UNIVERSITY OF JAMMU

(NAAC ACCREDITED A + GRADE UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION

(20/Jul/Adp/18)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of Regulations & Curriculum governing the degree of **Bachelor of Science in Medical Lab Technology (B.Sc. Medical Lab Technology)** from the Academic Session **2020-21 onwards** as given in the **Annexure-I & II.**

The Regulations & Curriculum of the course is available on the University Website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/20/1259-1264
Dated:07/08/2020

Copy for information & necessary action to:-

1. Dean Faculty of Medical Sciences
2. Principal, GMC, Jammu
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Incharge University Website

Sumita Sharma 5/8/2020.
Deputy Registrar (Academic)
4/8/20

Regulations & Curriculum For Bachelor of Science Degree Courses In

B.Sc Medical Lab Technology

Courses offered in Allied Health Sciences:

1. B.Sc Medical Lab Technology.
2. B.Sc Radiography.
3. B.Sc Cardiac Care Technology
4. B.Sc Operation Theatre.
5. B.Sc Respiratory Care Technology.
6. B.Sc Anesthesia Technology.
7. B.Sc Neuro Sciences Technology.
8. B.Sc Renal Dialysis.

A. INTRODUCTION

B.Sc (Allied Health Sciences) course is aimed at training students to prepare them as qualified physician assistants who will be able to meticulously assist the concerned specialist in handling the various illnesses. This program is a taught course that covers relevant topics and specialized areas of knowledge as opted. The aim of this B.Sc Program is to provide a through training to the candidates through formal lectures and or seminars and practical programs which culminate in a internship course that finally prepares the student for the rigors of the medical world.

B. SHORT TITLE AND COMMENCEMENT

These Regulations shall be called the "Regulations for B.Sc (Allied Health Sciences) Course". These regulations shall be deemed to have come into force from the academic year _____. These regulations are subject to modifications as may be approved by the concerned faculty / Board of studies from time to time.

C. ELIGIBILITY FOR ADMISSION

a) A candidate seeking admission to the Bachelor of Science Degree Courses in the Allied Health Sciences course from Sl.No. 1 to 8 shall have passed the 10 + 2 examination or equivalent examination from a recognized Board / University with Physics, Chemistry & Biology as principle subjects of study.

(MR. J.C. FRANK). (Sonam Sharma) Kheema Peshin

b) Lateral entry to second year for allied health science courses for candidates who have passed diploma program from the Government Boards and recognized by Jammu and Kashmir State Paramedical Council and shall have passed 10+2 with Physics, Chemistry & Biology as principal subjects and these students are eligible to take admission on lateral entry system only in the same subject studied at diploma level.

NOTE:

a. The candidate shall have passed individually in each of the principal subjects.
b. Candidates who have completed diploma or vocational course through Correspondence shall not be eligible for any of the courses mentioned above.
c. A candidate should have completed the age of 17 Years as on 31st December of the year of admission.

D. DURATION OF THE COURSE

Duration shall be for a period of three and half years including six months of Internship.

E. MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be in English.

F. SCHEDULE OF EXAMINATION

The University shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the head of the institution along with the application for examination and the prescribed fee.

G. SCHEME OF EXAMINATION

There shall be three examinations one each at the end of 1 st , 2nd and 3rd year.

ELIGIBILITY FOR THE EXAMINATION :

The Examination each year shall be open to :

a) A regular student who produces the following certificates signed by the Head of the Department / Principal of the College :
   i. Certificate of good character.
   ii. Certificate that the student attended the required number of lectures as prescribed under statutes.
   iii. Certificate that the student has qualified the sessionals / Clinicals etc.

b) A candidate who has otherwise eligible to appear in the Examination in the particular year but :
   i. Could not appear due to genuine reason (to be certified by an appropriate authority.
   ii. Was unable to pass the examination in any paper (s).

H. 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. A candidate lacking in prescribed percentage of attendance in any subjects either in theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject .The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the University.

CONDONATION :

Not with standing anything contrary contained in any provision of these statutes where any candidate falls short of attendance in any year it may be condoned after sufficient cause is shown by him/her in writing in this regard :

a) By the Head of the Department / Principal of the College up to maximum of 5% of the total lectures delivered in all the papers. In addition to this a maximum of 5% of the total lectures delivered may also be condoned by the Vice-Chancellor.

Provided that np condition in shortage shall be permitted by the Vice-Chancellor unless endorsed and recommended by the Head of the Department / Principal of the College.

PARTICIPATION IN SPORTS EVENTS :

i. Not with standing anything contrary contained in these statutes, where a candidate participates in any one or more of the activities as specified in the University statutes, he/she may be treated as present on all working days not exceeding 30 days in one academic year.

ii. The Candidate participating in such event must produce a copy of certificate to the Head of the Department / Principal of the College within seven days from the end of the event, failing which no such benefit shall be given.

iii. The authority competent to issue the candidate participation certificate shall bring to the notice of the Head of the Department, name, roll no. of the candidate and the date(s) on which the activities were conducted within a week's period from the end of the event.

I. INTERNAL ASSESSMENT (IA)

Theory - 20 marks.

Practical - 10 marks. [Lab work- 06 marks and Record-04 marks]

There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two tests will be calculated and reduced to 20. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to

the records of such periodical tests.

The marks of the internal assessment must be displayed on the notice board of the respective colleges with in a fortnight from the date test is held.

If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

*** There shall be no University Practical Examination in First year.**

J. CURRICULUM

Subject and hours of teaching for Theory and Practicals

The number of hours of teaching theory and practical, subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Main and Subsidiary subjects are common in first year for all the courses in Allied Health Science.

The number of hours for teaching theory and practical for main subjects in first, Second and Third year are shown in Table-I, II and III.

Table – I Distribution of Teaching Hours in First Year Subjects

Main Subjects

S.No	Subject	Theory No. of Hours	Practical No. of Hours	Total No. of Hours.
1	Human Anatomy	70	20	90
2	Physiology	70	20	90
3	Biochemistry	70	20	90
4	Pathology – [Clinical Pathology, Hematology & Blood Banking	70	20	90
5	Microbiology	70	20	90
	Total	350	100	450

The classes in main and subsidiary subjects are to be held from Monday to Thursday. On Fridays and Saturdays students shall work in hospitals in the respective specialty or department chosen by them

Subsidiary Subjects

English 25 Hours

Health-Care 40 Hours

Hospital posting – 470 Hours Fri day 9am - 1pm and 2pm - 4-30 pm
Saturday 9am - 1pm

Table – II Distribution of Teaching Hours in Second Year Subjects

Main Subjects

S.No	Subject	Theory No. of Hours	Practical No. of Hours	Clinical posting	Total No. of Hours.
1	Biochemistry II	100	80	170	350
2	Microbiology II	100	80	170	350
3	Pathology II	100	80	170	350
	Total	**300**	**240**	**510**	**1050**

Subsidiary Subjects

Sociology	20 Hours
Constitution of India	10 Hours
Environmental Science &Health	10 Hours

Table – III Distribution of Teaching Hours in Third Year Subjects

Main Subjects

S.No	Subject	Theory No. of Hours	Practical No. of Hours	Clinical posting	Total No. of Hours.
1	Biochemistry – III	100	80	170	350
2	Microbiology – III	100	80	170	350
3	Pathology – III	100	80	170	350
	Total	**300**	**240**	**510**	**1050**

Subsidiary Subjects

Ethics, Database Management	50 Hours
Research & Biostatistics	20 Hours
Computer application	10 Hours

*** There shall be no University Practical Examination in First year.**

K SCHEME OF EXAMINATION

There shall be three examinations, one each at the end of I, II and III year. The examination for both main and subsidiary subjects for all courses in Allied Health Sciences shall be common in the first year. Distribution of Subjects and marks for First Year, Second year & Third year University theory and practical Examinations are shown in the Table - IV, V & VI.

First year examination:

The University examination for 1st year shall consist of only theory examination and there shall be no University Practical Examination.

Second & Third year examination:

The University examination for 2nd and 3rd year shall consist of Written Examination & Practical.

Written Examinations consists of :

04 papers in the 2nd Year

02 papers in the 3rd Year.

Practical examination:

Two practical examinations, at the end 2nd Year and one practical examination at the end of the 3rd year.

Table – IV Distribution of Subjects and marks for First Year University theory Examination.

A	Main Subject *	Written Paper		Internal Assessment	Total
		Duration	Marks	Theory (Marks)	Marks
1	Basic Anatomy [Including Histology]	3 Hours	80	20	100
2	Physiology	3 Hours	80	20	100
3	Biochemistry	3 Hours	80	20	100
4	Pathology	3 Hours	80	20	100
5	Microbiology	3 Hours	80	20	100

B	Subsidiary Subject * *				Total
1	English	3 Hours	80	20	100
2	Health Care	3 Hours	80	20	100

Note * IA = Internal Assessment

Main Subjects shall have University Examination.

** Subsidiary subjects: Examination for subsidiary

Subjects shall be conducted by respective colleges.

Table – V Distribution of Subjects and marks for Second Year Examination.

Paper	Subjects	Theory		IA	Sub Total	Praticals			
		Theory	Viva-Voca			Univ Practicals	IA	Sub total	Grand Total
I	Biochemistry II	80		20	100	80	20	100	200
2	Microbiology II	80	-	20	100	80	20	100	200
3	Pathology II	80		20	100	80	20	100	200

Distribution of Subsidiary Subjects and marks for Second Year Examination.

