SUNRISE UNIVERSITY ALWAR
COURSE CURRICULUM FOR
BACHELOR OF SCIENCE
MEDICAL LABORATORY TECHNOLOGY

Semester I, II (2025-26)

Semester III, IV (2026-27)

Semester V and VI (2027-28)

Study & Evaluation Scheme
B.Sc. MLT- I Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML101T	HUMAN ANATOMY-I	3	-	-	3	40	60	100
BML102T	HUMAN PHYSIOLOGY-I	3	-	-	3	40	60	100
BML103T	BIOCHEMISTRY-I	3	-	-	3	40	60	100
BML104T	HEALTH EDUCATION & HEALTH COMMUNICATION	3	-	-	3	40	60	100
BML105P	PC SOFTWARE LAB		1	3	3	60	40	100
BML106P	PRACTICAL: HUMAN ANATOMY-I	-	1	3	3	60	40	100
BML107P	PRACTICAL: HUMAN PHYSIOLOGY-I	-	1	3	3	60	40	100
BML108P	PRACTICAL: BIOCHEMISTRY-I	-	1	3	3	60	40	100
	Total	12	03	12	24	400	400	800

Study & Evaluation Scheme B.Sc. MLT- II Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML201T	HUMAN ANATOMY-II	3	-	-	3	40	60	100
BML202T	HUMAN PHYSIOLOGY- II	3	-	-	3	40	60	100
BML203T	BIOCHEMISTRY-II	4	-	-	4	40	60	100
BML204T	BIOMEDICAL WASTE MANAGEMENT	4			3	40	60	100
BML205P	HUMAN ANATOMY-II	-	-	2	3	60	40	100
BML206P	HUMAN PHYSIOLOGY-II	-	1	3	3	60	40	100
BML207P	BIOCHEMISTRY-II	-	1	3	3	60	40	100
BML208P	COMMUNICATION LAB	-	2	3	3	60	40	100
	Total	14	4	11	24	400	400	800

Study & Evaluation Scheme
B.Sc. MLT- III Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML301T	PATHOLOGY-I	3	-	-	3	40	60	100
BML302T	CLINICAL HEMATOLOGY-I	3	-	-	3	40	60	100
BML303T	MICROBIOLOGY-I	3	-	-	3	40	60	100
BML304T	IMMUNOLOGY SEROLOGY-I	3	-	-	3	40	60	100
BML305T	HISTOPATHOLOGY & HUSTON TECHNIQUES-I	3	-	-	3	40	60	100
BML306P	CLINICAL HEMATOLOGY-I	-	2	2	3	60	40	100
BML307P	MICROBIOLOGY, IMMUNOLOGY& SEROLOGY - I	-	2	2	3	60	40	100
BML308P	HISTOPATHOLOGY & HISTOTECHNIQUES-I	-	2	2	3	60	40	100
	Total	15	6	06	24	380	420	800

Study & Evaluation Scheme
B.Sc. MLT- IV Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML301T	Pathology-II	3	-	-	3	40	60	100
BML302T	Clinical Hematology-II	3	-	-	3	40	60	100
BML303T	Microbiology-II	3	-	-	3	40	60	100
BML304T	Immunology Serology-II	3	-	-	3	40	60	100
BML305T	Histopathology & Histotechniques-II	3	-	-	3	40	60	100
BML306P	Clinical Hematology-II	-	1	3	3	60	40	100
BML307P	Microbiology, Immunology & Serology – II	-	1	3	3	60	40	100
BML308P	Histopathology& Histotechniques-II	-	1	3	3	60	40	100
	Total	15	03	09	24	380	420	800

