

**M.M. (Deemed to be UNIVERSITY), MULLANA –  
AMBALA**

**ORDINANCE**

**NAME OF THE COURSE:** B.Sc. Medical Laboratory Technology

**DURATION OF THE COURSE:**

3 years - followed by one year of compulsory rotatory internship.

**ELIGIBILITY FOR ADMISSION TO THE COURSE:**

1. A Person who shall attain the age of 17 years or more on December 31st of the year of admission.
2. A candidate seeking admission to the B.Sc. Medical Laboratory Technology should have passed any one of the following:-
  - a) Senior School Certificate Examination (10+2) of a Board of School Education, Haryana or an examination recognized as equivalent there to or Senior Secondary Examination (12<sup>th</sup>), Pre-Medical or Plus Two or an equivalent examination from any Indian/Foreign Universities/Boards with English, Physics, Chemistry and Biology as optional subjects in the qualifying examination as recognized by MMU, Mullana.

OR

- b) **LATERAL ENTRY**:- Provided that the candidate who has passed 3 year diploma after Matric or two year diploma after 10+2 shall be eligible for admission to the relevant branch of B.Sc. (MLT) in 2<sup>nd</sup> Year through lateral entry. The diploma course should be recognized by MMU.

**METHOD OF ADMISSION:**

- a) Every year in the beginning of the session in July/ August, number of seats for enrolment of B.Sc. MLT will be advertised by MMU, Mullana.
- b) The candidates will be selected on basis of qualifying interview conducted by MMU.
- c) Reservation for NRI/ Foreign candidates as per MMU Guidelines/ Rules/ Regulations.

## **TRAINING PERIOD AND TIME DISTRIBUTION:**

1. Every Student shall undergo a period of certified study and training extending over 3 years from the date of commencement of course till the date of completion of examination and followed by six months compulsory rotating internship.
2. The period of 3 years will be divided into three phases as follows:-
  - a) Phase I (Ist Year) – consisting of subjects (Human Anatomy, Physiology, Biochemistry, Pathology & Microbiology with additional subjects – Environmental studies, Data entry/ processing, Instrument maintenance & Chemical Hazards)
  - b) Phase II (IInd Year ) – consisting of subjects (Biochemistry, Pathology & Microbiology)
  - c) Phase III (IIIrd Year) - consisting of subjects (Biochemistry, Pathology & Microbiology)

## **PHASE DISTRIBUTION AND TIMING OF EXAMINATIONS:**

<b>Sr. No.</b>	<b>Examination &amp; Period of Study</b>	<b>Subjects</b>	<b>Annual</b>	<b>Supplementary</b>
<b>Phase I</b>	B.Sc. Ist Year (From date of Admission)	Human Anatomy, Physiology, Biochemistry, Pathology & Microbiology with additional subjects - Environmental studies, Data entry/ processing, Instrument maintenance & Chemical	June – July of next year	September of next year

		Hazzards		
<b>Phase II</b>	B.Sc. IInd Year (After the end of Ist year of the Admission)	Biochemistry, Pathology & Microbiology	June – July of next year	September of next year
<b>Phase III</b>	B.Sc. IIIrd Year (After the end of IInd year of the Admission)	Biochemistry, Pathology & Microbiology	June – July of next year	September of next year

**Note: - 1. The academic year shall include the time for examinations preparations and Holidays.**

**2. There shall be one main examination in a year and a supplementary to be held not later than 6 months after the publication of its results.**

### **ELIGIBILITY FOR APPEARING IN B.SC. MLT EXAMINATIONS:-**

#### **1. ATTENDANCE:**

1. 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 & Practical.
2. of having obtained at least 35% marks in internal assessment.
3. of having good character.
4. of having enrolled in the college for a period of one year as specified earlier.

### **GENERAL ELIGIBILITY PROVISIONS FOR APPEARING IN ANY EXAMINATIONS:**

#### First year examination:

A candidate who fails in any two of the five main subjects and Environmental studies of first year shall be permitted to carry over those subjects to second year. However, he/she must pass the carry over subjects before appearing for second year examination; otherwise he/she shall not permitted to proceed to third year.

#### Second year examination:

A candidate is permitted to carry over any one main subject to the third year but shall pass this subject before appearing for the third year examination.

**THE DETAILS OF THEORY/PRACTICAL/LAB POSTING ARE GIVEN AS UNDER:**

**DISTRIBUTION OF TEACHING HOURS**

**First Year**

**Main Subjects**

S L No	Subject	Theory	Practical	Total
1	Human Anatomy	60	20	80
2	Physiology	60	20	80
3	Biochemistry I	60	20	80
4	Pathology I	55	20	75
5	Microbiology I	55	20	75
<b>Additional Subjects</b>				
1	Environmental Studies	As per degree course		
2	Data entry/ processing	10	10	20
3	Instrument maintenance	10	10	20
4	Chemical Hazards	10	10	20

**Second Year**

**A**

**Main Subjects**

S L No	Subject	Theory	Practical	Lab posting	Total
1	Biochemistry II	100	80	170	350
2	Microbiology II	100	80	170	350
3	Pathology II	100	80	170	350
	<b>Total</b>	<b>300</b>	<b>240</b>	<b>510</b>	<b>1050</b>

**Third Year**  
**Main Subjects**

S L No	Subject	Theory	Practical	Lab posting	Total
1	Biochemistry III	100	80	170	350
2	Microbiology III	100	80	170	350
3	Pathology III	100	80	170	350
	<b>Total</b>	<b>300</b>	<b>240</b>	<b>510</b>	<b>1050</b>

**EXAMINATION:**

1. A Candidate not passing in Main/Supplementary Examination will attend classes, Seminars, Practicals etc. as decided by the Principal in the subjects in which he/she is to appear at next examination.
2. The Medium of examination will be English.
3. The examination shall be held according to the scheme of examination as in this Ordinance.
4. 20% of the total marks in each subject of every examination separately for theory & Practical should be reserved for internal assessment determined by regular periodical examination and day to day assessment and certified class work. The marks of internal assessment will be divided equally between theory and practical.

