Bacteriological examination
9. Body fluids
   Microscopic examination of Pleural, Pericardial, synovial, ascitic and peritonial fluid.
10. Pregnancy Test- Method ,interpretation.
    Clinical Pathology Practicals
1. Urine examination, Physical, chemical and microscopic. Urine examination by Strip method
   Urine Test for haemosiderin pigment. [Demonstration]
2. Stool examination -
   i. Macroscopic examination
   ii. Concentration method ,Flotation method .
   iii. Microscopic examination
   iv. Benzidine Test- for occult blood
3. Sputum examination

Macroscopic, Microscopic and AFB Staining
4. E xamination of Cerebrospinal fluid [CSF] and body fluids.
5. Pregnancy Test
6. Examination of Semen

Recommended Books -Haematology and Clinical Pathology

1. Clinical Haematology
   Illustrted - Colour Atls
   Victor Hoffbrand, John E Peth't
2. Parasitology - K.D.Chatterjee
3. Practical Haematolgoy - 9th edition Dacie 7 Lewis
4. Haematology -6th edition - Williams
5. Wintrobe clinical haematology Vol- I - 10th edition
6. Windtrobe clinical haematology Vol- II -10th edition
7. Lynch's Medical Lab - Technology Latest edition
8. Clinical Diagnosis & Management - Todd & Sanford 19th edition 1996
9. Medical Laboratory Technology by Sood 5th edition, Jaypee Brothers 1999
10. Clinical Haematology in Medical Practice - G.C. Degruchy - 5th edition

Immunopathology
Theory

1. Mechanism of Ab-mediated inactivation : direct and idirect
   Eg. Diabetes mellitus, thyroid diseases, pernicious anemia, polyendocrinopathy, infertility, haemophilia, myasthenia gravis, anti-idiotypes and diseases.

2. Immune deficeincy disorders

3. Immunohaematologic diseases : transfusion reactions, erythroblastosis foetails, warm-antibody disesases, cold antibody diseases, drug and hemolytic diseases, agranulocytosis, thrombocytopenic purpura, immune suppression cytotoxic antibodiessss in vitro.

4. Immune comples reactions : arthus reaction, serum sickness, evaluation of circulating immune complexes.

5. Connective tissue diseases : PI;arteritis, SLE, dermatomyosis, rheumatic fever, rhematoid arthritis, prograssive systemic sclerosis.

6. Atopic anaphyllactic reactions : reaginic antibody, anaphylaxis, atopic allery - factors invlved, asthma, hay fever, food allergy, insect allergy, atopic eczma, delayed hypersensitivity reactions, contact dematitis, viral infectionss, graft-host relationship in pregnancy.

7. Autoallergiiic diseases: encephalomyelitis, multiple sclerosis, ooorchitis, thyroiiditis, sjogren's syndrome.

8. Granulomatous reactions : Infectious diseases like tuberculosis, leprosy.
9. Autoimmune diseases-organ specific and systemic.

10. Immunomodulators

11. Clinical transplantation-Kidney ,Bone marrow ,Heart.

12. Immunology of AIDS ,Tumour and Tumour markers.

13. Immunohaeatology- Campattibility testing.

***Practicals:**

1. Serological tests[Screening &diagnostic] used in different pathological conditions.
2. Delayed type hypersensitivity testing.
3. Detection of tumour markers.
4. Histocompatibility testing .
5. Blood grouping &cross matching .
6. Coomb's Test = Direct & Indirect.
   Setting up of Immuno histochemistry lab.

***No University Practical examination**
Biostatistics:

Teaching hrs :30hrs

Unit 1. Introduction to Biostatistics

Definition, role of stastistics in health science and health care delivery system

Unit 2 . Sampling

Population, sample, sampling, reasons for sampling, probability and non-probability sampling Methods of probability sampling-simple random, stratified, systematic-procedure, merits and demerits Use of random number table.

Unit 3. Oragnisation of data

Frequency table, histogram, fraquency polygon, fraquency curve, bar diagram, pie chart

Unit 4. Measures of location

Arithmetic mean, median, mode, quartiles and percentiles - definition, computation (for raw data), merits, demerits and applictions.