Study & Evaluation Scheme
B.Sc. MLT- V Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML301T	IMMUNE HEMATOLOGY & BLOOD BANKING	3	-	-	3	40	60	100
BML302T	CLINICAL ENZYMOLOGIST & AUTOMATION	3	-	-	3	40	60	100
BML303T	PARASITOLOGY &VIROLOGY	3	-	-	3	40	60	100
BML304T	DIAGNOSTIC CYTOLOGY	3	-	-	3	40	60	100
BML305T	PRINCIPLES OF LAB MANAGEMENT & MEDICAL ETHICS	3	-	-	3	40	60	100
BML306P	CLINICAL ENZYMOLOGY	-	1	3	3	60	40	100
BML307P	PARASITOLOGY & VIROLOGY	-	1	3	3	60	40	100
BML308P	DIAGNOSTIC CYTOLOGY	-	1	3	3	60	40	100
	Total	15	3	9	24	380	420	800

Study & Evaluation Scheme
B.Sc. MLT- VI Semester

Course Code	Subject	Period			Credit	Evaluation Scheme		
		L	T	P		Internal	External	Total
BML301T	CLINICAL ENDOCRINOLOGY &TOXICOLOGY	3	-	-	3	40	60	100
BML302T	ADVANCED DIAGNOSTIC TECHNIQUES	3	- -	-	3	40	60	100
BML303T	DIAGNOSTIC MOLECULAR BIOLOGY	3	-	-	3	40	60	100
BML304P	CLINICAL ENDOCRINOLOGY TOXICOLOGY	-	1	2	3	60	40	100
BML305P	ADVANCED DIAGNOSTIC TECHNIQUES	-	1	2	3	60	40	100
BML306P	DIAGNOSTIC MOLECULAR BIOLOGY	-	1	2	3	60	40	100
BML307P	INTERNSHIP PROJECT	-	-	-	6	60	40	100
	Total	09	03	06	24	360	340	700

B.Sc. MLT - I Semester Course/Paper: Human Anatomy - I

Course Code: BML-101

Learning Objective:
The prime concern of this syllabus is to learn the terminology of the subject, gain basic knowledge of cells & tissues, and understand the anatomy of the human body. This subject will develop an understanding of the structure, culture, and function of organs and organ systems in the normal human body.

Unit-I

- Terminology and General Plan of the Body
- Body Parts and Areas
- Terms of Location and Position
- Body Cavities and Their Membranes: Dorsal cavity, Ventral cavity
- Planes and Sections

Unit-II

- Cells: Structure, function, and location
- Prokaryotic and Eukaryotic Cells
- Cell Organelles
- Cell Division
- Tissues: Types, Structure, Location, and Function of:
    - Epithelial Tissue
    - Connective Tissue
    - Muscle Tissue
    - Nerve Tissue
    - Membranes
    - Glandular Tissue
- The Integumentary System: Structure and function of the Skin, Subcutaneous Tissue

Unit-III

- Musculoskeletal System: Basic anatomy of important muscles and bones

Unit-IV

- Respiratory System: Basic anatomy of nose, larynx, trachea, bronchi, and lungs

Unit-V

- Digestive System: Basic anatomy of esophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas

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Learning Outcome:
Students will develop a vocabulary of appropriate terminology to effectively communicate information related to anatomy and recognize the anatomical structures included in the syllabus.

Suggested Readings:

1. Ross Wilson (2014), *Anatomy & Physiology in Health & Illness*, 11th edition, Elsevier Publications
2. Chaurasia BD (2016), *Human Anatomy*, 7th edition, CBS Publishers
3. Gerard J. Tortora and Bryan H. Derrickson, *Principles of Anatomy and Physiology*, 14th edition, Wiley Publications

B.Sc.MLT-ISemester
Course/Paper: Human Physiology-I
CourseCode:BML-102

Learning Objective: The prime concern of this syllabus is to integrate basic knowledge of cells, tissues, blood, physiological functions and diseases of system included in syllabus.

B.Sc. MLT - I Semester Course/Paper: Human Physiology - I

Course Code: BML-102

Learning Objective:
The prime concern of this syllabus is to integrate basic knowledge of cells, tissues, blood, physiological functions, and diseases of systems included in the syllabus.