B	Subsidiary Subject *	Written Paper		Internal Assessment	Total
		Duration	Marks	Theory (Marks)	Marks
1	Sociology	3 Hours	80	20	100
2	Constitution of India	3 Hours	80	20	100
3	Environmental Science & Health	3 Hours	80	20	100

** Subsidiary subjects: Examination for subsidiary
Subjects shall be conducted by respective colleges.

Table – VI Distribution of Subjects and marks for Third Year Examination.

Paper	Subjects	Theory		IA	Sub Total	Praticals			
		Theory	Viva-Voca			Univ Practicals	IA	Sub total	Grand Total
I	Biochemistry III	80		20	100	80	20	100	200
2	Microbiology II	80	-	20	100	80	20	100	200
3	Pathology II	80		20	100	80	20	100	200

Distribution of Subsidiary Subjects and marks for Third Year Examination.

B	Subsidiary Subject *	Written Paper		Internal Assessment	Total
		Duration	Marks	Theory (Marks)	Marks
1	Ethics, Database Management	3 Hours	80	20	100
2	Research & Biostatistics	3 Hours	80	20	100
3	Computer Application	3 Hours	80	20	100

L BOARD OF EXAMINERS FOR PRACTICALS:

i. Subject to the provisions of these statutes and regulations made thereunder, there shall be a Board of Examiners to conduct viva- voce at the end of every year to evaluate the understanding and comprehension of a candidate in subject(s) taught during that year.

ii. The Board of examiners shall consist of
   a. Dean of the Faculty or his/her nominee.
   b. Head of the Department / Principal of the College.
   c. External Examiners(s)

iii. The external examiner shall be chosen out of the panel recommended by the Head of the Department / Principal of the College and approved by the Vice-Chancellor.

iv. The quorum for the conduct of examination by the Board of Examiners shall be at least 2 including External Examiners.

M APPOINTMENT AND ELIGIBILITY OF EXAMINERS:

No person shall be appointed as an examiner in any of the subjects of the professional examinations leading to the award of the degree unless :

a) He / She has at least five years teaching experience in the subject concerned in a College affiliated to a recognized University as a Faculty member.

b) If of the rank of an Associate Professor or equivalent and above, with the requisite qualification and experience as given in above sub – clause

a. Provided that when an Associate Professor or equivalent and above are not available, an Assistant Professor of 5 Years standing as an Assistant Professor with requisite Qualification and Experience in the subject may be appointed as examiner.

c) There shall be at least four examiners for upto 100 Students, out of whom not less than 50% must be external examiners. Of the four examiners, the senior – most internal examiner will act as the Chairman and Co-Coordinator of the whole examination programme so that uniformity in the matter of assessment of candidate is maintained. Where candidates appearing are more than 100, two additional examiners (One external and one Internal) for every additional 50 or part thereof appearing , appointed. However, for students upto 50 there shall be two examiners one external and one internal.

d) Notwithstanding the number of candidates registered for the examination, one external examiner and one internal examiner who shall be the senior of the two internal examiners, in case of more than 100 students, will set and assess one question paper each (Where there are two papers in a subject) or one part of a question paper (where there is only one question paper in the subject). Senior most internal examiner of affiliated College shall be Chairman of the board of paper setters and act as moderator by rotation for one year.

e) The external examiner shall ordinarily be an in-service teacher in the subject or an allied subject from any college affiliated to a recognized University (Other than Jammu University) Post Graduate Institute.

f) External examiners (s) shall rotate after two years.

g) In the case of non-availability of an examiner in a subject, a retired teacher with requisite qualification and teaching experience may be appointed either as external or internal examiner within seven years of super annuation.

h) The Practical / Clinical and oral examination in each subject shall be conducted jointly by the external and internal examiner(s) and the award sheet containing the marks of practical and / or clinical (including the internal assessment) shall be compiled and signed by all the external and internal

examiner(s) before it is submitted to the University by the senior-most internal examiner of each affiliated college.

i) Award sheet containing marks of theory along with duly evaluated and signed answer scripts shall be submitted to the University separately by each examiner.
j) External examiner(s) shall rotate after two years.
k) External examiners shall not be from the same University.
l) Interpretation , if any shall be determined by the Vice-Chancellor in consultation with the Dean, Faculty of Medical Sciences and the decision taken shall be final and binding on all concerned.

N PASS CRITERIA

First year examination.

a. **Main Subjects:** A candidate is declared to have passed in a subject, if he/she secures, 50% of marks in University Theory exam and internal assessment added together.

b. **Subsidiary Subjects:** The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks obtained in the subsidiary subjects shall be communicated to the University before the Commencement of the University examination.

Second and Third year Examination

a. **Main Subjects:** A candidate is declared to have passed the Examination in a subject if he/she secures 50% of the marks in theory and 50% in practical separately. For a pass in theory, a candidate has to secure a minimum of 40% marks in the University conducted written examination, and 50% in aggregate in the University conducted written examination, internal assessment and Viva-Voce added together and for pass in Practical, a candidate has to secure a minimum of 40% marks in the university conducted Practical/Clinical examination and 50% in aggregate i.e.University conducted Practical/Clinical and Internal Assessment.In the third year a candidate is declared to have passed only if he/she passes all the two theory papers and one practical examination in a single attempt failing which where in the candidate fails in one or more theory papers and /or practical examination he/she will have to re appear for all the two theory papers and the practical examination in the subsequent attempt.

b. **Subsidiary Subjects:** The minimum prescribed marks for a pass in subsidiary subject shall be 35% of the maximum marks prescribed for a subject. The marks

obtained in the subsidiary subjects shall be communicated to the University before the commencement of the University examination.

O CARRY OVER BENEFIT

First year examination:

A candidate who fails in any two of the five main subjects of first year shall be permitted to carry over those subjects to second year. However, he/se 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

P ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall have passed in all the subjects of first, second and third year to be eligible for award of degree.

Distribution of Type of Questions and Marks for various Subjects

Subjects having Maximum Marks = 100		
Type of Question	**Number of Questions**	**Marks for each question**
Essay Type	3 (2 X10)	10
Short Essay Type	12 (10 x 5)	5
Short Answer Type	12 (10 x 3)	3

Subjects having Maximum Marks = 80		
Type of Question	**Number of Questions**	**Marks for each question**
Essay Type	10(8x5)	40
Short Essay Type	12 (10 x 3)	30
Short Answer Type	07 (5 x 2)	10

Subjects having Maximum Marks = 80		
Type of Question	**Number of Questions**	**Marks for each question**
Essay Type	3 (2 x10)	10
Short Essay Type	8 (6 x5)	05
Short Answer Type	12 (10x3)	03

Subjects having Maximum Marks =60		
Type of Question	**Number of Questions**	**Marks for each question**
Essay Type	3 (2 x10)	10
Short Essay Type	7 (5 x5)	05
Short Answer Type	7 (5 x 3)	03

Subjects having Maximum Marks =50		
Type of Question	**Number of Questions**	**Marks for each question**
Essay Type	3 (2 x10)	10
Short Essay Type	5 (3 x5)	05
Short Answer Type	7 (5 x 3)	03

Internship

Six month compulsory rotational postings during which students have to work under the supervision of experienced staff in the following areas :

1. Clinical Pathology -1 Month
2. Clinical Biochemistry – 2 Months
3. Clinical Microbiology – 2 Months
4. Blood Banking – 1 Month

Members of Board of Studies

Dr Sunanda Raina	Convener	
Smt.Shakuntla Sharma	Member	
Mr. J.C. Frank	Member	
Smt Munni Dhar	Member	
Smt.Sonam Sharma	Member	
Smt.Rafiqa Bashir	Member	
Smt. Rajni Sharma	Member	

B.SC MEDICAL LABORATORY TECHNOLOGY

COURSE CODE FOR B.SC MEDICAL LABORATORY TECHNOLOGY COURSE

YEAR	COURSE TITLE	COURSE CODE
FIRST YEAR	Human Anatomy	**BMLT101**
	Physiology	**BMLT102**
	Biochemistry	**BMLT103**
	Pathology – [Clinical Pathology, Hematology & Blood Banking	**BMLT104**
	Microbiology	**BMLT105**
	English	**BMLT106**
	Health Care	**BMLT107**
SECOND YEAR	Biochemistry II	**BMLT201**
	Microbiology II	**BMLT202**
	Pathology II	**BMLT203**
	Sociology	**BMLT204**
	Constitution of India	**BMLT205**
	Environmental Science & Health	**BMLT206**
THIRD YEAR	Biochemistry – III	**BMLT301**
	Microbiology – III	**BMLT302**
	Pathology – III	**BMLT303**
	Research & Biostatistics	**BMLT304**
	Computer Application	**BMLT305**
	Ethics, Database Management	**BMLT306**

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Human Anatomy
COURSE CODE: BMLT101
DURATION OF EXAMINATION: 3 HOURS

SYLLABUS FOR ALLIED HEALTH SCIENCE COURSES

I year - B.Sc. Allied Health Sciences
ANATOMY

Theory: 70hrs

Practicals: 20hrs

I. INTRODUCTION: HUMAN BODY AS A WHOLE

THEORY:

Definition of anatomy and its divisions
Terms of location, positions and planes
Cell and its organelles
Epithelium – definition, classification, describe with examples, functions
Glands – classification, describe serous and mucous glands with examples
Basic tissues – classification with examples