Unit 5. Measures of variation

Range, inter -quartile range, varianace, standard deviation, coefficient of variation- definition, computation (for raw data), merits, demerits and applications

Unit 6 : Basic probability distribtuions and sampling distribtuions:

Concept of probability distribtuion. Normal, Poisson and Binomial distribtuins, parameters and

application. Concept of sampling distribtuions. Standard error and confidence intervals. [Skewness and kurtosis]

Unit 7 : Tests of significance :

Basic of testing of hypothesis - Null and altertnate hypothesis, type I and type II errors, level of significance and power of the test , p value.

Tests of significance (parametric) - t - test (paired and unpaaired), Chi square test and test of proportion, one way analysis of variance.

Unit 8 . Correlation and Regression :

Scatter diagram, concept and properties of correlation coefficient, examples (No computation) Simple correlation) Pearson's and spearman's, testing the significance of correlation coefficient. Linear and multiple regression.

Suggested books :

1. Lwanga SK Cho-Yook Tye (Editors). Teaching Helath Statistics, Twenty lessons and seminar outlines, World Health Organization, Geneva

2. Mahajan BK, Methods in Biostatistics for medical students and research workers. 6th Edition, Jaypee Brothers medical Publishers, New Delhi, 1997.

3. Sundr Rao PSS and Richard J. Introduction of Biostatistics; A Manual for students in Health sciences. Prentic-Hall of India Pvt. Ltd, New Delhi.

4. N.S.M. Rao : Elements of Health statistics

SECOND YEAR M. Sc. MLT

THEORY

Specialaiztion subject Haematology

1. General aspects of blood cell formation,Sites of haemopoiesis. Development of blood cells. Morphology and Regulation of heaemopoiesis.

2. Red cells - Basic aspects of anaemia definition, patho phsiology ,classification and clinical features. Investigation of a case of anaemia in general.

3. Microcytic hypochromic anaemias
   Iron deficiency anemia
   Sideroblastic anemia
   Anaemia of chronic infection
   Thalassaemia.
   Iron deiciency anaemia - Iron metabolism ,causes of iron deficiency, clinical features, laboratory investigations.

4. Macrocytic Anaemias
   Megaloblastic
   Non megaloblastic
   Megaloblastic anaemia - Etiology, clinical featurees, laboratory investigation. Pernicious anaemia.

5. Normocytic normochronic anaemia
   Anaemia in systemic disorders
   Acute blood loss, Renal failure
   Liver disorders etc.

6. Disorders of Haemoglobin
   Structure of Hb and Synthesis
   Normal and Abnormal haemoglobins
   Hamoglobinspathies

7. Haemolytic anaemia
   Definition, pathogenesis, classification, clinical features.
   Laboratory investigations to establish a case of haemolytic anaemia.
   1. Peripheral smear - spceific morphologic abnormalities
   2. Special tests
   a. Osmotic fragility test
   b. Sickling test
   c. Kleihaure acid elution test
   d. Alkali denaturation test
   e. Ham's test ,Sucrose lysis test
   f. Coomb's test
   g. Electrophoresis - HbF, HbA2 estimation
   h. Tests for G6PD deficeiency

8. Aplastic anaemia
   Pancytopenia.

9. Polycythaemia - classification ,Clinical features, laboratory investigation

II Leucocyte disorders

Leukaemoid reaction - type of leukaemoid and diagnosis.
Myelodysplastic syndrome [MDS] Definition, Clinical features, peripheral smear and Bone marrow findings.
Leukaemias: Definition, classification -French- American-British [FAB]
WHO- classification of acute leukaemias
Diagnostic criteria , Cytochemical staining and Immunophenotyping
Chronic Leukaemias: classification, Diagnostic criteria .
Myeloproliferative disorders - classification ,Clinical features, laboratory investigations.
Chronic myeloid leukaemia in detail.
Lymphoproliferative disorders - Chronic lymphocytic leukaemia in detail.

Plasma cell disorders - classification.
Plasma cell myeloma - definition. Clinical features, laboratory investigations.

Haemorrhagic disorders:
Definition: Pathogenesis, clinical features
Classification: Vascular disorders, platelet disorders ,Coagulation diorders Fibrinolysis.