**FEE:**

Admission Fees, Annual Fee, Evaluation Fee, etc. to be paid by the candidates shall be as prescribed by the University from time to time. In case any candidate does not pay his/her dues in time, his/her enrolment shall be cancelled without any further notice.

**PASSING SCORE:**

The Minimum number of marks required to pass in each examination i.e.

First/Second/Third Year shall be 50% Marks in aggregate in each of the subjects separately with a minimum of 50% marks in Theory (including oral examination) and clinical/practical separately inclusive of internal assessment, as the case may be.

1. A candidate who obtains pass marks in one or more subjects need not appear in that/those subjects again in any subsequent examination.
2. As soon as possible, after termination of the examination, the controller of Examinations shall publish the result of the candidates and issue Detailed – Marks – Card/Certificate.
3. Successful candidates who obtain 75% or more marks in any subject shall be declared to have passed with “distinction” in that subject provided he/she passes in all the subjects of the examination at one and the same time and the examination is annual Examination.
4. A successful candidate of the Third year B.Sc. MLT examination shall be granted the degree after he/she has completed the post examination internship training as prescribed.

**DISTRIBUTION OF MARKS AND SCHEME OF EXAMINATION**

**NAME OF THE COURSE: B.Sc. Medical Laboratory Technology**  
**Each Theory Question Paper will have two Parts:-**

**Part – A & Part – B**

**First Year**

Sr. No.	Main Subjects	Written Paper		I.A Theory	Viva - voce	Total	Practical		Total	Grand Total
		Duration	Marks	Marks	Marks	Marks	Univ. Pract	I.A	Marks	Marks
1	Basic Anatomy [Including histology]	3 hr.	Part A – 30 Part B – 30	20	20	100	80	20	100	200
2	Physiology	3 hr.	Part A – 30 Part B – 30	20	20	100	80	20	100	200
3	Biochemistry	3 hr.	Part A – 30 Part B – 30	20	20	100	80	20	100	200
4	Pathology	3 hr.	Part A – 30 Part B – 30	20	20	100	80	20	100	200
5	Microbiology	3 hr.	Part A – 30 Part B – 30	20	20	100	80	20	100	200
6	Environmental Studies		60	40 (Internal assessment of Theory & Practical)						100

IA = Internal Assessment

**Theory Examination**

**Part – A**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>		<b>30</b>	

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**Part – B**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**Grand Total - 60**

**Practical Examination**

**(Anatomy)**

Types of Questions	Marks
<b>Spotting of Gross Anatomy</b>	<b>30</b>
<b>Spotting of Histology</b>	<b>20</b>
<b>Osteology &amp; Gross Anatomy</b>	<b>20</b>
<b>Radiology &amp; Surface marking</b>	<b>10</b>
<b>Total Marks</b>	<b>80</b>

**(Physiology)**

Types of Questions	Marks
<b>Instruments</b>	<b>20</b>
<b>Operation/Methodology</b>	<b>20</b>
<b>Principles behind methodology</b>	<b>20</b>
<b>Representative results/curves</b>	<b>20</b>
<b>Total Marks</b>	<b>80</b>

**(Biochemistry)**

Types of Questions	Marks
<b>Safety measurements</b>	<b>20</b>
<b>Specimen collection</b>	<b>10</b>
<b>Lab apparatus &amp; Instruments</b>	<b>20</b>
<b>Units of measurements</b>	<b>10</b>
<b>Making stock standards &amp; working standards</b>	<b>20</b>
<b>Total Marks</b>	<b>80</b>



### (Pathology)

Types of Questions	Marks
<b>Urine Examination</b> <ul style="list-style-type: none"><li>▪ Physical</li><li>▪ Chemical</li><li>▪ Microscopic</li></ul>	15
<b>Blood Grouping</b>	10
<b>Haematology</b> <ul style="list-style-type: none"><li>▪ Hb</li><li>▪ BT, CT</li></ul>	10 15
<b>Histopathology</b> <ul style="list-style-type: none"><li>▪ Section Cutting</li><li>▪ H&amp; E Staining</li></ul>	15 15
<b>Total Marks</b>	80

### (Microbiology)

Types of Questions	Marks
<b>Spotters</b>	15
<b>General Microbiology</b>	10
<b>Immunology</b>	10
<b>Parasitology (Stool Examination)</b>	10
<b>Mycology</b>	15
<b>Virology</b>	10
<b>Record</b>	10
<b>Total Marks</b>	80

### Scheme of Examination Second Year

Paper	Subject	Theory			Practicals			Grand Total
		Univ. Exam	IA	Sub Total	Univ. Practicals	IA	Sub Total	
I	Biochemistry II	Part A – 40 Part B - 40	20	100	160	40	200	300
II	Microbiology II	Part A – 40 Part B - 40	20	100	160	40	200	300
III	Pathology II	Part A – 40 Part B - 40	20	100	160	40	200	300

### Theory Examination

**Part – A**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

**Part – B**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

**Grand Total - 80**

**Practical Examination  
(Biochemistry)**

Types of Questions	Marks
<b>Quality control</b>	<b>20</b>
<b>Normal values &amp; their interpretations</b>	<b>20</b>
<b>Special Investigations</b>	<b>80</b>
<b>Estimation of Blood Gases</b>	<b>20</b>
<b>Estimation of Electrolytes</b>	<b>20</b>
<b>Total Marks</b>	<b>160</b>