Unit-I: Cell Physiology

- Structure of cells
- Cell membrane and transport across the cell membrane (Active and Passive transport)
- Organization of the Body
- Body Composition
- Body Fluid Volumes and their measurement
- Diffusion
- Osmosis
- Tonicity
- Homeostasis

Unit-II: Blood and Lymphatic System

- Blood: Composition, function, cellular components and their functions
- Haemoglobin & anaemia
- Blood groups and coagulation
- Lymphatic system: Composition & function of lymph, lymphatic tissue
- Immunity with the role of the thymus

Unit-III: Cardiovascular System

- General arrangement of the cardiovascular system
- Heart: structure and function
- Arteries, veins, and capillaries
- Cardiac cycle, heart sounds, and heart rate
- Blood pressure and mechanism of circulation
- Definition of hypertension & shock

B.Sc. MLT - I Semester Course/Paper: Human Physiology - I (Units IV–V)

Unit-IV: Respiratory System

- Parts of the respiratory system
- Mechanism of respiration
- Pulmonary function and pulmonary circulation
- Lung volumes
- Gas transport between lungs and tissues
- Definitions and disorders: hypoxia, dyspnoea, cyanosis, asphyxia, and obstructive airway diseases

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Unit-V: Gastrointestinal Physiology

- Organs of GIT and their structure & function
- Secretion, digestion, absorption, and assimilation
- Gastrointestinal hormones
- Physiology of digestion of carbohydrates, proteins & lipids
- Structure & function of liver, spleen, gall bladder & pancreas
- Disorders: Jaundice, Cirrhosis & Pancreatitis

Learning Outcome:
Students will develop an understanding of the function of organs and organ systems in the normal human body. They will be able to explain the physiological systems of the body and understand the basis of diseases.

Suggested Readings:

1. Ross & Wilson (2014), *Anatomy & Physiology in Health & Illness*, 11th edition, Elsevier Publications
2. Sujit Chaudhury (2011), *Concise Medical Physiology*, 6th edition, NCBA
3. Sembulingam K (2012), *Essentials of Medical Physiology*, 6th edition, Jaypee Publications
4. Guyton & Hall (2011), *Textbook of Medical Physiology*, 12th Edition, Saunders/Elsevier
5. Gerard J. Tortora and Bryan H. Derrickson, *Principles of Anatomy and Physiology*, 14th edition, Wiley Publications

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B.Sc. MLT - I Semester Course/Paper: Biochemistry - I

Course Code: BML-103

Learning Objective:
This syllabus has been formulated to impart basic knowledge of biochemistry, apparatus, units, equipment, and volumetric analysis in Clinical Biochemistry.

Unit-I: Introduction to Clinical Biochemistry

- Role of the Medical Lab Technologist
- Ethics, responsibility, safety measures, and hazards in the clinical biochemistry lab

First aid in laboratory accidents

Unit II

Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement,

Unit-III

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base

Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins

Unit-IV

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinizationofsample,Handlingofspecimensfortesting,preservationof specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample

Unit-V

Physical, chemical and microscopic examination of urine, Benue Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments,urobilinogen,occultblood,uricacid,ureaand Cretonne, quantitative estimation of 24 hrs urine for protein and their clinical significance.

Learning Outcome: Students will know the basics of reagent preparation, instrument handling and can perform common analytical in Clinical Biochemistry.