Platelet disorders:
Quantitative - Thrombocytopenia - Idiopathic thromobcytopenic purpura (ITP)
Classification, clinical featrues, diagnosis and B.M findings in ITP.
Qualitative platelet disorders.
Thromobcytosis - Definition ,Etiology,. Lab Investigations
Coagulation disorders - Inherited -Haemoplulia Aand B von Willebrand's disease
Acquired: Vit. K deficiency, Liver disease, DIC
Investigation of Haemorrhagic disorders.
Tests of vascular and platelet function - Bleeding time, Clot retraction ,Patelet count.
Platelet aggregation studies. Bone marrow examination.
Tests for coagulation disorders:
Screening tests- First line tests -Prothrombin time (PT) Activated partial thromboplastin time(APTT) Thrombin time (TT)
Second line tests - Mixing experiments.
Coagulation factory assay.
Urea solubility tests for Factor XIII.
Factor VIII inhibitor study.
Fibrinogen assay.
Disseminated intravascular coagulation- Definition, Pathogenesis, laboratory investigations

Thrombotic disorders:
Classification - Inherited and Acquired.
Clinical features, Investigation of thrombotic disorders:
Tests:
i. Protein C
ii. Protein S,
iii. AT-III
iv. Factor V leiden

Antiphospholipid antibody syndrome: Defintion clinical feature laboratory investigation.
B.M.Examination- Aspiration and Trephin biopsy staining
Automation in haematology
Cleaning of glass ware
Organization and quality control in the laboratory
Bio medical waste management .

Practicals

1. Staining and Interpretation of Peripheral smears.

2. Microcytic hypochromic anaemia- Peripheral smear, B.M. Examination , Serum iron.
   Serum Total iron bindng capacity [TIBC] PercentSaturation, SerumFerritin B.M. IronStain .

3. Macrocytic Anaemia- Peripheral smear, B.M. Examination, Vit B12 assay, Folate assay, Schilling Test.

4. Plasma Hb Estimation

5. Haemolytic Work up
   Peripheral smear - spceific morphologic abnormalities

Special tests

i. Osmotic fragility test
j. Sickling test
k. Kleihauer acid elution test
l. Alkali denaturation test
m. Ham's test, Sucrose lysis test
n. Coomb's test
o. Electrophoresis - HbF, HbA2 estimation
p. Tests for G-6PD deficiency
6. Leukaemias:
   i. Myeloperoxidase
   ii. Periodic Acid Phosphatase [PAS]
   iii. Sudan Black
   iv. Esterase, Non specific esterse
   v. Leucocyte alkaline Phsophatase

   Immuno Cytochemical Staining.

1. Plasma cell Disorders : Serum Protein Electrophoresis, Urine Electrophoresis

2. Investigation of Haemorrhagic disorders
   Test of vascular and platelet function - Bleeding time, Clot retraction, Platelet count.
   Platelet aggregation studies. Bone marrow examination.
   Tests for coagulation disordrs:
   Screening tests - First line tests- Prothrombin time (PT) Activated partial thromboplastin time(APTT) Thrombin time(TT) INR.
   Second line testrs - Mixing experiments.
   Coagulation factor assay
   Urea solubility tests for Factor XIII
   Factor VIII inhibitor study
   Fibrinogen assay

3. Thrombotic Work-up
   Tests:
   i. Protein C
   ii. Protein S
   iii. AT-III

iv. Factor V leiden

4. Antiphospholipid Antibody -work up

5. Bone marrow examination - Preparation of B.M Aspiration and Trephine biopsy smears staining

6. Organisation and quality control in the laboratory

7. Cleaning of glass ware

8. Bio Medical waste management

9. Preparation of Reagents, Diluting fluids,
   Stains - Leishman's stain
   Geimsa stain
   M. G. G. stain

Recommended Books -Haematology and Clinical Pathology

1. Clinical Haematology
   Illustrted - Colour Atls
   Victor Hoffbrand, John E Peth't
2. Practical Haematolgoy - 9th edition Dacie 7 Lewis
3. Haematology -6th edition - Williams
4. Wintrobe clinical haematology Vol- I - 10th edition
5. Wintrobe clinical haematology Vol- II -10th edition
6. Lynch's Medical Lab - Technology Latest edition
7. Clinical Diagnosis & Management - Todd & Sanford 19th edition 1996
8. Medical Laboratory Technology by Sood 5th edition, Jaypee Brothers 1999
8. Clinical Haematology in Medical Practice - G.C. Degruchy - 5th edition

SECOND YEAR M.Sc. MLT

Blood Transfusion
Theory

Special Subject For MSc.MLT
Introduction to Immuno Haematology

1. History of Transfusion Medicine
2. Blood groups and genetics
   ABO System - ABO sub groups
   Bombay group, secretors , non secretors. Rh system - Importance of Rh system
   Du red cells (A variant of Rh system)
   MNS System - clinical significance
3. Blood transfusion - indications for blood transfusion