**(Pathology)**

Types of Questions	Marks
<b>Special Stain</b>	<b>20</b>
<b>PCV</b>	<b>20</b>
<b>Total count</b>	<b>20</b>
<b>Differential count</b>	<b>20</b>
<b>ESR</b>	<b>20</b>
<b>PS preparation and staining</b>	<b>20</b>
<b>Record</b>	<b>20</b>
<b>Spotters</b>	<b>20</b>
<b>Total</b>	<b>160</b>

## (Microbiology)

Types of Questions	Marks
Spotters	20
Media preparation	10
General Microbiology	20
Immunology	10
Parasitology (Stool Examination)	10
Mycology	10
Virology	10
Systemic Bacteriology	20
Record	10
Viva	40
<b>Total Marks</b>	<b>160</b>

### Scheme of Examination Third Year

Paper	Subject	Theory			Practicals			Grand Total
		Univ. Exam	IA	Sub Total	Univ. Practical	IA	Sub Total	
I	Biochemistry III	Part A – 40 Part B – 40	20	100	160	40	200	300
II	Microbiology III	Part A – 40 Part B – 40	20	100	160	40	200	300
III	Pathology III	Part A – 40 Part B – 40	20	100	160	40	200	300

### Theory Examination

#### Part – A

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

#### Part – B

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

**Grand Total - 80**

## **Practical Examination**

### **(Biochemistry)**

<b>Types of Questions</b>	<b>Marks</b>
<b>Urine analysis (Normal &amp; Abnormal)</b>	<b>20</b>
<b>Screening of urine with enzyme sticks</b>	<b>20</b>
<b>Urinary Stone analysis</b>	<b>10</b>
<b>Liver function tests</b>	<b>20</b>
<b>Lipid profile</b>	<b>20</b>
<b>Renal function test</b>	<b>20</b>
<b>Cardiac Markers</b>	<b>20</b>
<b>Estimation of Blood Glucose</b>	<b>10</b>
<b>Demonstration of Glucometer</b>	<b>10</b>
<b>Demonstration of complete Autoanalyzer.</b>	<b>10</b>
<b>Total</b>	<b>160</b>

### **(Pathology)**

<b>Types of Questions</b>	<b>Marks</b>
<b>Pap Stain</b>	<b>20</b>
<b>Special Stain</b>	<b>20</b>
<b>Cross matching</b>	<b>20</b>
<b>Coomb's test</b>	<b>20</b>
<b>Tissue processing &amp; Blocking</b>	<b>20</b>
<b>Knife Sharpening</b>	<b>20</b>
<b>Record</b>	<b>20</b>
<b>Spotters</b>	<b>20</b>
<b>Total</b>	<b>160</b>

### **(Microbiology)**

<b>Types of Questions</b>	<b>Marks</b>
<b>Spotters</b>	<b>20</b>
<b>Parasitology (Stool Examination)</b>	<b>15</b>
<b>Mycology</b>	<b>15</b>
<b>Virology</b>	<b>10</b>
<b>Systemic Bacteriology</b>	<b>40</b>
<b>Record</b>	<b>10</b>
<b>Viva</b>	<b>50</b>
<b>Total Marks</b>	<b>160</b>



# Syllabus of B.Sc. MLT Ist Year

## ANATOMY

### THEORY PAPER

Part – A & Part – B of each question Paper should be answered in separate answer sheets.

Time: 3 Hrs.

Max. Marks: 60

**PART – A**

Max. Marks: 30

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – B**

Max. Marks: 30

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

### PART – A

**1. Introduction:** human body as a whole Definition of anatomy and its divisions

Terms of location, positions and planes Cell and its organelles

Epithelium-definition, classification, describe with examples, function

Glands- classification, describe serous & mucous glands with examples

Basic tissues – classification with examples.

**2. Locomotion and support:** Cartilage – types with example & histology

Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull

Joints – Classification of joints with examples, synovial joint (in detail for radiology)

Muscular system: Classification of muscular tissue & histology

Names of muscles of the body

**3. Cardiovascular system:** Heart-size, location, chambers, exterior & interior

Blood supply of heart Systemic & pulmonary circulation

Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery

Peripheral pulse Inferior venacava, portal vein, portosystemic anastomosis

Great saphenous vein Dural venous sinuses

Lymphatic system- cisterna chyli & thoracic duct Histology of lymphatic tissues

Names of regional lymphatics, axillary and inguinal lymph nodes in brief

**4. Gastro-intestinal system:** Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)

Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas

Radiographs of abdomen

**5. Respiratory system:** Parts of RS, nose, nasal cavity, larynx, trachea, lungs,

bronchopulmonary segments Histology of trachea, lung and pleura

Names of paranasal air sinuses

**PART – B**

**6. Peritoneum**

Description in brief

**7. Urinary system**

Kidney, ureter, urinary bladder, male and female urethra

Histology of kidney, ureter and urinary bladder

**8. Reproductive system**

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology)

Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology)

Mammary gland – gross

**9. Endocrine glands**

Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal glad – (gross & histology)

## **10. Nervous system**

Neuron

Classification of NS

Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve  
(gross & histology)

Meninges, Ventricles & cerebrospinal fluid

Names of basal nuclei

Blood supply of brain

Cranial nerves

Sympathetic trunk & names of parasympathetic ganglia

Skin: Skin-histology

Appendages of skin

Eye: Parts of eye & lacrimal apparatus

Extra-ocular muscles & nerve supply

Ear: parts of ear- external, middle and inner ear and contents

Spermatogenesis & oogenesis

Ovulation, fertilization

Fetal circulation

Placenta

## **PRACTICALS**

Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

Histology of the 3 types of cartilage

Demo of all bones showing parts, radiographs of normal bones & joints

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

Histology of skeletal (TS & LS), smooth & cardiac muscle

Demonstration of heart and vessels in the body

Histology of large artery, medium sized artery & vein, large vein

Microscopic appearance of large artery, medium sized artery & vein, large vein  
pericardium