Suggested Readings:

1. DMVasudevan,(2011),TextbookofMedicalBiochemistry,6th editionJaypeePublishers
2. MNChatterjea & Rana Shinde,(2012),Textbook of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh&Sahni,(2008),IntroductoryPracticalBiochemistry,2nd edition,Alphascience
4. Lehninger,(2013),PrinciplesofBiochemistry,6th edition,WHFreeman
5. USatyanarayan,(2008),EssentialsofBiochemistry,2nd edition,StandardPublishers

B.Sc. MLT-I Semester
Course/Paper: Health Education & Health Communication
Course Code: BML-104

Unit1:

- Health Education: Principles& Objectives, Levels of Health Education, Educational Methods, Evaluation & Practice of Health Education in India.
- Health Counseling: Introduction, Theories, Process &Techniques.
- HealthCareReporting,RoleofNIC&OtherBodies,ResearchinHealthEducation

Unit 2:

- HeathCommunication:BasicConcept&PrinciplesofCommunication,Definition,Purpose, Types of Communication

B.Sc. MLT - I Semester Course/Paper: Health Education & Health Communication

Course Code: BML-104

Unit-II: Communication

- Communication Process
- Directions of Communication: Upward, Downward, Lateral
- Factors influencing communication
- Barriers to effective communication and how to overcome them
- Models of Communication:
    - Aristotle Model
    - Shannon and Weaver Model
    - Schramm Model
    - Laegans Model
    - Fano Model
    - Literer's Model
    - Westly Maclean's Model

Unit-III: Mass Communication & ICT in Health Education

- Mass communication and the role of media in health education
- Information and Communication Technologies (ICT) in healthcare and awareness (Telemedicine & e-health, community radio)
- Future trends in information and communication systems

Suggested Books:

1. *Health Education – A New Approach* – L. Ramachandran & T. Dharmalingan
2. *Health Communication in the 21st Century* – Kevin B. Wright, Lisa Sparks, H. Dan O'Hair, Blackwell Publishing Limited, 2013, First Edition
3. *Health Communication: From Theory to Practice* – Renata Schiavo, Jossey-Bass
4. *Health Communication* – R.D. Karma, Mohit Publications, 2008
5. *Counseling Skills for Health Care Professionals*, 1st Edition – Rajinikanth AM, Jaypee Brothers, 2010

B.Sc. MLT - I Semester Course/Paper: PC Software Lab

Course Code: BML-191

Topics:

- Introduction to computers and software
- MS Windows (Windows '98, Second Edition)
- Desktop: Creation of folders and shortcuts, features of Windows Explorer
- Familiarization and basic use of MS Office packages: Word, Excel, PowerPoint (Version MS-Office 2000)

Suggested Books:

1. *Introduction to Computers with MS-Office* – Leon, TMH
2. *Personal Computer Software* – EXCELBOOKS
3. *A First Course in Computers*, 2003 – Saxena, VIKAS

B.Sc. MLT - I Semester Course/Paper: PC Software Lab

Course Code: BML-191

Suggested Books (continued):
4. *Computer Concepts & Windows* – Stoline, SPD/LABYRINTH
5. *Windows '98 in Easy Steps* – Harshad Kotecha, Wiley Dreamtech
6. *Office 2000 in Easy Steps* – Stephen Copestake, Wiley Dreamtech
7. *Windows & MS-Office 2000* – Krishnan, SCITECH
8. *Trouble Shooting Microsoft Windows* – PHI/MSP

B.Sc. MLT - I Semester Course/Paper: Practical Human Anatomy-I

Course Code: BML-192

Practical Exercises:

1. Demonstration of major organs through models and permanent slides
2. Demonstration of parts of the circulatory system from models
3. Demonstration of parts of the respiratory system from models
4. Demonstration of the digestive system from models
5. Demonstration of the excretory system from models
6. Demonstration of the nervous system from models
7. Structure of the eye and ear
8. Demonstration of structural differences between skeletal, smooth, and cardiac muscles

B.Sc. MLT - I Semester Course/Paper: Practical Human Anatomy-I (continued)

Course Code: BML-192

Practical Exercises (continued):
9. Demonstration of various bones
10. Demonstration of various joints
11. Demonstration of various parts of male & female reproductive system from models

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B.Sc. MLT - I Semester Course/Paper: Practical Human Physiology-I