4. Blood donation , Donor registration, Donor selection, Blood collection. Adverse donor reaction
5. Anticoagulants used to store blood
   Changes occuring in the stored blood
6. Blood group systems - antigen - antibody reaction ,ABO system- Forward grouping reverse group
7. Rh system Inheritence& nomenclature R h grouping - Rh antigen and antibodies DuVariant Anti D type of reagents and their application
8. Coomb's test - Application - DCT, ICT Rh antibody titre
9. Compatibility testing - Major
   Minor
   Coomb's cross match
10. Blood components - Indications preparation of blood components
11 Autologous transfusion
12. Transfusion transmitted disease
13. Haemolytic disease of the new born and exchange transfusion
14. Transfusion Therapy
15. Transfusion in Special Situations-Auto immune haemolytic anaemia
16. Transfusion reactions a nd Investigation of transfusion reaction
17. Transfusion transmitted Infections
18. Immunomodulation and Graft versus host reactions .
19. Haemapheresis-Definition ,Types of pheresis ,Machines and Techniques.
20. Tissue banking
21. Cord blood banking
22. Stem Cell processing,Storage and Transplantation
23. Disposal of wastes and biologically hazardous substance in the blood bank
24. Medico legal aspects of blood transfusion
25. Technical advances and future trends in blood banking
26. Paternity Testing
27. Orientation of a routine blood bank
28. Quality Assurance - General condition
    Equipment
    Reagents
    Donor processing
29. Drugs controlregulation and Blood Bank

Practicals

Blood grouping - **ABO grouping** Forward grouping (slide &tube method)
Reverse grouping - preparation of pooled A, B & O cells
Grading of Reaction. Other methods of Grouping.
ABO antibody titration, Cold antibody titration.
.Rh grouping & Rh typing (slide & tube method)
Du Testing
Rh - antibody titration
Antiglobulin Testing
Direct aned Indirect
Preparation of Coomb's Control Cells.

Compatibilty Testing
Selection of blood
Cross matching Technique - Major,Minor, Saline, Albumin,Coomb's
Emergency -Crossmatches
Blood Collection
Donor Selection
Blood collection [Phlebotomy]
Post Donation Care
Preservation and Storage of blood
Preparation and Storage of blood Components
Packed Cells ,Fresh Frozen plasma [FFP] Platelet Concentrate, Cryoprecipitate
Component transfusion - selection of blood group
Crossmatching in Special Situations
Exchange transfusion - selection of blood group
Autoimmune haemolytic anaemia
Investigation of Blood Transfusion reaction
Testing for transfusion Transmitted Diseases
Elisa-HIV,HBsAg ,HCV
VDRL Test
Malaria
Quality control - Methods
Reagents
Test methods
Products
Documents
Equipments
Apheresis procedures - Types of pheresis ,Machines and Techniques.
Biomedical Waste mangement - Demonstration
Record keeping - To be Observed
Documentation

Books Recommend for Blood Transfusion

1. Technical manual - 12th edition - AABB
2. The Clinical use of Blood Handbook WHO
3. ABO Rh system - Ortho diagnostics
4. Compatibility testing - Ortho diagnostics
5. Compendium of transfusion medicine Fr. R. N. Makroo. Ed. 1999
6. Bl ood transfusion in Clinical Medicine - Mollision - 5th edition
7. Blood group Serology, Theory, Techniques, Practical application - K.E.Boorman, B.E Dodd, P. J. Lincoln - 5th edition
8. Technical Manual 12th edition AABB.
9. Rossi's Principles of Transfusion Medicine 3rd Edition 2002 Toby L.Simon ,Walter H Dzik,Edward L. Snuder , Christopher P. Stowell Ronald G.Strauss 3 rd edition Lippincott Willams and Wilkins.

Scheme of Examination: Ist Year M Sc MLT Course

Internal Assessment

Total marks - 40 [Theory-20 Practical- 20]
It shall be based on evaluation of assignment, preparation of seminar etc.
Minimum two tests should be conducted
Average of the two tests to be taken in to consideration for calculating internal assessment.
The internal assessment marks both theory and practical obtained by the candidate should be sent to the university at least fifteen days prior to the commencement of theory examination.

University examination:

A. Theory : 100 Marks

There shall be one paper of 100marks. The duration of the paper will be 3 hrs.