Histology of lymph node, spleen, tonsil & thymus

Normal chest radiograph showing heart shadows



Normal angiograms  
 Demonstration of parts of respiratory system.  
 Normal radiographs of chest  
 Histology of lung and trachea  
 Demonstration of reflections  
 Demonstration of parts of urinary system  
 Histology of kidney, ureter, urinary bladder  
 Radiographs of abdomen-IVP, retrograde cystogram  
 Demonstration of section of male and female pelvis with organs in situ  
 Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary  
 Radiographs of pelvis – hysterosalpingogram  
 Demonstration of the glands  
 Histology of pituitary, thyroid, parathyroid, suprarenal glands  
 Histology of peripheral nerve & optic nerve  
 Demonstration of all plexuses and nerves in the body  
 Demonstration of all part of brain  
 Histology of cerebrum, cerebellum, spinal cord  
 Sensory organs:  
 Histology of thin and thick skin  
 Demonstration and histology of eyeball  
 Histology of cornea & retina  
 Embryology:

## **PHYSIOLOGY**

### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 60**

**PART – A**

**Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – B****Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – A**

- ❖ Functions of cell organelles, tissues, organs, coordination amongst various organs as functional systems. Digestive, Respiratory

**PART – B**

- ❖ CVS, humoral & neural regulation of functions. Effect of environment on various functions of body.

**PRACTICALS**

1. Instrumentation used in Physiology
2. Various techniques used in Physiology

**BIOCHEMISTRY****THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.****Max. Marks: 60****PART – A****Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – B****Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – A**

- ❖ General introduction Role of medical lab technologists, Ethics, responsibility, safety measures and first aid. Cleaning and care of general laboratory Glassware and equipment.
- Distilled water: Types of distilled water plants, preparation & storage
- Analytical balance: Principal, Working & maintenance; Preparation of reagents: Formulation and preparation;
- Standard solutions: Various std. solutions used, their preparation; storage of chemicals. Units of measurements: S.I units: Definitions, conversions; Measurement of volume: Strength, Normality, Molarity, Molality: volumetric apparatus, calibration of volumetric apparatus

**PART – B**

- ❖ pH
- Osmosis, dialysis, surface tension
- Collection and recording of biological specimens, separation of serum plasma preservation and disposal of biological samples/materials.
- Volumetric analysis preparation of standard acid and base solutions.
- Urine analysis (Qualitative).
- Chemistry of Carbohydrates, Proteins, Vitamins, Enzymes, Fats, Electrolytes PH
- Blood buffers

**PRACTICALS**

1. Safety measurements.
2. Specimen collection.

3. Introduction to laboratory apparatus.
4. Instruments.
5. Units Of Measurements in Biochemistry.
6. Making Stock Standards & working Standard.

**PATHOLOGY**  
**THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 60**

**PART – A**

**Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – B**

**Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

**PART – A**

**HISTOPATHOLOGY**

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques – various Mountants
- Maintenance of records and filing of the slides.
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Bio-Medical waste management

- Section Cutting
- Tissue processing for routine paraffin sections
- Decalcification of Tissues.
- Staining of tissues - H& E Staining
- Bio-Medical waste management
- Clinical Pathology – Theory
- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical Specimens
- Urine Examination – Collection and Preservation of urine.  
Physical, chemical, Microscopic Examination
- Examination of body fluids.
- Examination of cerebro spinal fluid (CSF)
- Sputum Examination.
- Examination of feces

## **PART – B**

### **HAEMATOLOGY**

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV
- ESR
- Normal Haemostasis    Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.

### **BLOOD BANK**

- Introduction
- Blood grouping and Rh Types
- Cross matching

## **PRACTICALS**

- Urine Examination.
- Physical
- Chemical
- Microscopic
- Blood Grouping, Rh typing.
- Hb Estimation, Packed Cell Volume[PCV], Erythrocyte Sedimentation rate{ESR}
- Bleeding Time, Clotting Time.
- Histopathology – Section cutting and H &E Staining.

## **MICROBIOLOGY**

### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 60**

#### **PART – A**

**Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

#### **PART – B**

**Max. Marks: 30**

Type of Questions	No. of Questions	Marks	Sub-total
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total Marks</b>	<b>30</b>		

## PART – A

### General Microbiology

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	Introduction and Historical Background	Importance of Medical Microbiology in diagnosis and prevention of infectious diseases. Contribution of Antony van Leeuwenhoeck, Pasteur, Lister, Robert Koch, Fleming, Jenner etc.
2.	Morphology of Bacteria and classification	Bacterial cell, morphology, Morphological classification, Method of studying of bacteria, Staining methods and their principles, especially Gram and Zeihi Neelsen Staining their importance in presumptive diagnosis, Negative staining methods.
3.	Physiology of Bacteria including growth requirement	Nutrition, Respiration (aerobic and anaerobic) and growth of bacteria, growth curve, physical factors influencing growth and metabolism
4.	Sterilization and Disinfections	Definition of sterilization, disinfection, Asepsis, antisepsis, Enumeration of physical methods of sterilization which includes principles and their application. Detail on working and efficacy testing of autoclave, Hot air oven, Inspissator, Koch's steamer and Pasteurization. Detail of antiseptic and disinfectants.
6.	Culture Media and culture method	Definition, Classification and Application
7.	Infection	Types of Infection, Mode of Infection and predisposing factors

### IMMUNOLOGY

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	Immunity	Definition of immunity, types of immunity, factors responsible, mechanism of innate immunity, Active and passive immunity, local immunity and can add note on herd immunity.