PRACTICALS:

Histology of types of epithelium
Histology of serous, mucous and mixed salivary gland

II. LOCOMOTION AND SUPPORT

THEORY:

Cartilage – types with examples and 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 and histology
Names of muscles of the body

PRACTICALS:

Histology of 3 types of cartilages
Demo of all bones showing parts, radiographs of normal bones and joints

Histology of compact bone (TS and LS)
Demonstration of all muscles of the body
Histology of skeletal, smooth and cardiac muscle (TS and LS)

III. CARDIOVASCULAR SYSTEM

THEORY:
Heart – size, location, chambers, exterior and interior
Blood supply of heart
Systemic and 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 and thoracic duct
Histology of lymphatic tissues
Names of regional lymphatics, axillary and inguinal lymph nodes in brief
PRACTICALS:
Demonstration of heart and vessels in the body
Histology of large artery, medium sized artery and vein, large vein
Microscopic appearance of large artery, medium sized artery and vein,
Large vein pericardium
Histology of lymph node, spleen, tonsil and thymus
Normal chest radiograph showing heart shadows
Normal angiograms

IV. GASTRO-INTESTINAL SYSTEM

THEORY:
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

V. RESPIRATORY SYSTEM

Parts of RS – nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments
Histology of trachea, lungs and pleura
Names of paranasal air sinuses
PRACTICALS:
Demonstration of parts of respiratory system
Normal radiographs of chest
Histology of lung and trachea

VI. PERITONEUM

THEORY:

Description in brief
PRACTICAL:
Demonstrations of reflections

VII. URINARY SYSTEM

Kidney, ureter, urinary bladder, male and female urethra
Histology of kidney, ureter and urinary bladder
PRACTICAL:
Demonstration of parts of urinary system
Histology of kidney, ureter, urinary bladder
Radiographs of abdomen – IVP, retrograde cystogram

VIII. REPRODUCTIVE SYSTEM

THEORY:
Parts of male reproductive system, testis, vas deferens, epididymis,
Prostate (gross and histology)
Parts of female reproductive system, uterus, fallopian tubes,
Ovaries (gross and histology)
Mammary gland – gross
PRACTICAL:
Demonstration of section of male and female pelvis with organs in situ
Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes,
Ovaries
Radiographs of pelvis – Hysterosalpingogram

IX. ENDOCRINE GLANDS

THEORY:
Names of all endocrine glands, in detail on pituitary gland, thyroid gland,
Parathyroid gland, suprarenal gland (gross and histology)
PRACTICAL:
Demonstration of the glands
Histology of pituitary, thyroid, parathyroid, suprarenal glands

X. NERVOUS SYSTEM

THEORY:
Neuron
Classification of NS
Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord
With spinal nerve (gross and histology)
Meninges, ventricles and cerebrospinal fluid
Names of basal nuclei
Blood supply of the brain
Cranial nerves
Sympathetic trunk and names of parasympathetic ganglia
PRACTICAL:
Histology of peripheral nerve and optic nerve

Demonstration of all plexuses and nerves in the body
Demonstration of all parts of brain
Histology of cerebrum, cerebellum, spinal cord

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Human Anatomy
COURSE CODE: BMLT101
DURATION OF EXAMINATION: 3 HOURS

XI. SENSORY ORGANS

THEORY:
Skin – histology, appendages of skin
Eye – parts of eye and lacrimal apparatus
Extra-ocular muscles and nerve supply
Ear – parts of ear- external, middle and inner ear and contents
PRACTICAL:
Histology of thin and thick skin
Demonstration and histology of eyeball
Histology of cornea and retina

XII. EMBRYOLOGY

THEORY:
Spermatogenesis and oogenesis
Ovulation, fertilization
Fetal circulation
Placenta

INTERNAL ASSESSMENT
Theory-average of 2 exams conducted 20
Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY
There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Short essay type	10 (attempt 8)	8 x 5	40
Short answer type	12 (attempt 10)	10 x 3	30
To the point answer	07 (attempt 5)	5 x 2	10
GRAND TOTAL			80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	*			100

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Physiology
COURSE CODE: BMLT102
DURATION OF EXAMINATION: 3 HOURS

PHYSIOLOGY
Theory 70 hours
Practical 20hours

Introduction
Composition and function of blood
Red blood cells – Erythropoiesis, stages of differentiation function, count physiological Variation.
Haemoglobin –structure, function, concentration physiological variation, Methods of Estimation of Hb
White blood cells – Production, function, life span, count, differential count
Platelets – Origin, normal count, morphology functions.
Plasma Proteins – Production, concentration, types, albumin, globulin, Fibrinogen,
Prothrombin functions.
Haemostasis & Blood coagulation
Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.
Blood Bank
Blood groups – ABO system, Rh system
Blood grouping & typing
Crossmatching
Rh system – Rh factor, Rh incompatibility.
Blood transfusion – Indication, universal donor and recipient concept.
Selection criteria of a blood donor. Transfusion reactions
Anticoagulants – Classification, examples and uses
Anaemias : Classification – morphological and etiological. Effects of anemia on body
Blood indices – Colour index, MCH, MCV, MCHC
Erythrocyte sedimentation Rate (ESR) and Paced cell volume
Normal values, Definition. Determination
Blood Volume -Normal value, determination of blood volume and regulation of blood volume Body fluid – pH, normal value, regulation and variation
Lymph – lymphoid tissue formation, circulation, composition and function of lymph

Cardiovascular system
Heart – Physiological Anatomy, Nerve supply
Properties of Cardiac muscle
Cardiac cycle-systole, diastole.

Intraventricular pressure curves.
Cardiac Output – only definition
Heart sounds- Normal heart sounds Areas of auscultation.
Blood Pressure – Definition, normal value, clinical measurement of blood pressure. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension. Pulse – Jugular, radial pulse, Triple response
Heart sounds – Normal heart sounds, cause characteristics and signification. Heart rate
Electrocardiogram (ECG) –significance.

Digestive System - Physiological anatomy of Gastro intestinal tract
Functions of digestive system.
Salivary glands - Structure and functions.
Deglutination –stages and regulation
Stomach – structure and functions.
Gastric secretion – Composition function regulation of gastric juice secretion.
Pancreas – structure, function, composition, regulation of pancreatic juice
Liver – functions of liver.
Bile secretion, composition, function, regulation of bile secretion. Bilirubin metabolism, types of bilirubin, Vandernberg reaction, Jaundice- types, significance.
Gall bladder – functions.
Intestine – small intestine and large intestine.
Small intestine –Functions- Digestion, absorption, movements.
Large intestine – Functions, Digestion and absorption of Carbohydrates, Proteins, Fats, Lipids. Defecation

Respiratory system
Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract, Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration.

Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall.

Transportation of Respiratory gases: Transportation of Oxygen: Direction, pressure gradient, Forms of transportation, Oxygenation of Hb. Quantity of Oxygen transported.

Lung volumes and capacities - Regulation of respiration what? Why? How? Mechanisms of Regulation, nervous and chemical regulation. Respiratory centre. Hearing Brier, Reflexes.

Applied Physiology and Respiration : Hypoxia, Cyanosis, Asphyxia, Dyspnea,
Dysbarism, Artificial Respiration, Apnoea.

Endocrine System –
Definition, Classification of Endocrine glands & their Hormones Properties of Hormones.

Thyroid gland hormone – Physiological, Anatomy, Hormone secreted, Physiological function, regulation of secretion. Disorders – hypo and hyper secretion of hormone

Adrenal gland, Adrenal cortex physiologic anatomy of adrenal gland, Adrenal cortex, cortical hormones – functions and regulation Adrenal medulla – Hormones, regulation and secretion. Functions of Adrenaline and nor adrenaline

Pituitary hormones – Anterior and posterior pituitary hormones, secretion, function.

Pancreas – Hormones of pancreas. Insulin – secretion, regulation, function and action.

Diabetes mellitus – Regulation of blood glucose level.

Parathyroid gland – function, action, regulation of secretion of parathyroid hormone.

Calcitonin – function and action

Special senses
Vision – structure of eye. Function of different parts.
Structure of retina.
Hearing structure and function of can mechanism of hearing
Taste – Taste buds functions.
Smell physiology, Receptors.

Nervous system
Functions of Nervous system, Neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting. Synapse – structure, types, properties.
Receptors – Definition, classification, properties. Reflex action – unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts
Pyramidal tracts – Extrapyramidal tracts. Functions of Medulla, pons, Hypothalamic, disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex, Cerebellum, functions of Cerebellum. Basal ganglion-functions. EEG.
Cerebro Spinal Fluid(CSF) : formation, circulation, properties, composition and functions lumbar puncture.
Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions and comparison of functions.

Excretory System
Excretory organs

Kidneys: Functions of kidneys structural and functional unit nephron, vasarecta, cortical and juxtamedullary nephrons – Comparision, Juxta Glomerular Apparatus –Structure and function. Renal circulation peculiarities.

Mechanism of Urine formation: Ultrafiltration criteria for filtration GFR, Plasma, fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption – sites of reabsorption, substance reabsorbed, mechanisms of reabsorption Glucose, urea.
H + Cl aminoacids etc. TMG, Tubular lead, Renal threshold % of reabsorption of different substances, selective e secretion.
Properties and composition of normal urine, urine output. Abnormal constituents in urine. Mechanism of urine concentration.
Counter – Current Mechanisms : Micturition, Innervation of Bladder, Cystourethrogram. Diuretics : Water, Diuretics, osmotic diuretics, Artificial kidney Renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests.