Course Code: BML-193

Practical Exercises:

1. To measure pulse rate
2. To measure blood pressure
3. Demonstration of ECG
4. To perform Hemoglobin estimation by Sahli's Method
5. To perform Hemoglobin estimation by CMG method
6. Hemoglobin by CMG method (duplicate, ensure consistency in lab record)
7. To perform Total RBC count
8. To perform total leucocyte count
9. To perform differential leucocyte count
10. To perform PCV (Packed Cell Volume)
11. To calculate Red cell indices

B.Sc. MLT - I Semester Course/Paper: Practical Biochemistry-I

Course Code: BML-194

Practical Exercises:

1. Study general laboratory safety rules
2. Demonstrate glassware, apparatus, and plasticware used in laboratory
3. Collection of blood samples
4. Separation of serum and plasma
5. Preparation of different percentage solutions
6. Preparation of normal and molar solutions (0.1N NaOH, 0.2N HCl, 0.1M H_2SO_4)
7. Demonstration of photo colorimeter
8. Demonstration of spectrophotometer
9. Demonstration of pH meter
10. Deproteinization of blood sample

B.Sc. MLT - II Semester Course/Paper: Human Anatomy-II

Course Code: BML-201

Learning Objective:
This syllabus is an extension of Part-I. It divides the body systems into two semesters to ensure complete and comprehensive knowledge of all functionalities of the body.

Unit-I: Cardiovascular System

- Basic anatomy of the heart and important blood vessels
- Brief introduction about the lymphatic system

Unit-II: Nervous System

- Basic anatomy of the brain and spinal cord
- Meninges and cerebrospinal fluid
- Cranial nerves

Unit-III: Endocrine System

- Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, and Adrenal glands

Unit-IV: Special Senses

- Basic anatomy of eye, ear, and nose

B.Sc. MLT - II Semester Course/Paper: Human Anatomy-II

Course Code: BML-201

Unit-V: Genitourinary System

- Basic anatomy of kidney and associated organs
- Male reproductive organs
- Female reproductive organs

Learning Outcome:
This curriculum can stimulate students to understand the basic anatomy of included systems and the resultant unified organization of the human body.

Suggested Readings:

1. Ross & Wilson, (2014), *Anatomy & Physiology in Health & Illness*, 11th edition, Elsevier Publications
2. Chaurasia BD, (2016), *Human Anatomy*, 7th edition, CBS Publishers
3. Gerard J. Tortora and Bryan H. Derrickson, *Principles of Anatomy and Physiology*, 14th edition, Wiley Publications

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B.Sc. MLT - II Semester Course/Paper: Human Physiology-II

Course Code: BML-202

Learning Objective:
This subject imparts knowledge of the structure and function of organs and organ systems in the normal human body.

Unit-I: Excretory System

- Organs of excretory system: Kidneys, nephron
- Mechanism of excretion, urine formation (glomerular filtration and tubular reabsorption)
- Electrolytes: their balances and imbalances
- Introduction to acidosis and alkalosis

Unit-II: Muscle Physiology

- Muscle and nerve physiology
- Types of muscles
- Gross structural and functional differences with reference to properties

Unit-III: Nervous System

- General organization of CNS
- Function of important structures and spinal cord

- Neuron, nerve impulse
- Types of nerves according to function
- Autonomic nervous system: organization and function
- Special senses: general organization and functions

Unit-IV: Endocrine System

- Brief introduction of endocrine glands and their secretion
- Common endocrinological disorders: diabetes mellitus, hyper- & hypothyroidism, dwarfism, gigantism, titans

Unit-V: Reproductive System

- Male and female reproductive organs
- Sex hormones and secondary sexual characteristics
- Puberty, spermatogenesis, cogenesis, menstrual cycle, pregnancy, menopause
- Contraceptive measures

Learning Outcome:
Students will be able to understand the functioning of various systems included in the syllabus as well as related diseases.