- |    |   |   |
|----|---|---|
| 2. | Antigens, HLA                           | Definition, types, antigen determinants, properties of antigen. MHC – concept, class I, II and III, functions, indication and typing  |
| 3. | Antibodies                              | Definition, nature, structure, Classes and properties of immunoglobulin   |
| 4. | Structure and function of Immune System | Primary lymphoid organs – thymus, bursa of Fabricius, Bone marrow. Secondary lymphoid organs lymph nodes, spleen, mucosa – associated lymphoid tissue, gut associated lymphoid tissue (MALT and GALT). Cells of immune system – lymphocytes, T cell, B cells, Null cells, Antigen presenting cells (APC). |

## **PART – B**

### **PARASITOLOGY**

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	Introduction to Parasitology	Parasite: - Their nature, classification, explanation of terminology. Laboratory diagnosis of parasite infection including sample collection.

### **MYCOLOGY**

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	General Mycology	Nature of Fungus (Definition, Differences with bacteria). Characterization of fungi, Method of Identification.

### **VIROLOGY**

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	General Virology	Basic structure, Shape, Size, Symmetry, resistance, multiplication, classification of viruses, pathogenesis and pathology of viruses, concept of virions. Bacteriophage with relation to virulence mechanism and Epidemiology.  - Laboratory diagnosis of viral infections, Collection of samples, Transport,



Cultivation and method of diagnosis.

- Viral immunity and treatment – viral immunity, interferons, viral vaccines.
- Commonly used antiviral agents.

## **PRACTICALS**

Compound Microscope. – Care and handling  
Care and maintenance of equipment  
Handling and cleaning of glassware apparatus  
Staining-  
a. Gram staining  
b. ZN staining  
c. Alberts staining  
Hanging drop preparation

Demonstration and sterilization of equipments - Hot air oven, Autoclave, Bacterial filters.

Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar,

Chocolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media,

- Demonstration of Bacterial capsule, Spore metachromatic granules.
- Scheme for laboratory diagnosis of infective disease which includes collection, storage and transport of microbiological specimens.
- Sterilization – Demonstration of physical agents, chemical agents and method of waste disposal. Visit to hospital for demonstration of biomedical waste management.

Data entry/ processing:-

Instrument maintenance

Chemical Hazards

## Syllabus of B.Sc. MLT IInd Year

### BIOCHEMISTRY

#### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

**PART – B**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

#### **PART – A**

Colorimetry, Spectrophotometry, Flamephotometry, Atomic absorption spectroscopy, Electrometric determination of Na<sup>+</sup> and K<sup>+</sup>,

#### **PART – B**

Chromatography, Electrophoresis, Radioimmunoassay (RIA) and ELISA

Introduction, properties and simple metabolism of carbohydrates, proteins and fats, Nucleicacids and Enzymes(introduction,General properties)

## **PRACTICALS**

1. Quality Control.
2. Normal Values and their interpretations.
3. Special Investigations.
4. Estimation of Blood Gases.
5. Estimation of Electrolyte.

## **PATHOLOGY**

### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

**PART – B**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

## **PART – A**

### **HISTOPATHOLOGY AND HEMATOLOGY**

Instrumentation:

- (a) Automated Tissue Processor
- (b) Microtomes, Knives, Knife sharpners  
and Ultramicrotome
- (c) Freezing microtome and Cryostat
- (d) Automatic slide stainer

Techniques :

- (a) Routine paraffin section cutting
- (b) Frozen section and Cryostat section studies

Staining techniques: Special stains for Carbohydrates, Connective tissue, Nervous tissue, Bone tissue, Collage fibers, Elastic Fibers, Lipids, Organisms, fungi, parasites, pigments and deposits in tissues

Mounting techniques: Various mounts and mounting techniques

.

Electron Microscope, Scanning electron microscope, Dark ground and Flurescent microscope

Museum technology

Microphotography and its applications

Maintenance of records and filing of slides

ICDS Classification and coding

Application of computers in Pathology

## **PART – B**

### **HEMATOLOGY**

Hemopoiesis, Stem cells, formed elements and their functions

Anticoagulants used in various hematological studies

Routine hematological tests and normal values:

- (a) Determination of Hemoglobin and Hematocrit
- (b) Enumeration of RBC, WBC & Platelets

- (c) Absolute Eosinophil count
- (d) Reticulocyte count
- (e) Calculation of Red cell Indices
- (f) Preparation of staining of blood film for morphology of

red cells and differential count

Special Hematological tests:

- (a) Sickling tests
- (b) Osmotic fragility test
- (c) Determination HbF and HbA<sub>2</sub>
- (d) Hemoglobin Electrophoresis
- (e) Investigation of G6PD deficiency
- (f) Plasma haptoglobin and demonstration of hemosiderin in urine
- (g) Tests for Autoimmune hemolytic anemia
- (h) Measurement of abnormal Hb pigments

Hemostasis and Coagulation

- (a) Normal hemostasis, mechanism of blood coagulation and normal fibrinolytic system
- (b) Collection of blood and anticoagulants used in coagulation studies
- (c) Investigation of hemostatic mechanism-BT, CT, whole blood coagulation time test, PT, PTT
- (d) Assay of clotting factors
- (e) Tests for fibrinolytic activity- Euglobulin , clot lysis test and FDP
- (f) Platelet function tests

Investigation of Megaloblastic anemia and Iron deficiency anemia

- (a) B<sub>12</sub> and Folate assay and Schilling test
- (b) Estimation of serum iron and iron binding capacity