Type of Question:	No. of Question	Marks	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short answer	10	3	30

Paper I - 100 Marks

Haematology	-	50 marks
Clinical pathology	-	25 marks
Innuno pathology	-	25 marks

B. Practicals - Total - 180 marks
Practical Exam - 100 marks

1. Spotters - 20 marks
2. Staining and reporting the Peripheral smear - 20 marks
3. Special test - (Any one to be performed) - 15 marks
   a. Platelet count
   b. Reticulocyte count
   c. Absolute Eosinophil Count
   d. ESR OR PCV
4. Chart - Clinical pathology, Haematology ,Immunopathology - 10 marks
5. Urine Examination - 20
6. Cyto chemical Staining - 15

C. Viva Voce - 30 Marks
1. Haematology - 10
2. Clinical Pathology - 10

3. Immunology - 10

The Viva Voce exam will carry 30 marks and all the examiners will conduct the Examination.

D. - Record - 30 marks

Scheme of Examination: I1nd Year MSc. MLT Course

Internal assesment

Total marks - 4o [Theory -20 Practical -20]

It shall be based on evaluation of assignment, preparation of seminar etc.

Minimum two tests should be conducted

Average of the two tests to be taken in to consideration for calculating internal assessment.

The internal assessment marks both theory and practical obtained by the candidate should be sent to the university at least fifteen days prior to the commencement of theory examination.

University examination:

A. Theory : 200 Marks

There shall be two papers of 100marks each and duration of each paper will be 3 hrs.

Type of Question:	No. of Question	Marks	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short answer	10	3	30

Paper I 1 - 200 Marks

Haematology - 50 marks

Blood Transfusion - 50 mark

B. Practicals - Total - 100 marks

Practical Exam -1 - Haematology - 50 marks Duration -3hours

Practical Exam -11 - Blood Tranfusion - 50 marks Duration -3hours

Practical Exam -1 - Haematology- 50 marks

1. Spotters - 10 marks
   [Including slides ,Instruments]

2. Stained Peripheral smear with clinical history for reporting and interpretation - 15 marks

3. Special test - (Any one to be performed) - 10 marks

a. Prothrombin Time
b. Activated partial thromboplastine time
c. Cyto chemical staining
d. Sickle cell preparation.

4. Charts for Interpretation - Haematology - 15

Practical -11- Blood Transfusion - 50 marks Duration - 3hours

1. Blood grouping[forward & reverse] and Rh typing - 15 marks
2. Coomb's test- Indirect - 10
3. Charts for interpretation[Blood banking] - 15
4. Bleeding the Donor - 10

C. VIVA Voce - 40 Marks

1. Haematology - 20
2. Blood Transfusion - 20

The Viva Voce exam will carry 30 marks and all the examiners will conduct the Examination.

D. - Record - 20 marks

SECTION IV

MONITORING LEARNING PROGRESS

It is essential to monitor the learning progress of each candidate through continuous appraisal and regular assessment. It not only also helps teachers to evaluate students, but also students to evaluate themselves. The monitoring be done by the staff of the department based on participation of students in various teaching / learning activities. It may be structured and assessment be done using checklists that assess various aspects. Model Checklists are given in this Chapter which may be copied and used.

The learning out comes to be assessed should include:

i. **Acquisition of Knowledge :** The methods used comprise of `Log Book' which records participation in various teaching / learning activities by the students. The number of activities attended and the number in which presentations are made are to be recorded. The log book should periodically be validated by the supervisors. Some of the activities are listed. The list is not complete. Institutions may include additional activities, if so, desired.

   Journal Review Meeting (Journal Club): The ability to do literature search, in depth study, presentation skills, and use of audio- visual aids are to be assessed. The assessment is made by faculty members and peers attending the meeting using a checklist (see Model Checklist - I, Section IV)

   Seminars / Symposia: The topics should be assigned to the student well in advance to facilitate in depth study. The ability to do literature search, in depth study, presentation skills and use of audio- visual aids are to be assessed using a checklist (see Model Checklist-II, Section IV)

ii. **Teaching skills :** Candidates should be encouraged to teach undergraduate medical students and paramedical students, if any. This performance should be based on assessment by the faculty members of the department and from feedback from the undergraduate students (See Model checklist III, Section IV)

iii. **Dissertation:** Please see checklist IV and V in Section IV.

iv. **Work diary / Log Book-** Every candidate shall maintain a work diary and record his/her participation in the training programmes conducted by the department such as journal reviews,

seminars, etc. Special mention may be made of the presentations by the candidate as well as details of experiments or laboratory procedures, if any conducted by the candidate.

v. **Records:** Records, log books and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University.