B.Sc. MLT - II Semester Course/Paper: Biochemistry-II

Course Code: BML-203

Learning Objective:
This paper is an extension of BML-S-104 and aims at understanding the chemical properties of bimolecular, their functions, and biomedical importance.

Unit-I: Carbohydrates and Proteins

- **Carbohydrates:** Classification, function, importance, structure, digestion & absorption
- **Proteins:** Classification, function, importance, structure, digestion & absorption

Unit-II: Amino Acids and Lipids

- **Amino acids:** Classification, structure, properties, and biological functions
- **Lipids:** Classification of lipids, classification of fatty acids (saturated & unsaturated), their biological functions, digestion and absorption, introduction to lipoproteins

Unit-III: Enzymes

- Definition and classification of enzymes
- Cofactors and coenzymes
- Concept of active sites and general mode of action of enzymes
- Units for measuring enzyme activity
- Factors affecting enzyme activity
- Factors responsible for abnormal enzyme secretion

Unit-IV: Nucleic Acids

- Structure and function of DNA and RNA
- Types of DNA and RNA
- Nucleotides and nucleosides
- Nitrogen bases: pureness and pyrimidines
- Role of nucleic acids

Unit-V: Vitamins, Minerals, and Ions

- **Vitamins:** Classification, function, and diseases associated with deficiencies
- **Minerals and ions:** Requirement, function, and biological importance of calcium, iron, iodine, zinc, phosphorus, copper, sodium, and potassium

Learning Outcome:
Students will understand the chemistry, function, and biological importance of carbohydrates, proteins, lipids, nucleic acids, enzymes, vitamins, and minerals.

Suggested Readings:

1. DMVasudevan, (2011), *Textbook of Medical Biochemistry*, 6th edition, Jaypee Publishers

Suggested Readings (continued):

3. Singh & Sahni, (2008), *Introductory Practical Biochemistry*, 2nd edition, Alpha science
4. Menninger, (2013), *Principles of Biochemistry*, 6th edition, W.H. Freeman
5. U. Satyanarayan, (2008), *Essentials of Biochemistry*, 2nd edition, Standard Publishers

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B.Sc. MLT - II Semester Course/Paper: Bio-Medical Waste Management

Course Code: BML-204

Unit-I: Present Scenario

- Bio-medical waste – Concepts and perceptions
- Waste generation
- Segregation
- Disposal

Unit-II: Planning and Objectives

- Planning and objectives of BMW (Bio-Medical Waste) management
- Survey
- Policies and perspectives of BMW management

Unit-III: Record Keeping & Technologies

- Record keeping
- Management of bio-medical waste
- Technologies for treatment of BMW
- Criteria for selecting appropriate medical waste technologies

Unit-IV: Training & Safety

- Training
- Occupational safety and health issues

Unit-V: Legal & Environmental Aspects

- Legal aspects and environmental concerns
- Implementation of action plan
- Approaches to common regional facilities

Reference Books:

1. *The Book of Hospital Waste Management* – Dr. D.B. Acharya & Dr. Meeta Singh, Minerva Press, New Delhi
2. *Hospital Waste Management & its Monitoring* – Madhuri Sharma, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi

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Practical Syllabus – B.Sc. MLT - II Semester

BML-291: Practical Anatomy-II

- As per Theory BML – 201

BML-292: Practical Human Physiology-II

1. To perform total platelet count
2. To perform bleeding time
3. To perform clotting time
4. To study CSF (Cerebrospinal Fluid) examination
5. To study intrauterine contraceptive devices
6. To demonstrate microscopic structure of bones with permanent slides
7. To demonstrate microscopic structure of muscles with permanent slides