Bone marrow biopsy study

- (a) Needle aspiration and surgical biopsy technique
- (b) Preparation of smears and staining

Demonstration of LE cells

Cytochemistry

Administration in Hematology and Quality control

## **PRACTICALS**

1. Paraffin section cutting
2. Staining by Hematoxylin & Eosin and other special stains
3. Determination of Hemaglobin and Hematocrit
4. Red blood cell count
5. Total white blood cell count
6. Platelet count
7. Differential count of white blood cells
8. Absolute Eosinophil count
9. Reticulocyte count
10. Calculation of red cell indices
11. Determination of ESR
12. Determination of BT, CT, Whole blood clotting time
13. Determination of PT and PTT
14. Blood smear preparation and staining
15. Osmotic fragility test
16. Sickling test

## **MICROBIOLOGY**

### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

**PART – B****Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

**PART – A****General Microbiology**

1. Chemotherapy
 

Mode of action of antimicrobials on bacteria antimicrobial susceptibility Tests, disk diffusion test- Kirby – Bauer’s method and Stoke’s method. Tube dilution test i.e. Minimum Inhibitory concentration test.
2. Sterilization and Disinfections
 

Definition of sterilization, disinfection, Asepsis, antiseptis, ubiquity of bacteria, Modes of killing microbes and preventing them. Enumeration of physical methods of sterilization which includes principles and their application. Detail on working and efficacy testing of autoclave, Hot air oven, Inspissator, Koch’s steamer and Pasteurization. Detail of antiseptic and disinfectants.
3. Waste Disposal
 

Definition of waste, Classification, Segregation, Transport and Disposal.
4. Culture Media
 

Definition, Classification and Application. Can add note on important constituents of culture Media.
5. Microbiological Specimen
 

collection, transportation and processing of specimens for microbiological diagnosis
6. Identification of Bacteria
 

Culture methods, biochemical reactions and serological tests and animal

pathogenicity.

- |                      |   |
|----------------------|---|
| 7. Normal Flora      | Introduction – various sites, types and role. |
| 8. Laboratory Animal | Care and handling of laboratory animals       |

## **IMMUNOLOGY**

- |                          |  |
|--------------------------|--|
| 1. Serological Reactions | Precipitation, Agglutination, Complement fixation, ELISA, RIA, immunofluorescent test, neutralization and opsonization.                    |
| 2. Immune Response       | Humoral – Primary and Secondary immune responses. CMI – Definition, types, role of T cells and macrophages.                                |
| 3. Complement            | Definition, components, synthesis, pathways of activation, role and biological functions.  |
| 4. Hypersensitivity      | Definition, Classification, A brief about immediate and Delayed Reactions.   |
| 5. Vaccination           | National immunization Programme. Immunoprophylaxis. Nature of vaccines, rationale and dosage. Principles of Immunization. Future Vaccines. |
| 6. Molecular techniques  | - PCR, DNA hybridization   |

## **PART – B**

### **PARASITOLOGY**

<b>Sr. No.</b>	<b>Topic of Lecture</b>	<b>Contents</b>
1.	E. histolytica	Geographical distribution, habitat, morphology, life cycle, Pathogenesis, laboratory diagnosis, Treatment, control.
2.	Free living amoebae flagellates	Giardia,
3.	Haemoflagellates	Leishmania donovani – Geographical distribution habitat Morphology, Life Cycle, Pathogenesis, Laboratory diagnosis, Treatment, Immunoprophylaxis. Brief account of Trypanosomes.



- |    |                                   |  |
|----|-----------------------------------|--|
| 4. | Malaria                           | Malaria parasites:- Geographical distribution, habitat, Morphology, Life cycle, Pathogenesis, Laboratory Diagnosis, Treatment, Control, immunoprophylaxis. |
| 5. | Miscellaneous Pathogenic Protozoa | Toxoplasma. Brief account on Cryptosporidium, Isospora, Balantidium Coli.  |

### **MYCOLOGY**

- |    |                      |   |
|----|----------------------|---|
| 1. | Superficial Mycosis  | Dermatophytes , Malsezzia furfur, clinical feature, morphological features. Predisposing factors, Lab diagnosis – Specimen collection, Microscopy, Cultural characteristics of important species. |
| 2. | Subcutaneous Mycosis | Mycetoma,   |

### **VIROLOGY**

- |    |                |  |
|----|----------------|--|
| 1. | Herpes Viruses | List of viruses included, Lesions produced, pathogenesis and latency, laboratory diagnosis, method of prevention.  |
| 2. | Rhabdoviruses  | Morphology, Pathogenesis, Antemortum diagnosis in rabies. Antirabies vaccines  |
| 3. | Arboviruses    | List of arboviruses prevalent in India, Dengue, KFD, Japanese encephalitis – Definition, Classification, Pathogenesis, Laboratory diagnosis And control. |

### **SYSTEMIC BACTERIOLOGY**

Sr. No.	Topic of Lecture	Contents
1.	Gram Positive Cocci	- <u>Staphylococcus, Streptococcus</u> <u>/Pneumoccus</u> - Classification, Morphology,

- Pathogenesis, Diseases caused, Laboratory diagnosis
- 2. Gram Negative Cocci - Gonococci, Meningococci
  - Classification, Morphology, Pathogenesis, Diseases caused, Laboratory diagnosis

## **PRACTICALS**

### **General Bacteriology**

1. Introduction to biochemical reactions
2. Culture methods, anaerobic culture methods.
3. Motility study
4. Antibiotic sensitivity testing – Kirby Bauer method
5. Laboratory Animals.