Reproductive system
Function of Reproductive system, Puberty
Male reproductive system- Functions of testes, spermatogenesis site, stages, factors, influencing semen.
Endocrine functions of testes
Androgens – Testosterone structure and functions.
Female reproductive system. Ovulation, menstrual cycle. Physiological changes during pregnancy, pregnancy test.

Lactation : Composition of milk factors controlling lactation.

Muscle nerve physiology
Classification of muscle, structure of skeletal muscle, Sarcomere contractile proteins, Neuromuscular junction. Transmission across, Neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue Rigour mortis.

Skin -structure and function
Body temperature measurement, Physiological variation, Regulation of body Temperature by physical chemical and nervous mechanisms .Role of Hypothalamus, Hypothermia and fever.

Practicals
Haemoglobinometry
White Blood Cell count
Red Blood Cell count
Determination of Blood Groups
Leishman's staining and Differential WBC count
Determination of packed cell Volume
Erythrocyte sedimentation rate [ESR]
Calculation of Blood indices
Determination of Clotting Time, Bleeding Time
Blood pressure Recording
Auscultation for Heart Sounds
Artificial Respiration
Determination of vital capacity

INTERNAL ASSESSMENT
Theory-average of 2 exams conducted 20
Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY
There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Short essay type	10 (attempt 8)	8 x 5	40
Short answer type	12 (attempt 10)	10 x 3	30
To the point answer	07 (attempt 5)	5 x 2	10
GRAND TOTAL			80

Distribution of Marks for University Theory and Practical Exam

Theory	Practicals	Grand total

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Physiology
COURSE CODE: BMLT102
DURATION OF EXAMINATION: 3 HOURS

Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	*			100

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Biochemistry
COURSE CODE: BMLT103
DURATION OF EXAMINATION: 3 HOURS

BIOCHEMISTRY I

No. Theory classes: 70 hours
No. Practical classes: 20 hours

I. Clinical Laboratory

- Responsibilities of health care personnel
- Laboratory hazards- Physical, Chemical and Biological. Laboratory safety measures- Safety regulations and first aid in laboratory

II. Laboratory apparatus : Different types, use, care and maintenance (Where appropriate, diagrams to be drawn in practical record)

- Glass ware in laboratory – Significance of boro silicate glass. Plastic ware in laboratory Cleaning of glass ware and plastic ware
- Pipettes - Glass and Automated
- Burettes, Beakers, Petri dishes, Porcelain dish
- Flasks - different types (volumetric, round bottomed, Erlenmeyer, conical etc.,)
- Funnels – different types (Conical, Buchner etc.,)
- Bottles – Reagent, Wash bottles
- Measuring cylinders, reagent dispensers
- Tubes – Test tube, Centrifuge tube, Folin-Wu tube
- Cuvettes and its use in measurements , cuvettes for visible and UV range
- Racks – Bottle, Test tube, Pipette and draining racks
- Tripod stand, Wire gauze, Bunsen burner, Dessicator, Stop watch, timers

III. Instruments: Use, care and maintenance (Where appropriate, pictures/diagrams and schematic diagrams to be drawn in practical record)

- Water bath, Oven & Incubators, Distillation apparatus - water distillation plant and water deionisers, Reflux condenser, Cyclomixers , Magnetic stirrer, Shakers
- Refrigerators, Deep freezers, Cold box
- Centrifuges*: Principle, Svedberg unit, centrifugal force, centrifugal field, rpm, Conversion of G to rpm and vice versa) Components, working.
  Different types of centrifuges
- Laboratory balances*: Physical and analytical. Mono & double pan, Electronic balances. Weighing different types of chemicals, liquids, hygroscopic compounds etc. Precautionary measures while handling (Diagram)
- Photometry - Colorimeter*- Principle, limitations of Beer-lambert's law, components, working.
- pH meter*- Principle, components-pH measuring electrodes, Working, Precautions taken while handling. (Diagram of pH meter)

(*Diagrams mandatory)

IV. Units of measurement

- Metric system. Common laboratory measurements, Prefixes in metric system
- International system of units- SI units- definition, classification, Conversion of conventional and SI Units

V. Introduction to general Bio-molecules:

- Chemistry of carbohydrates: Classification (structures for monosaccharides*), Functions of carbohydrates
- Chemistry of amino acids*: Classification–based on structure and nutritional requirement, Occurrence. Functions of amino acids.
- Chemistry of lipids: Classification of lipids and fatty acids. Functions of lipids
- Chemistry of nucleotides*: Purine and Pyrimidine bases. Composition of nucleosides and nucleotides. Occurrence of bases.

  *** Structures mandatory**

VI. Fundamental Chemistry

- Valency, Molecular weight & Equivalent weight of elements and compounds. Normality, Molarity, Molality.

VII. Solutions: Definition, use, classification where appropriate, preparation and storage

- Stock and working solutions.
- Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H_2SO_4, H_3PO_4, CH_3COOH etc.,)
- Preparation of percent solutions – w/w, v/v w/v (solids, liquids and acids), Conversion of a percent solution into a molar solution
- Saturated and supersaturated solutions
- Standard solutions. Technique for preparation of standard solutions and Storage. E.g: glucose, albumin etc.
- Dilutions- Diluting Normal , Molar and percent solutions. Preparing working standard from stock standard.

  Part dilutions: Specimen dilutions. Serial dilutions. Reagent dilution. Dilution factors

VIII. Acids, Bases, Salts and Indicators : Basic concepts. Determination of pH- Henderson Hasselbalch's equation. Buffer solutions. pH determination of buffers. Blood pH. Fluid buffers.

IX. Biomedical waste management

ASSIGNMENT TOPICS:

- Radio active isotopes
- Arterial Blood gases

PRACTICAL DEMONSTRATION (Record book to be maintained)

- Laboratory apparatus - All glass ware and plastic ware (all appropriate diagrams in practical record)
- Water bath, Oven & Incubators, Water Distillation plant*, refrigerators, cold box, cool barns, reflux condensers.
- Preparation of solutions: 1N HCl, 1M NaOH. Standard solutions of glucose and albumin
- Centrifuges*- Technique of Centrifugation
- Analytical balance* - Weighing of chemicals to prepare standard and different types of solutions. Care while weighing acids, deliquescent and hygroscopic compounds.
- Colorimeter* - Absorbance readings of a colored solution and graphing

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Biochemistry
COURSE CODE: BMLT103
DURATION OF EXAMINATION: 3 HOURS

- pH meter* - Checking pH of urine and buffer

Diagrams to be drawn

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry I shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Short essay type	10 (attempt 8)	8 x 5	40
Short answer type	12 (attempt 10)	10 x 3	30
To the point answer	07 (attempt 5)	5 x 2	10
GRAND TOTAL			80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	*			100

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Pathology
COURSE CODE: BMLT104
DURATION OF EXAMINATION: 3 HOURS

PATHOLOGY I

Histopathology, Clinical Pathology, Hematology and Blood Banking

Theory-70 hours

Practicals-20 hours

I. Histopathology- Theory

- Introduction to Histopathology
- Receiving specimens in the laboratory
- Grossing techniques
- Mounting techniques- various mountants
- Maintenance of records and filing of slides
- Use and care of Microscope
- Various fixatives, mode of action, preparation and indications
- Biomedical waste management
- Section cutting
- Tissue processing for routine paraffin sections
- Decalcification of tissues
- Staining of tissues-H & E Staining

II. Clinical Pathology- Theory

- Introduction to clinical pathology
- Collection , transport, preservation and processing of various clinical specimens
- Urine examination- collection and preservation, Physical, chemical and microscopic examination for abnormal constituents
- Examination of Body fluids
- Examination of Cerebrospinal fluid (CSF)
- Sputum examination
- Examination of feces

III. Hematology – Theory

- Introduction to hematology
- Normal constituents of Blood, their structure and functions
- Collection of Blood samples
- Various anticoagulants used in Hematology
- Various instruments and glass ware used in Hematology, preparation and usage of glass wares
- Laboratory safety guidelines
- SI units and conventional units in Hospital laboratory
- Quality control of laboratory findings
- Hemoglobin estimation, different methods and normal values
- Packed cell volume
- Erythrocyte sedimentation rate
- Normal Haemostasis
- Bleeding time. Clotting time, prothrombin time, Activated partial Thromboplastin time

IV. Blood Bank- Theory

- Introduction blood banking
- Blood group system
- Collection and processing of blood for transfusion

- Compatibility testing
- Blood transfusion reactions

Practicals

1. Urine analysis- Physical, Chemical, Microscopic
2. Blood grouping and Rh typing
3. Hb estimation , packed cell volume (PCV), Erythrocyte Sedimentation rate (ESR)
4. Bleeding time and Clotting time
5. Histopathology- section cutting and H & E Staining (for BSc MLT only

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology I shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Short essay type	10 (attempt 8)	8 x 5	40
Short answer type	12 (attempt 10)	10 x 3	30
To the point answer	07 (attempt 5)	5 x 2	10
GRAND TOTAL			80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	*			100

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Microbiology
COURSE CODE: BMLT105
DURATION OF EXAMINATION: 3 HOURS

Microbiology I

Theory: 70 Hours
Practicals: 20 Hours

1. Introduction **(6 hrs)**

History of Microbiology, classification of microorganisms, use of microscope in the study of bacteria, Morphology of bacterial cell

2. Growth and nutrition **(6 hrs)**

Nutrition, growth and multiplication of bacteria, culture media and culture methods

3. Sterilization and disinfection **(8 hrs)**

Principles and use of equipments of sterilization, chemicals used in disinfection

4. Biomedical waste management principle and practice

5. Immunology **(5 hrs)**

Immunity, vaccines

Immunization schedule

Definition of Antigen, antibody, list of antigen antibody reactions.