Log book

The log book is a record of the important activities of the candidates during his training, Internal assessment should be based on the evaluation of the log book. Collectively, log books are a tool for the evaluation of the training programme of the institution by external agencies. The record includes academic activities as well as the presentations and procedures carried out by the candidate.

Format for the log book for the different activities is given in Tables 1 and 2 of Section IV. Copies may be made and used by the institutions.

Procedure for defaulters: Every department should have a committee to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default the departmental committee may recommend that defaulting candidate be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set himself or herself right.

Format of Model Checklists

CHECKLIST - I

MODEL CHECKLIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the student : Date:

Name of the faculty/ Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1.	Article chosen was					
2.	Extent of understanding of scope & objectives of the paper by the candidate					
3.	Whether cross- references have been consulted					
4.	Whether other relevant references have been consulted					
5.	Ability to respond to questions on the paper /subject					
6.	Audio-visuals aids used					
7.	Ability to defend the paper					
8.	Clarity of presentation					
9.	Any other observation					
	Total Score					

CHECKLIST - II

MODEL CHECK LIST FOR THE EVALUATION OF THE SEMINAR PRESENTATIONS

Name of the student : Date:

Name of the faculty/ Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1.	Article chosen was					
2.	Extent of understanding of scope & objectives of the paper by the candidate					
3.	Whether cross- references have been consulted					
4.	Whether other relevant references have been consulted					
5.	Ability to respond to questions on the paper /subject					
6.	Audio-visuals aids used					
7.	Ability to defend the paper					
8.	Clarity of presentation					
9.	Any other observation					
	Total Score					

CHECKLIST - III

MODEL CHECK LIST FOR EVALUATION OF TEACHING SKILL

Name of the student : Date:

Name of the faculty/ Observer:

Sl. No.		Strong Point	Weak point
1.	Communication of the purpose of the talk		
2.	Evokes audience interest in the subject		
3.	The introduction		
4.	The sequence of ideas		
5.	The use of practical examples and /or illustrations		
6.	Speaking style (enjoyable, monotonous, etc., specify)		
7.	Summary of the main points at the end		
8.	Ask questions		
9.	Answer questions asked by the audience		
10.	Rapport of speaker with his audience		
11.	Effectiveness of the talk		
12.	Uses of AV aids appropriately		

CHECKLIST - IV

MODEL CHECK LIST FOR DISSERTATION / PROJECT WORK PRESENTATIONS

Name of the student : Date:

Name of the faculty/ Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1.	Interest shown in selecting topic					
2.	Appropriate review					
3.	Discussion with guide and other faculty					
4.	Quality of protocol					
5.	Preparation of proforma					
	Total score					

CHECKLIST - V

CONTINUOUS EVALUATION OF DISSERTATION
PROJECT WORK BY GUIDE/ CO-GUIDE

Name of the student : Date:

Name of the faculty/ Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below average 1	Average 2	Good 3	Very Good 4
1.	Periodic consultation with guide/ co-guide					
2.	Depth of Analysis / Discussion					
3.	Department presentation of findings					
4.	Quality of final output					
5.	Others					
	Total score					

OVERALL ASSESSMENT SHEET

Date:

Check list No.	Name of the students			
	A	B	C	D
1				
2				
3				

Signature of the HOD **Signature of the Principal**

The above overall assessment sheet used along with logbook should form the basis for certifying satisfactory completion of course of study, in addition to the attendance requirement.

KEY

Mean score: Is the sum all the scores of checklists 1 to 5
A, B, C : Name of the students

LOG BOOK

TABLE - 1

ACADEMIC ACTIVITIES ATTENDED

Name :
Admission Year:
College:

Date	Type of activity, Specific Seminar, Journal club, presentation, UG teaching	Particulars

TABLE - 2

ACADEMIC PRESENTATIONS MADE BY THE STUDENT

Name :
Admission Year:
College:

Date	Topic	Type of activity, Specific Seminar, Journal club, presentation, UG teaching

MANAGEMENT INFORMATION SYSTEM REPORT

1. Name of the college imparting M.Sc. MLT PG Program:
2. Details of M.Sc. MLT Program

Sl. No.	Name of the Branch & Teaching faculty	Sanctioned Strength	Admitted	Name of the subjects to be studied at 1st Year M.Sc. MLT	
1.					
2.					