### **Immunology**

Serological tests:

- a. Specimen collection
- b. Principle
- c. Methods
- d. Procedure
- e. Normal values/Significant titer
- f. Interpretations
- g. Limitations : of all the following tests
  - i Widal
  - ii ASO
  - iii CRP
  - iv RPR/VDRL
  - v RA
  - vii ELISA

### **Systemic Bacteriology**

- Identification by staining, culture, biochemical reactions, serology and special diagnostic procedures

### **Virology**

- Morphology of viruses.
- Egg inoculation Techniques

### Mycology

- Identification by staining, culture, lactophenol cotton blue preparation, serology and special diagnosis procedures for fungi.

### Parasitology

- Medical Entomology.
- Stool Examination for demonstration of trophozoites and cyst of the parasites.
- Demonstration of blood smear – (thin and thick smear) for demonstration of malaria parasite.
- Demonstration of promastigote and amastigote forms of Leishmania donovani.
- Demonstration of NNN media.

## Syllabus of B.Sc. MLT IIIrd Year

### BIOCHEMISTRY

#### **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

**PART – B**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>		<b>40</b>	

## **PART – A**

Principles of assay procedures for biological materials Total proteins, albumin, Glucose, Urea,

Uric acid, Creatinine, Cholesterol, Bilirubin.

Sodium, Potassium, Chloride, Calcium and phosphorus.

PBI, 17- Ketosteroids, Barbiturates

Glucose tolerance test, insulin tolerance test, gastric analysis, xylose absorption test, clearance

## **PART – B**

Test for renal function-

Enzymes Acid and alkaline phosphates, AST, ALT, Amylase and lactate dehydrogenase, CPK

Analysis of calculi and CSF

Quality control of clinical investigations, Automation in clinical biochemistry laboratory, laboratory organisation management and maintenance of records

## **PRACTICALS**

1. Urine Analysis (Normal & Abnormal)
2. Screening of urine with enzyme sticks.
3. urinary stone analysis.
4. Liver function tests.
5. Lipid profile.
6. Renal function Tests.
7. Cardiac Markers.
8. estimation of blood glucose.
9. Demonstration of Glucometer.
10. Demonstration of complete Autoanalyzer.

# **PATHOLOGY**

## **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

**PART – B**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

## **PART – A**

### **CYTOLOGY**

1. Normal cell structure, functions, cytologic criteria of malignancy
  2. Types of specimens, methods of collection & preparation of cell block
  3. Different fixatives and methods of fixation
  4. Staining :
    - (a) Papanicolaou's stain- principle , preparation and staining techniques
    - (b) May Grunwald Giemsa stain
    - (c) Shorr's stain
    - (d) Aceto orcin stain
- Female Genital tract
1. Anatomy, Histology, Physiology & normal cytology

2. Techniques of collection of specimen for cervical cytology study
  3. Hormonal cytology and cytological indices
  4. Cervical cytology screening for malignant and nonmalignant conditions , Radiation changes & follow up
  5. Cytology of Endometrium – normal , nonmalignant and in malignant conditions
  6. Cytology in Ovarian cancers
- Respiratory tract, Gastrointestinal tract and Urinary tract
1. Anatomy, Histology and Physiology
  2. Collection of sample, preparation of smears and staining
  3. Cytology of normal, nonmalignant & malignant conditions
- C S F and Effusions
1. Cytology of CSF in inflammatory, nonmalignant & malignant Conditions
  2. Cytology of effusions in nonmalignant and malignant conditions
- Glands – Breast, Thyroid, Salivary glands and Lymph nodes
1. Anatomy , Histology and Physiology
  2. Fine needle aspiration cytology of glands and other soft tissue mass
  3. Cytologic features in nonmalignant and malignant conditions of different glands and nipple discharges
- Automation in Cytology
1. Flow cytometry
  2. Image Analysis
  3. Principles, Equipments, procedures & Evaluation

### **Tissue culture and Immunohistochemistry**

1. Equipments for Tissue culture studies
  - (a) Laminar air flow equipment
  - (b) Carbon dioxide incubator
  - (c) Inverted microscope
2. Derivation of culture from tissue
  - (a) Enzymatic digestion of tissue using collagenase, protease
  - (b) Plating in tissue culture media
  - (c) Observation of cells in Invertoscope
  - (d) Subculturing & derivation of cell lines
3. Characterization of cell lines
  - (a) Determination of biochemical markers in cells
  - (b) Chromosomal & DNA content of cells
- © Immunological properties of cells
4. Preservation of Immortalized cell lines
  - (a) Storage in Glycerol in Liquid Nitrogen
  - (b) Storage in Dimethyl sulfoxide in Liquid Nitrogen

### **PART – B**

#### **Cytogenetics**

1. Introduction to cytogenetics, terminology , classification and nomenclature of human chromosomes

2. Methods of karyotypic analysis
  - (a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts
  - (c) Direct preparation from tumor materials
3. Characterization of human chromosomes by various banding techniques
4. Sex chromatin identification
5. Chromosomes in neoplasia and oncogenes

### **Immunocytochemistry**

1. Basics concepts, monoclonal antibodies & preparation
2. Fluorescence reactions

### **Immunoematology and Blood transfusion**

1. ABO Blood group and Rh system
2. Subgroups of A and B , Other blood groups and Bombay group
3. HLA antigens and their significance
4. Principles of Blood transfusion:
  - (a) Blood donor selection
  - (b) Methods of bleeding donors
  - (c) Blood containers, anticoagulants and storage of blood
  - (d) Coomb's test and its significance
  - (e) Screening of blood for infective material
  - (f) Blood components, preparation & component therapy
  - (g) Autologous transfusion
  - (h) Transfusion reactions and work up
  - (i) Blood bank organization, standards, procedures, techniques and quality control