5. Infection **(5hrs)**

Definition, types and mode of transmission

Hospital infections – causative agents, mode of transmission and prophylaxis

Antimicrobial susceptibility testing

6. Systematic bacteriology **(15 hrs)**

Disease caused and lab diagnosis of medically important bacteria (Staphylococcus, Streptococcus, Gonococcus, Echerichia coli, Salmonella, Shigella, Vibrio, Mycobacteria, Treponema, Leptospira)

(No need of classification, antigenic structure, virulence mechanism)

7. Parasitology **(10hrs)**

Introduction to Parasitology

List of medically important parasites and diseases (E.histolytica, Plasmodium, W.bancrofti, Ascaris, Ancylostoma)

Lab diagnosis of parasitic infections

8. Virology **(10hrs)**

Introduction to virology

List of medically important viruses and diseases (AIDS, Hepatitis, Rabies, Polio, Arboviruses)

Lab diagnosis of viral infections

9. Mycology **(5hrs)**

Introduction to Mycology

List of medically important fungi and diseases (Candidiasis, Cryptococcosis, Dermatophytes, Aspergillosis and Mucor mycosis)

Lab diagnosis of fungal infections

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Microbiology
COURSE CODE: BMLT105
DURATION OF EXAMINATION: 3 HOURS

PRACTICALS **(20hrs)**

Compound Microscope

Demonstration and sterilization of equipments

Demonstration of commonly used culture media and media with growth

Antibiotic susceptibility test

Demonstration of common serological tests –widal, VDRL,

Grams stain, Acid fast staining

Stool exam for Helminthic ova

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Microbiology
COURSE CODE: BMLT105
DURATION OF EXAMINATION: 3 HOURS

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20

Practicals: record and lab work* 10

*There shall be no university practical examination and internal assessment marks secured in Practicals need not be sent to the university.

SCHEME OF EXAMINATION THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology I shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Short essay type	10 (attempt 8)	8 x 5	40
Short answer type	12 (attempt 10)	10 x 3	30
To the point answer	07 (attempt 5)	5 x 2	10
GRAND TOTAL			80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	*			100

SUBSIDIARY SUBJECTS

ENGLISH

COURSE OUTLINE

COURSE DESCRIPTION: This course is designed to help the student acquire a good command and comprehension of the English language through individual papers and conferences.

BEHAVIOURAL OBJECTIVES:

The student at the end of training is able to

1. Read and comprehend English language
2. Speak and write grammatically correct English
3. Appreciates the value of English literature in personal and professional life.

UNIT - I: INTRODUCTION:

Study Techniques

Organisation of effective note taking and logical processes of analysis and synthesis

Use of the dictionary

Enlargement of vocabulary

Effective diction

UNIT - II: APPLIED GRAMMAR:

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

UNIT - III: WRITTEN COMPOSITION:

Precise writing and summarizing

Writing of bibliography

Enlargement of Vocabulary

UNIT - IV: READING AND COMPREHENSION:

Review of selected materials and express oneself in one's words.

Enlargement of Vocabulary.

UNIT - V: THE STUDY OF THE VARIOUS FORMS OF COMPOSITION:

Paragraph, Essay, Letter, Summary, Practice in writing

UNIT - VI: VERBAL COMMUNICATION:

Discussions and summarization, Debates, Oral reports, use in teaching

First Year Annual Examination to be held in the year 2022, 2023, 2024

CLASS: B.Sc Medical Laboratory Technology 1st Year

COURSE TITLE: English

COURSE CODE: BMLT106

DURATION OF EXAMINATION: 3 HOURS

Scheme of Examination

Written (Theory): Maximum Marks: –80 marks.

No Practical or Viva voce examination

This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

First Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 1st Year
COURSE TITLE: Health Care
COURSE CODE: BMLT107
DURATION OF EXAMINATION: 3 HOURS

HEALTH CARE
Teaching Hours : 40
Introduction to Health
Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept.
National Health Policy
National Health Programmes (Briefly Objectives and scope)
Population of India and Family welfare programme in India
Introduction to Nursing
What is Nursing ? Nursing principles. Inter-Personnel relationships. Bandaging : Basic turns; Bandaging extremities; Triangular Bandages and their application.
Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.
Lifting And Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.
Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine. Observation of sputum, Understand use and care of catheters, enema giving.
Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion
Care of Rubber Goods
Recording of body temperature, respiration and pulse,
Simple aseptic technique, sterilization and disinfection.
Surgical Dressing: Observation of dressing procedures
First Aid :
Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

Scheme of Examination
Written (Theory): Maximum Marks: –80 marks.
No Practical or Viva voce examination
This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Biochemistry - II
COURSE CODE: BMLT201
DURATION OF EXAMINATION: 3 HOURS

SYLLABUS FOR II B.Sc. MLT COURSES

BIOCHEMISTRY II

No. Theory classes: 100 hours

No. Practical classes: 80 hours

Preparation of solutions and reagents

- Basic requirements – types / grades of chemicals, solvents, types of water and other requirements
- Various types of solutions and reagents – Normal, Molar, percent, buffer solutions and substrates, indicators, standards

Measurements in Clinical Laboratory

- Quantitative estimations- Selecting a method, linearity of a method, endpoint and rate reaction methods. Checking accuracy and precision
- Calibration: Preparation of calibration curve, importance of a calibration curve, straight line calibration and non-linear calibration graph; Technique of preparing a calibration curve using stock standard solutions. Graphic representation of calibration.

II. Chemistry of Carbohydrates

- Structural properties- Stereoisomerism, optical activity, cyclic structures, mutarotation, epimers.
- Monosaccharides of biological importance. Important chemical reactions –formation of furfural derivatives, enediols, osazones, sugar acids, sugar alcohols. Deoxy sugars Biomedical importance of amino sugars, glycosides.
- Disaccharides: Properties of maltose, lactose, sucrose. Invert sugars. Biomedical importance of Lactose and sucrose.
- Polysaccharides: Properties of starch and glycogen. Biomedical importance of inulin. Mucopolysaccharides- Composition, tissue distribution and functions.

III. Chemistry of amino acids and proteins

- Properties of amino acids- Isomerism, amphoteric nature and isoelectric pH. Peptide bond formation. Colour reactions of amino acids. Use of amino acids analysis in diagnosis of diseases. Peptides and functions.
- Proteins- Functions. Classification - Based on composition and solubility, functional and nutritional. Protein Structure-primary(insulin), secondary, tertiary and quaternary
- Precipitation reactions of proteins- salting out, iso-electric precipitation, precipitation by organic solvents, heavy metal ions, alkaloidal reagents. Denaturation of proteins. Heat coagulation. Preparation of protein free filtrates for quantitative estimations

IV. Enzymes

- Classification, properties, specificity, mechanism of enzyme action, factors affecting enzyme activity, enzyme inhibition. Coenzymes. Analytical and therapeutic role of enzymes. Immobilized enzymes

V. Chemistry of Nucleic acids

- Structure of DNA. Watson-Crick model, different forms of DNA

- Structure of RNA. Types of RNA. Structure of tRNA
- Functions of DNA and RNA

VI. Water soluble vitamins:

- Thaimine, riboflavin, niacin, pyridoxine, vitamin B12, folic acid and Vitamin C
- Chemistry, Sources, RDA, functions, deficiency and or toxicity. Antivitamins

VII. Metabolism of Carbohydrates

- Digestion and absorption of carbohydrates. Disorders
- Metabolic pathways, energetics, inhibitors and regulation, disorders - Glycolysis, TCA cycle, Glycogen metabolism.
- Diabetes mellitus-Diagnosis and management.
- Principles and procedures for the determination of plasma glucose levels-reductometric and enzymatic methods.
- Urinary glucose.

VIII. Metabolism of amino acids and nucleic acids

a. **Non protein nitrogenous compounds:**

- Formation of ammonia - transamination and deamination, Urea cycle and disorders, Blood urea/ Blood urea nitrogen- clinical importance.
- Biosynthesis of creatine. formation of creatinine, clinical importance of creatinine
- Degradation of purine nucleotides, formation of uric acid, Disorders- Gout, Lesch Nyhan syndrome.

Principles and procedures for the determination of Blood urea nitrogen, creatinine & uric acid - colorimetric and enzymatic methods.

b. **Catabolism of Branched chain, Phenylalanine/Tyrosine catabolism :**

- Pathway Disorders- Phenylketonuria, Alkaptonuria, Maple Syrup Urine Disease

IX. Overview of Body fluids

- Ascitic fluid, CSF, peritoneal, pleural, pericardial and synovial fluids. Quantitative analysis of constituents in different types of fluids.

X. Specimen collection: Technique, use of anticoagulants and preservatives where appropriate. Storage, time of collection, instructions to patients for timed sample collection.