3. No. of experiments/assignments conducted for 1st year M.Sc. MLT students

Sl. No.	Branch	Subject		Assigned by RGUHS	Conducted	%	Remarks
1.		No	Name				
2.							

4. No. of theory classes conducted for 1st year M.Sc. MLT students

Sl. No.	Branch	Subject		RGUHS Norms (25)	Conducted	%	Remarks
1.		No	Name				
2.							
3.							

5. Number of theory and practical classes taken by 2nd year M.Sc. MLT students for under graduate Program (Optional)

6. No. of Journal clubs department wise for 1st year and 2nd year M.Sc. MLT students

Total No. of students Dept Wise	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1st year M.Sc. MLT No.=	2 per candidate per year			
2nd year M.Sc. MLT No.=	2 per candidate per year			

7. Number of seminars for 1st year and 2nd year M.Sc. MLT students

Total No. of students Dept Wise	Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1st year M.Sc. MLT No.= 10	2 per candidate per year			
2nd year M.Sc. MLT No.= 08	2 per candidate per year			

8. Number of interdepartmental meetings

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1	2	200%	Interactive and productive

9. Number of visits to pharmaceutical industry/research center/hospital for 1st year and 2nd year M.Sc. MLT students

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1	02	200	Educative & informative

10. Number of guest lectures for postgraduate Program

Norms for half yearly Report	Achieved Number	% Achievement	Remarks
1	03	150	Need focused and educative

11. Number of research papers published in the year in the college -

12. Any other additional information such as consultancy/collaboration/conducting Seminars & workshops or attending seminar & workshops or conference.

SECTION V

ETHICS IN M.Sc. MLT

(Should be taught to the Ist year studentsof M.Sc. MLT of three branches of specialization.)

Introduction

With the advances in science and technology and the increasing needs of the patient, theirs families and community, there is a concern for the health of the community as a whole. There is a shift to greater accountability to the society. It is therefore absolutely necessary for each and every one involved in the health care delivery to prepare themselves to deal with these problems. Technicians like the other professionals are confronted with many ethical problems.

Standards of professional conduct for technicians are necessary in the public interest to ensure an efficient laboratory service. Every technician should not only be willingly to play his part in giving such a service, but should also avoid any act or omission which would prejudice the giving of the services or impair confidence, in respect, for technician as a body.

To accomplish this and develop human values, it is desired that all the students under go ethical sensitization by lectures or discussion on ethical issues.

Introduction to ethics

- What is ethics?
- General introduction to Code of Laboratory Ethics
- How to form a value system in one's personal and professional life?
- International code of ethics.

Ethics of the individual

- Technician relation to his job
- Technician in relation to his trade
- Technician in relation to medical profession
- Technician in relation to his profession

Professional Ethics

- Code of conduct

- Confidentiality
- Fair trade practice
- Handling of prescription
- Mal practice and Negligence
- Professional vigilance

Research Ethics

- Animal and experimental research/ humanness
- Human experimentation
- Human volunteer research - informed consent
- Clinical trials
- Gathering all scientific factors
- Gathering all value factors
- Identifying areas of value - conflict, setting priorities
- Working out criteria towards decision
- ICMR/ CPCSEA/ INSA Guidelines for human / animal experimentation

Recommended reading

1. Francis C.M., Medical Ethics, I Edition, 1993, Jay pee Brothers, New Delhi p189.
2. Good Clinical Practices : GOI Guidelines for clinical trials on Pharmaceutical Products in India (www.cdsco.nic.in)
3. INSA Guidelines for care and use of Animals in Research - 2000.
4. CPCSEA Guidelines 2001(www.cpcsea.org).
5. Ethical Guidelines for Biomedical Research on Human Subjects, 2000, ICMR, New Delhi.
6. ICMR Guidelines on animal use 2001, ICMR, New Delhi.

PAPER-1 GENERAL MICROBIOLOGY.

1. Historical background, classification of microorganisms, eukaryote and prokaryotes, methods of studying microbes, staining, microscopy, electron microscopes and specimen preparation of EM, culture methods and media, sterilization methods for identification of bacteria, application of molecular techniques for identification of bacteria.