### **PRACTICALS**

#### **Preparation of various cytology smears and fixation**

1. Papanicolaou's and May Grunwald Geimsa staining
2. Blood grouping and Rh typing
3. Cross matching techniques
4. Screening of Donor's blood for infective agents
5. Transfusion reaction work up
6. Preparation of blood components
7. Knife Sharpening

# **MICROBIOLOGY**

## **THEORY PAPER**

**Part – A & Part – B of each question Paper should be answered in separate answer sheets.**

**Time: 3 Hrs.**

**Max. Marks: 80**

**PART – A**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

**PART – B**

**Max. Marks: 40**

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	One	1x10	10
Short Essay (SE)	4 (To attempt 3)	3x5	15
Short Answer (SA)	6 (To Attempt 5)	5x3	15
<b>Total</b>	<b>40</b>		

## **PART – A**

### **PARASITOLOGY**

1. Cestodes  
Taenia saginata and solium, Echinococcus granulosus Life cycle, Morphology, Pathogenesis, Laboratory diagnosis, control.  
Brief account of H.nana, D.latum.
2. Trematodes  
Schistosomiasis – Geographical distribution, habitat, Morphology, Life



- cycle, Pathogenesis, Laboratory Diagnosis.
3. Intestinal Nematodes  
Brief account of Fasciola hepatica. Geographical distribution, habitat, Morphology, Life cycle, Pathogenesis, Laboratory diagnosis, Control E. vermicularis, T. Trichura. Brief account on S. stercoralis- Life cycle, Morphology, Laboratory diagnosis.
4. Tissue Nematodes  
Geographical distribution, habitat, Morphology, Life cycle, , Morphology, Pathogenesis, Laboratory diagnosis, Treatment, control, Immunoprophylaxis of W.bancrofti, D. medinensis, in brief – T.spiralis.

### MYCOLOGY

Sr. No.	Topic of Lecture	Contents
1.	Systemic Mycosis	Cryptococcus, Histoplasmosis
2.	Opportunistic fungal Infection	Candida, Aspergillosis, Penicillois, Zygomycosis, Mycotoxins Pneumocystis

### VIROLOGY

Sr. No.	Topic of Lecture	Contents
1.	Hepatitis Viruses	Immunity, Resistance, Laboratory Diagnosis, method of prevention and control (including vaccines) in detail. Poliomyelitis, important features of coxsackie, Enteroviruses.
2.	Retroviruses	HIV/AIDS, Morphology, Pathogenesis , Immunity, Lab diagnosis, Laboratory tests and their on interpretation, Universal precautions, Specific precautions, Recent trends in diagnosis and prophylaxis.

3. Orthomyxo Viruses -Morphology, Pathogenesis, Classification, Antigenic variation in influenza virus with relevance to vaccine efficacy.

## **PART - B**

### **SYSTEMIC BACTERIOLOGY**

- |    |                         |   |
|----|-------------------------|---|
| 1. | Gram Positive Bacilli   | <ul style="list-style-type: none"> <li>- <u>C. diphtheriae</u>, Clostridia, bacillus, Listeria, Actinomyces, Nocardia</li> <li>- Classification, Morphology, Pathogenesis, Diseases caused, Laboratory diagnosis</li> </ul>   |
| 2. | Gram Negative Bacilli   | <ul style="list-style-type: none"> <li>E.coli, Klebsiella, Enterobacter, Proteus, Salmonella, Shigella, Yersinia, Pseudomonas, Haemophilus, Brucella, Pasturella, Legionella, Bordetella, Burkholderia, Gardnerella, Vibrio, Campylobacter, Helicobacter, Bacteriodes, Fusobacterium, Acinetobacter</li> <li>Classification, Morphology, Pathogenesis, Diseases caused, Laboratory diagnosis</li> </ul> |
| 3. | Spirocheates            | <ul style="list-style-type: none"> <li>Treponema, Borrelia, Leptospira</li> </ul>   |
| 4. | Mycobacteria            | <ul style="list-style-type: none"> <li>M. tuberculosis, M. leprae, Atypical Mycobacteria</li> </ul>   |
| 5. | Mycoplasma, Chlamydiae, | <ul style="list-style-type: none"> <li>- Classification, Morphology, Pathogenesis, Diseases Rickettsiaceae caused, Laboratory diagnosis</li> </ul>  |

### **APPLIED MICROBIOLOGY**

1. Gastrointestinal infections (Diarrhea and Dysentery) and their laboratory diagnosis.

2. Upper Respiratory tract infections (Patch and sore throat) and their laboratory diagnosis.
  3. Lower Respiratory tract infections (Pneumonia, Bronchitis, Bronchiolitis etc.) and their laboratory diagnosis.
  4. Urinary tract infections and their laboratory diagnosis.
  5. Infection of Central Nervous System (Meningitis, Encephalitis, Brain abscess) and their laboratory diagnosis.
  6. Wound infection and Pyogenic infections.
  7. Pyrexia of unknown origin, organisms and their laboratory diagnosis.
  8. Sexually transmitted disease and their laboratory diagnosis.
  9. Eye infections and their laboratory diagnosis.
  10. Bone and joint infections and their laboratory diagnosis.
  11. Food poisoning and their laboratory diagnosis.
- a. Hospital infections, role of laboratory in cross infections, control policies.

## **PRACTICALS**

### **Parasitology:-**

- Medical Entomology.
- Stool Examination for demonstration of ova of the parasites.
- Demonstration of NIH swab

### **Mycology:-**

- Identification by staining, culture, lactophenol cotton blue preparation, serology and special diagnosis procedures for fungi.

### **Virology:-**

- Morphology of viruses.
- Egg inoculation Techniques

### **Systemic Bacteriology:-**

- Identification by staining, culture, biochemical reactions, serology and special diagnostic procedures for bacteria.