Disposal

- Blood- venous and capillary puncture.
- Urine-random, timed & 24 hrs

XI. Normal constituents of urine: Physical characteristics. Chemical examination of urinary constituents.

XII. Renal function tests

- Glomerular and tubular function. Handling of different solutes by tubules. Reabsorption of water
- Abnormal constituents of urine - Physical characteristics. Chemical examination of urinary constituents.
- Clearance tests: Definition. Procedure for creatinine clearance test, reference values and significance
- Tests of tubular function: Concentration and dilution tests. Measurement of specific gravity and osmolality
- Urinary acidification: Ammonium chloride loading test

XIII. Techniques

- **Spectrophotometry:** Principle, components, operation, care and maintenance, relation between concentration and optical density, standardization of spectrophotometer.

- **Chromatography:** Principle. Partition chromatography-instrumentaion and application in identification of amino acids
- **Others- Principle and application**
  Osmometry, Reflectance photometry, Turbidimetry, Nephelometry

- **Glucometers:** Principle, instrumentation and application

ASSIGNMENT TOPICS:

- Oral Glucose tolerance test
- Glycated HbA1c
- Microalbuminuria

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Biochemistry - II
COURSE CODE: BMLT201
DURATION OF EXAMINATION: 3 HOURS

PRACTICAL SYLLABUS

I. PRACTICAL APPROACH TO BASIC LABORATORY PRACTICES

a. Pipetting techniques

- Use of glass pipettes-graduated and volumetric pipets; Specimen and Reagent using fixed and variable pipettes

b. Operation of instruments

- Analytical Balance: Weighing chemicals, deliquescent, hygroscopic compounds and acids.
- pH meter: Checking pH of urine and buffers by electrometry.
- Centrifuges: concept of balancing, time and speed specifications
- Urinometer, Esbach's albuminometer

c. Techniques of preparation of solutions and reagents

- Normal, molar, percent (Na_2CO_3, NaCl, NaOH, KCl, HCl, H_2SO_4, H_3PO_4, CH_3COOH, Sodium tungstate) Buffers (Phosphate buffer, citrate buffer), Indicators.
- Standard solutions – Creatinine, Total Protein etc.,

d. Dilution techniques

- Dilution of stock standards and reagents to working
- Dilution of acids
- Part dilution of body fluids

e. Determination of pH: using indicators, pH paper, universal indicator solutions

II. QUALITATIVE

a. Color reactions - known test solutions

- Carbohydrates: Glucose, Fructose, Xylose, Sucrose, Starch
- Amino acids in protein solution
- NPN- Urea, Creatinine and Uric acid
- Titrable acidity and ammonia in urine

b. Precipitation reactions

- Albumin
- Preparation of protein free filtrates for quantitative estimations - glucose, urea, creatinine uric acid estimation

c. Spot tests for

- Phenylketonuria, alkaptonuria, MSUD

d. Urine analysis

- Normal and Abnormal urine

III. QUANTITATIVE

a.Operation of Colorimeter / Spectrophotometer.

- Colorimetric experiment to select a complementary filter.
- Concepts of use of blank, reagent blank
- Standardization of a colorimeter/ spectrophotometer using coloured solutions
- Graphing of Beer's law- drawing calibration curves.
- Determination of unknown concentration of colored solution from calibration curve. Concept of one point calculation or calibration (T/S X concentration of standard)

b. Quantitative estimation by manual methods- Preparation of calibration curve & estimation of unknown analyte concentration

- Blood Glucose by reductometric method (Not to use O-toluidine method as it is a potent carcinogen)
- Blood urea by Diacetyl Monoxime method.
- Serum and urine creatinine by Jaffe's reaction. Determination of Creatinine clearance rate.
- Serum uric acid by Caraway's method
- CSF and urine protein by sulphosalicylic acid method

PRACTICAL DEMONSTRATION

- Paper chromatography of amino acids
- Dipsticks for urine analysis

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20
Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry II shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay	3 (attempt 2)	2 x 10	20
Short essay	8 (attempt 6)	6 x 5	30
Short answer	12 (attempt 10)	10 x 3	30
GRAND TOTAL			80

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Biochemistry II Practical shall be as follows: Distribution of marks

Type of Question	Marks allotted
Quantitative estimation	30
Qualitative estimation	30
Urine examination	20
Total	80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	80	20	100	200

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Microbiology - II
COURSE CODE: BMLT202
DURATION OF EXAMINATION: 3 HOURS

MICORBIOLOGY II
(Systematic Bacteriology + Parasitology)

I. Systematic Bacteriology

Biochemical reactions for identification of bacteria

Antimicrobial Susceptibility Testing

Normal flora of the human body

Gram Positive Bacteria: Systematic study of the following bacteria with special reference to morphology, cultural characteristics, pathogenicity, lab diagnosis and prophylaxis -

- Staphylococcus,
- Streptococcus,
- Pneumococcus
- Corynebacterium , Bacillus
- Mycobacterium
- Clostridium
- Actinomycetes

Gram Negative Bacteria:

- Neisseria
- Haemophilus, Bordetella, Brucella
- Enterobacteriaceae, Salmonella & Shigella
- Vibrio, Campylobacter & Helicobacter

- Pseudomonas, Burkholderia & non fermenters
- Yersinia

Spirochaetes & Others:

- Treponemes, Leptospira & Borrelia
- Mycoplasma, Chlamydia & Rickettsia
- Non sporing anaerobes
- Gardenerella, Legionella & Listeria
- Miscellaneous Bacteria

Applied bacteriology

- UTI, Diarrhoeal diseases and food poisoning, Meningitis, Sexually transmitted diseases, pyogenic infections, Hospital infections and PUO
- Specimen collection for the above said infections.

Bacteriology of Water, Milk and Air

II. Parasitology

1. Protozology

- Entamoeba, Balantidium coli,
- Trichomonas,Giardia, Leishmania, Trypanasoma
- Malaria, Toxoplasma
- Cryptosporidium, Microsporidium, Isospora, Cyclospora

2. Helminthology

- **Cestodes** – Taenia, Echinococcus, D. latum, H. nana,
- **Trematodes** – Schistosoma, Fasciola,
- **Nematodes** – Ascaris, Ancylostoma, Enterobius, Strongyloides, Trichuris, Trichinella, Dracunculus, Wuchereria and other Filarial worms.

Lab Diagnosis of Parasitic Infections

Arthropods of Medical Importance

Practicals:

Staining:

1. Gram Stain, Z N Stain, Albert stain
2. Hanging drop Preparation
3. Culture methods
4. Introduction to Biochemical reactions
5. Identifications of pure bacterial culture based on morphology, colony characteristics, motility, biochemical reaction and anti biogram
6. Antibiotic sensitivity testing -Kirby Bauer method
7. Stool examination
8. Saline mount
9. Iodine mount
10. Peripheral smear examination for malaria and filariasis

INTERNAL ASSESSMENT
Theory-average of 2 exams conducted 20
Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY
There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology II shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay	3 (attempt 2)	2 x 10	20
Short essay	8 (attempt 6)	6 x 5	30
Short answer	12 (attempt 10)	10 x 3	30
GRAND TOTAL			80

SCHEME OF EXAMINATION – PRACTICALS
The scheme of examination for Microbiology II Practical shall be as follows: Distribution of marks

Type of Question	Marks allotted
Spotters	20
ZN staining	10
Pure culture of the organism	25
Stool examination	15
Record	10
Total	80

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Microbiology - II
COURSE CODE: BMLT202
DURATION OF EXAMINATION: 3 HOURS

Distribution of Marks for University Theory and Practical Exam

Theory				Practicals			Grand total
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	80	20	100	200

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Pathology - II
COURSE CODE: BMLT203
DURATION OF EXAMINATION: 3 HOURS

B.Sc Medical Laboratory Technology
2nd year
PATHOLOGY II

No. Theory classes: 100 hours
No. Practical classes: 80 hours

Theory:-

Histopathology and Hematology

Histopathology

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 Florescent microscope
Museum technology
Microphotography and its applications
Maintenance of records and filing of slides
ICDS Classification and coding
Application of computers in Pathology

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 HbA2
(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) B12 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

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Pathology - II
COURSE CODE: BMLT203
DURATION OF EXAMINATION: 3 HOURS

17. LE cell preparation

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted	20
Practicals: record and lab work*	20

Scheme of examination: Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology II shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB- TOTAL
LONG ESSAY (LE)	3 (to attempt 2)	2 x 10	20
SHORT ESSAY (SE)	8 (to attempt 6)	6 x 5	30
SHORT ANSWER (SA)	12 (to attempt 10)	10 x 3	30
GRAND TOTAL			80

Scheme of Examination: Practical
Distribution of marks

Type of Question	Marks allotted
Haematoxylin and eosin or a special stain	10
Haemoglobin or PCV	10
Total count	10
Differential count	10
ESR	10
PS preparation and staining	10
Record	10
Spotters	10
Total	80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	80	20	100	200

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Sociology
COURSE CODE: BMLT204
DURATION OF EXAMINATION: 3 HOURS

SUBSIDIARY SUBJECTS
SOCIOLOGY
Teaching Hours: 20
Course Description

This course will introduce student to the basic sociology concepts, principles and social process, social institutions [in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

Introduction:
Meaning – Definition and scope of sociology
Its relation to Anthropology, Psychology, Social Psychology
Methods of Sociological investigations – Case study, social survey, questionnaire, interview and opinion poll methods.
Importance of its study with special reference to health care professionals

Social Factors in Health and Disease:
Meaning of social factors
Role of social factors in health and disease

Socialization:
Meaning and nature of socialization
Primary, Secondary and Anticipatory socialization
Agencies of socialization

Social Groups:
Concepts of social groups, influence of formal and informal groups on health and sickness. The role of primary groups and secondary groups in the hospital and rehabilitation setup.