2. Bacterial morphology: shape and arrangement of bacterial cells, ultrastructure of cell wall, cytoplasmic memebrane, outer envelope, flagella, fimbria and pilae, cytoplasmic matrix, nucleoid, cytoplasmic inclusions, endospores-formation and germination, cell-wall synthesis.

3. Bacterial metabolism and growth: requirements nutritional classification, transport of solutes across the cell membrane, effect of pH, temperature, oxygen etc. On growth, generation time growth curve, batch cultures an continuous cultures, chemostat, turbidostat, assessment of bacterial growth-different methods bacterial nutrition an design of culture media.

4. Antimicrobial agents: Chemical and physical agents, mode of action, methods for testing antimicrobials as therapeutics-antibacterial, antifungal, antiviral, mode of action, MIC and MBC,

development of resistance, antimicrobial sensitivity testing.

5. Bacterial genetics: Bacterial genome, extra chromosomal genome and bacterial pneumonia and Haemophilus influenzae, role of plasmids, artificial transformation. Bacterial conjugation-properties of plasmid, Hfr stains, conjugation in gram positive and gram negative organisms, transduction-generalized and specialized, bacteria in genetic engineering.

6. Bacteria useful to man: Making of wine, beer and bread, milk products, butyric acid bacteria, microbes as source of proteins, microbial production of chemotherapeutic agents, antibiotics (eg: Penicillin, streptomycin, transformation of steroids, biopesticides, genetic engineering products.

PRACTICLS

1. Staining techniques: Simple. Grams, AFB, flagella, cell wall, capsule, spirochetes, volutin granules etc.
2. Principles and uses of microscopes (compound, dark field, electron).
3. Culture methods.
4. Antimicrobial sensitivity testing-disc diffusion, MIC and MBC.
5. Isolation of antibiotic resistant strains.

PAPER-I IMMUNOLOGY AND IMMUNOLOGICAL TECHNIQUES

1. History of immunology, innate and aquired immunity, meehanisms of innate immunity inflammation-inflammatory cells, mediators, inflammatory response types, antigens, cells and organs of immune system, evolution of immunity.

2. Immunoglobulin: Structure and function, classes and subclass-Cryoglobins, immunoglobulins genes -Organisation and expression, antibody diversity, class switching, monoclonal antibodies-hybridoma technique and MAB production, application in biomedical research, clinical diagnosis and treatment.

3. Immune Response: Clonal selection theory and related theories, primary and secondary response, humoral and cell mediated response, antigen processing and presentation, role of accessory molecules, MHC-structure and role in antigen presentation, MHC genes, maturation activation and differentiation of B cells and T cells, lymphocyte trafficking, TCR-structure anf generation of diversity, cytokine properties and function, cytokine receptor, therapeutic uses, ADCC, NK cell regulation of immune response, advances in the development of vaccines (eg. Haemophilus B conjugate, Pertusis, Cholera, Malaria, Hepatitis B, Polio, HIV, Antitumour) adjuvants.

4. Compliment system: function, compliment receptors, activation pathways, control mechanisms, role in inflammation, kinin cascade, kinnins in disease.

5. Immunity against bacteria: Virus, Fungi and Parasites.

6. Immunological methods in clinical laboratories: Method interpretation and application of the following

A. Double diffusion in agar
B. Single radial immuno diffusion
C. Electrophoresis and immunoelectrophoresis
D. Chromatography
E. Ion exchange
F. Affinity (gel)
G. RIA
H. Elisa
I. Western blotting
J. Detection of immune complexes, nephelometry
K. Immunoflouresence
L. Agglutination test direct and indirect
M. Haemagglutination and haemagglutination inhibition
N. Complement assays-CFT
O. Hemolytic assays
P. Detection of cellular immunity-delayed hypersensitivity skin test
Q. Assays for lymphocytes-T and B cells
R. Flow cytometry
S. FACS
T. Mixed lymphocyte culture
U. NK cells neutrophil function test
V. Histocompatibility testing

PRACTICAL

1. Double diffusion technique
2. Radial immuno diffusion
3. Haemagglutination inhibition test
4. Haemagglutination test
5. Latex agglutination test
6. Complement fixation test
7. Immunoelectrophoresis
8. Countercurrent immunoelectrophoresis
9. FITC conjugation of antibodies
10. Lymphocyte culture
11. Isolation of lymphoid organs in mice
12. Elisa
13. RIA demonstration
14. Western blotting demonstration
15. Widal test
16. VDRL test