Family:
The family, meaning and definitions
Functions of types of family
Changing family patterns
Influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy

Community:
Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community.
Urban community – Meaning and features – Health hazards of urbanities
Culture and Health:
Concept of Health
Concept of culture
Culture and Health
Culture and Health Disorders
Social Change:
Meaning of social changes
Factors of social changes
Human adaptation and social change
Social change and stress
Social change and deviance
Social change and health programme
The role of social planning in the improvement of health and rehabilitation
Social Problems of disabled:
Consequences of the following social problems in relation to sickness and disability remedies to prevent these problems
Population explosion
Poverty and unemployment

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Sociology
COURSE CODE: BMLT204
DURATION OF EXAMINATION: 3 HOURS

Beggary
Juvenile delinquency
Prostitution
Alcoholism
Problems of women in employment

Social Security:
Social Security and social legislation in relation to the disabled

Social Work:
Meaning of Social Work
The role of a Medical Social Worker

Scheme of Examination
Written (Theory): Maximum Marks: –80 marks.
No Practical or Viva voce examination
This is a subsidiary subject, examination to be conducted by respective colleges. Marks required for a pass is 35%

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Constitution of India
COURSE CODE: BMLT205
DURATION OF EXAMINATION: 3 HOURS

INDIAN CONSTITUTION

Prescribed for the First Year students of all degree classes

Unit-I: Meaning of the term 'Constitution'. Making of the Indian Constitution 1946-1950.

Unit-II: The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.

Unit-III: Fundamental Rights and Duties their content and significance.

Unit – IV: Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.

Unit – V: Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.

Unit-VI: Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India.

Unit – VII: The Election Commission and State Public Service commissions.

Unit – VIII: Method of amending the Constitution.

Unit – IX: Enforcing rights through Writs:

Unit – X: Constitution and Sustainable Development in India.

Second Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 2nd Year
COURSE TITLE: Environmental Science & Health
COURSE CODE: BMLT206
DURATION OF EXAMINATION: 3 HOURS

ENVIRONMENT SCIENCE AND HEALTH

Introduction to Environment and Health

Sources, health hazards and control of environmental pollution

Water

The concept of safe and wholesome water.

The requirements of sanitary sources of water.

Understanding the methods of purification of water on small scale and large scale.

Various biological standards, including WHO guidelines for third world countries.

Concept and methods for assessing quality of water.

Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.

Awareness of standards of housing and the effect of poor housing on health.

Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Biochemistry - III
COURSE CODE: BMLT301
DURATION OF EXAMINATION: 3 HOURS

III year - B.Sc., Medical Laboratory Technology

Biochemistry III

No. Theory classes: 100 hours

No. Practical classes: 80 hours

THEORY SYLLABUS

I. Laboratory management

- Soft skills in patient handling
- Clinical automation, different types of automation
- Quality assurance in clinical laboratory- control of pre-analytical, analytical and post-analytical variables
- Biological reference intervals.
- General approach to quality control. Commonly used terms in quality control - accuracy, precision, specificity, sensitivity, mean, standard deviation, co-efficient of variation etc.,
- Use of controls, Preparation of Levey-Jennings' control charts, Westgard rules

II. Clinical Enzymology

- Sources of plasma enzymes. Units of enzyme activity. Diagnostic importance of enzymes. Isoenzymes. Cardiac troponins

III. Plasma proteins

- Total proteins.
- Functions and clinical importance. - Albumin and globulins-acute phase proteins (CRP, ceruloplasmin, AAT, Immunoglobulins). Genetic deficiencies and disorders
- Electrophoretic separation of plasma proteins. Electrophoretic patterns. Reference intervals and interpretation

IV. Fat soluble vitamins: A, D, E and K

- Chemistry, Sources, RDA, absorption, functions, deficiency and or toxicity.
- Antivitamins

V. Metabolism of Carbohydrates

- HMP pahway, Uronic acid pathway, Metabolism of galactose and fructose
- Disorders

VI. Lipid metabolism

- Digestion and absorption of lipids, β-oxidation of fatty acids-pathway and energetics (palmitic acid). Formation of Ketone bodies
- Cholesterol Pool: Body cholesterol and cellular. Excretion of cholesterol.
- Classification of lipoproteins based on separation and electrophoretic mobility. Metabolism. Frederickson's classification of hyperlipoproteinemias.
- Lipid profile. Coronary Artery Disease

VII. Molecular genetics

Protein biosynthesis-eukaryotic

- Semiconservative DNA replication, Transcription and Translation , Mutations and cancer.

VIII. Tumour markers

- Definition, classification and clinical applications
- Over view of specific tumour markers-AFP, CEA, CA- 125, PSA, hCG, ALP

IX. Acid-base balance

- Regulation of pH
- Disorders
- Blood gases- symbols, reference intervals for arterial blood gases.Procedure for obtaining arterial blood sample. Pre-analytical variables.

X. Liver

- Role of liver in metabolism, functions of liver. Liver enzymes
- Formation of Bilirubin
- Jaundice
- Panel for Liver function in Clinical laboratory

XI. Pancreatic function tests:

- Functions of pancreas, composition of pancreatic juice.
- Clinical utility of enzyme determinations in pancreatitis.

XII. Thyroid function tests

- Overview of function of thyroid hormones.
- Clinical utility and methods for the measurement of circulating thyroid hormones.

XIII. Cardiac markers- Chemistry and overview of cardiac markers. Diagnostic and prognostic use of cardiac markers. Laboratory evaluation

XIV. Techniques- Prinicple, instrumentation and application

- Flame photometry
- Atomic Absorption Spectrophotometry
- Ion Selective Electrodes
- Agarose gel electrophoresis for separation of plasma proteins
- Immunochemical assays–RIA, ELISA, Chemiluminiscence

XV. Calculi

- Renal and gall. Theory of formation and analysis.

XVI. Mineral metabolism and clinical conditions

- Metabolism of Calcium, Phosphorus and Iron.
- Serum and urine electrolytes-Sodium, Potassium and chloride

XVII. Nutrition

- Nutrition and energy supply
- Utilization of energy in man
- Nutritional importance of carbohydrates, lipids , proteins, vitamins and minerals
- RDA, Balanced diet, fiber in nutrition
- Nutritional disorders

XVIII. Detoxification and biotransformation of xenobiotics

ASSIGNMENT TOPICS:

- Laboratory design
- Preparation of in-house quality control serum. Establishing mean and cutoff limits
- Point-of-Care-Testing

PRACTICAL SYLLABUS

I. QUALITATIVE

- Qualitative tests of lipids, tests for unsaturation, qualitative tests for glycerol and cholesterol.
- Renal calculi
- Gall stones

II. QUANTITATIVE

Basic approach : Concepts of preparation of buffered substrate, use of control serum in enzymatic estimations, enzyme calculations

Quantitative estimation by manual methods- Preparation of calibration curve & estimation of unknown analyte concentration.

- Total protein by Biuret method

- Albumin by Bromo Cresol Green method, Calculation of A/G ratio
- Total and conjugated Bilirubin by Malloy and Evelyn method
- Aspartate Transaminase (AST) and Alanine Transaminase (ALT) by Bergmeyer
- Alkaline phosphatase (ALP) by Kind and King method using 4-aminoantipyrine.

- Pancreatic amylase by Somogyi method
- Calcium in serum and urine by o-cresolphthalein complexone method and Phosphate in serum and urine by Fisk & Subbarow method. (Care and cleaning of tubes before and after the analysis)
- Serum Chloride by method of Schales and Schales

III. PRACTICAL DEMONSTRATION

- Osazones of Galactose, Lactose and Fructose.
- Electrolyte and Arterial Blood Gas measurements
- Agarose gel electrophoresis for Serum proteins
- Automated analyzer
- Semi automated or automated method for following analytes.
    a. Lipid profile – Cholesterol, HDL, LDL, Triglycerides
    b. T3, T4, TSH
    c. Troponin T or I, CK, CK-MB

IV. CASE REPORTS

- Inborn errors of Galactose, Pentose and Fructose
- Multiple myeloma, polyclonal gammopathy
- OGTT curves
- Jaundice – different types
- Electrophoretograms; normal and abnormal
- Thyroid disorders
- Cardiac markers
- Lipid disorders
- Tumour markers

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted 20
Practicals: record and lab work* 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry III shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay	3 (attempt 2)	2 x 10	20
Short essay	8 (attempt 6)	6 x 5	30
Short answer	12 (attempt 10)	10 x 3	30
GRAND TOTAL			80

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Biochemistry III Practical shall be as follows: Distribution of marks

Type of Question	Marks allotted
Quantitative estimation	30
Renal Calculi	20
Urine examination	20
Case Reports	10
Total	80

Split up fo marks for experiments:

Qualitative:

Carrying out color reactions of the given solution + Bench viva

II yr B.Sc.,	8 mks + 2 mks
III yr B.Sc.,	**15 mks + 5 mks**

Quantitative:

a. Writing principle & procedure before conducting the experiment

II yr B.Sc.,	3 mks
III yr B.Sc.,	**5 mks**

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Biochemistry - III
COURSE CODE: BMLT301
DURATION OF EXAMINATION: 3 HOURS

b. Standardisation of expt & determining unknown concentration+ Bench viva

II yr B.Sc.,	25mks + 2 mks
III yr B.Sc.,	**40 mks + 5 mks**

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	80	20	100	200

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Microbiology - III
COURSE CODE: BMLT302
DURATION OF EXAMINATION: 3 HOURS

MICROBIOLOGY III
(Immunology, Virology and Mycology)

THEORY: 100 HOURS
PRACTICALS: 80 HOURS

I. IMMUNOLOGY

1. Infection 2 hrs

2. Immunity 4 hrs

- Innate immunity
- Acquired immunity (adaptive immunity)
- Active and passive immunity

3. Immune system

- Cell development
- B lymphocytes(general knowledge of their role)
- T lymphocytes
- Natural killer cells

4. Immune responses

- Humoral Immunity, Cell mediated immunity
- Antigen & Antibody
- Primary and secondary responses
- Theories of antibody productions
- Monoclonal Antibodies (production and applications)

5. Antigens

6. Antibodies

- Properties of Antibodies (immunoglobulins)
- Classes of immunoglobulins

7. Antigen-antibody reactions

Precipitation, Agglutination, ELISA, Immunofluorescence and miscellaneous tests.

8. Complement system

9. Hypersensitivity reactions

Immediate and delayed type

10.Autoimmunity

11. Transplantation and malignancy immunity

12. Immunodeficiency diseases

II. Virology

- General properties of virus, cultivation of viruses
- Pox viruses, Herpes viruses, Adenoviruses
- Picornaviruses, Orthomyxoviruses,
- Paramyxoviruses, Arboviruses, Rhabdoviruses
- Hepatitis viruses, Oncogenic viruses, HIV, Parvovirus

- Viral haemorrhagic fevers, SARS, Slow viruses
- Rotavirus, Norwalk virus, Astrovirus, Corona virus

III. **Mycology**

1. Introduction of Mycology, Classification
2. Lab Diagnosis of Fungal Infections
3. Mycoses

a. **Superficial Mycoses**
Malsezzia furfur, T. nigra, T .pidera

b. **Dermatophytes**

c. **Subcutaneous Mycoses**
Mycetoma, Rhinosporidium, Sporotrichosis, Chromomycosis

d. **Systemic Mycoses**
Histoplasmosis, Blastomycosis, Coccidiodosis, Paracoccidiosis

e. **Opportunistic fungi**
Aspergillosis, Penicillosis, Zygomycosis, Pneumocystis

f. **Candida, Cryptococcus**

3. Mycotoxins and antifungal agents.

Practicals

1. Immunology: Serological tests
Principle, procedure, normal values, significant titer, interpretation and limitation of the following tests
WIDAL, Brucella
VDRL, RPR
ASO, CRP, RF
ELISA for HbsAg,HIV
2. Virology
Demonstration of embryonated egg inoculation/ animals/inclusion bodies
Virology exercise
ELISA (HIV, HBV)
Western blot
Spot test (tridot/immuno comb test)
3. Mycology
Slide culture techniques
KOH mount
Identification of fungal culture
Macroscopic and microscopic examination of candida, Cryptococcus, Dermatophytes, aspergillus, rhizopus, mucur, penicillium

Practicals: record and lab work 20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology III shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay	3 (attempt 2)	2 x 10	20
Short essay	8 (attempt 6)	6 x 5	30
Short answer	12 (attempt 10)	10 x 3	30
GRAND TOTAL			80

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Microbiology III Practical shall be as follows: Distribution of marks

Type of Question	Marks allotted
Virology exercise	10
Mycology 2 exercise	15
Serology(Widal/ Brucella)	15
Serology (ASO/ CRP RPR/ RF)	10
Spotters	20
Record	10
Total	80

Distribution of Marks for University Theory and Practical Exam

Theory				Practicals			Grand total
Theory	Viva	IA	Sub	Practicals	IA	Sub Total	

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Pathology - III
COURSE CODE: BMLT303
DURATION OF EXAMINATION: 3 HOURS

PATHOLOGY III

Cytology, Automation in cytology, Cytogenetics, Cytochemistry, Immunohaematology and Blood transfusion

No. Theory classes: 100 hours
No. Practical classes: 80 hours

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) Papanicoloau's stain- principle , preparation and staining techniques
(b) May Grunwald Giemsa stain
(c) Shorr's stain
(d) Aceto orcin stain

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Pathology - III
COURSE CODE: BMLT303
DURATION OF EXAMINATION: 3 HOURS

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 collaginase, 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
(c) 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

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
Direct preparation from tumor materials

3. Characterization of human chromosomes by various banding techniques
4. Sex chromatin identification
5. Chromosomes in neoplasia and oncogenes

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Pathology - III
COURSE CODE: BMLT303
DURATION OF EXAMINATION: 3 HOURS

Immunocytochemistry

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

Immunohematology 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. Papanicoloau's and May Grunwald Geimsa staining
2. Hormonal cytology study
3. Blood grouping and Rh typing
4. Cross matching techniques
5. Screening of Donor's blood for infective agents
6. Transfusion reaction work up
7. Preparation of blood components

INTERNAL ASSESSMENT

Theory-average of 2 exams conducted	20
Practicals: record and lab work*	20

SCHEME OF EXAMINATION -THEORY

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology III shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
Long essay	3 (attempt 2)	2 x 10	20

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Pathology - III
COURSE CODE: BMLT303
DURATION OF EXAMINATION: 3 HOURS

Short essay	8 (attempt 6)	6 x 5	30
Short answer	12 (attempt 10)	10 x 3	30
GRAND TOTAL			80

SCHEME OF EXAMINATION – PRACTICALS

The scheme of examination for Pathology III Practical shall be as follows: Distribution of marks

Type of Question	Marks allotted
Pap stain	20
Blood grouping and typing	10
Cross matching	15
Coomb's test	15
Spotters	10
Record	10
Total	80

Distribution of Marks for University Theory and Practical Exam

Theory				**Practicals**			**Grand total**
Theory	Viva Voce	IA	Sub Total	Practicals	IA	Sub Total	
80	-	20	100	80	20	100	200

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Research & Biostatistics
COURSE CODE: BMLT304
DURATION OF EXAMINATION: 3 HOURS

SUBSIDIARY SUBJECTS

BIO STATISTICS
Time Allotted: 20 Hours
Course Description:
Introduction to basic statistical concepts: methods of statistical analysis; and interpretation of data
Behavioral Objectives:
Understands statistical terms.
Possesses knowledge and skill in the use of basic statistical and research methodology.

Unit – I : Introduction
Meaning, definition, characteristics of statistics.
Importance of the study of statistics.
Branches of statistics.
Statistics and health science including nursing.
Parameters and estimates.
Descriptive and inferential statistics.
Variables and their types.
Measurement scales

Unit – II : Tabulation of Data
Raw data, the array, frequency distribution.

Basic principles of graphical representation.
Types of diagrams - histograms, frequency polygons, smooth frequency polygon, commulative frequency curve, ogive.
Normal probability curve.

Unit - III : Measure of Central Tendency
Need for measures of central tendency
Definition and calculation of mean - ungrouped and grouped
Meaning, interpretation and calculation of median ungrouped and grouped.
Meaning and calculation of mode.
Comparison of the mean, and mode.
Guidelines for the use of various measures of central tendency.

Unit - IV : Measure of Variability
Need for measure of dispression.
The range, the average deviation.
The variance and standard deviation.
Calculation of variance and standard deviation ungrouped and grouped.
Properties and uses of variance and SO

Unit -V : Probability and Standard Distributions.
Meaning of probability of standard distribution.
The Binominal distribution.
The normal distribution.
Divergence from normality - skewness, kurtosis.

Unit - VI : Sampling Techniques
Need for sampling - Criteria for good samples.
Application of sampling in Community.
Procedures of sampling and sampling designs errors.
Sampling variation and tests of significance.

Unit - VII : Health Indicator
Importance of health Indicator.
Indicators of population, morbidity, mortality, health services.
Calculation of rates and rations of health.

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Computer Application
COURSE CODE: BMLT305
DURATION OF EXAMINATION: 3 HOURS

BASICS IN COMPUTER APPLICATIONS

Time allotted: 20 hours

The course enables the students to understand the fundamentals of computer and its applications.

Introduction to Data processing :

Features of computers, Advantages of using computers. Getting data into / out of

computers. Role of computers. What is Data processing? Application areas of computers involved in Data processing. Common activities in processing. Types of Data processing, Characteristics of information. What are Hardware and Software?

Hardware Concepts :
Architecture of computers, Classification of computers, Concept of damage. Types of storage devices. Characteristics of disks, tapes, Terminals, Printers, Network. Applications of networking concept of PC System care, Floppy care, Data care.

Concept of Software.
Classification of software : System software. Application of software. Operating system. Computer system. Computer virus. Precautions against viruses. Dealing with viruses. Computers in medical electronics
Basic Anatomy of Computers

Principles of programming
Computer application - principles in scientific research ; work processing, medicine, libraries, museum , education, information system.

Data processing
Computers in physical therapy - principles in EMG, Exercise testing equipment, Laser.

No Practical or Viva voce examination

Third Year Annual Examination to be held in the year 2022, 2023, 2024
CLASS: B.Sc Medical Laboratory Technology 3rd Year
COURSE TITLE: Computer Application
COURSE CODE: BMLT305
DURATION OF EXAMINATION: 3 HOURS