BML-293: Practical Biochemistry-II

1. To identify carbohydrates in a given solution by various methods
2. To determine protein by Biuret method
3. To perform protein tests by various methods
4. Physical examination of urine
5. Urine sugar determination by Benedict's method
6. Protein determination by heat and acetic method
7. Bile salt, bile pigments, and urobilinogen determination
8. Determination of ketone bodies
9. Determination of various parameters of urine by uristik method
10. Preparation of hemolysate

BML-294: Communication Lab

1. **Introduction:** Meaning of communication; role of communication in business; basic elements of the communication process; levels of communication; forms, models, and media of communication; verbal and non-verbal communication – functions and types; barriers to effective communication
2. **Grammar:** Subject-verb agreement, tense, voice, sentence improvement, sentence rearrangement
3. **Vocabulary:** Usage, synonyms, antonyms
4. **Comprehension**
5. **Forms of Writing:** Essay, précis, report, proposal, C.V. and job application letter, presentation
6. **Role Playing**
7. **Group Discussion**

B.Sc. MLT – III Semester Course/Paper: Pathology-I

Paper Code: BML-301
Learning Objective: To develop basic understanding of diseases, their pathogenesis, and supplement prior knowledge from physiology.

Unit I: Introduction & Cell Injury

- Introduction & history of pathology
- Basic definitions and familiarization with common pathology terms
- Causes and mechanisms of cell injury: reversible and irreversible
- Introduction to hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis, apoptosis

Unit II: Inflammation

- General features of acute and chronic inflammation
- Vascular changes and cellular events
- Cells and mediators of inflammation
- Phagocytosis and its mechanism

Unit III: Tissue Renewal & Repair

- Healing and fibrosis
- Cirrhosis
- Introduction to edema, hyperemia, congestion, hemorrhage
- Hemostasis, thrombosis, embolism, infarction, shock, hypertension

Unit IV

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, A etiology and path physiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease
Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

Unit V

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of ontogenesis, tumor suppressor genes, DNA repair genes and cancers stem cells.

Learning Outcome: This curriculum will provide an introductory nature and build the concepts of how human system work in altered and diseased stage under the influence of various internal
And external stimuli to the students.

Suggested Readings:

1. Harshmohan(2017),TextbookofPathology,7th edition,JaypeePublications
2. Robbins,(2012),TextbookofPathology,3rd edition,ElsevierPublications

B.Sc. MLT-III Semester
Course/paper: Clinical

Hematology-I
CourseCode:BML-302

Learning Objective: This course has been designed to understand the blood disorders, its lab diagnosis and various type of laboratory test.

Unit–I

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3- BPG and oxygen dissociation curve.
Anemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management,
Iron deficiency anemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test
Megaloblasticanaemia, pernicious anaemia,pathogenesis,laboratoryinvestigations

Unit-II

Harmon globins, its synthesisandtypes,normalandabnormalhemoglobins, extravasccular and intravascular hemolysis.
Haemolyticanaemia,pathogenesisandlaboratoryinvestigations,principleand procedure of special test, G-6-PD

Unit–III

Leukopoiesis , Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia , neutrophilia , eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on bloodcell parameter

Unit-IV
Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondary hemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system,Fibrinolysis

Unit-V
General blood picture, estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin,Vit.B12, Folic acid, FIGLU test, Schiling test, Parietal cell antibodies,G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR APTT, Mixing experiments in PT and APTT, Thrombin time.

Learning Outcome: Students will learn the differential diagnosis and appropriate diagnostic evaluation of common hematologic abnormalities.

Suggested Readings:

1. Mukherjee .L.K(2017),Medical Laboratory Technology,Vol.1-3,3rd edition, Tata McgrawHill
2. SodRamnik,(2015),TextbookofMedicalLaboratoryTechnology,2nd edition, Jaypee Publications
3. Wintrobe'sClinicalHaematology,(2014),13thedition,LippincottWilliams& Wilkins
4. DeGruchy'sClinicalHaematologyinMedicalPractice,(2012),Sixthedition, Wiley Publications
5. Dacie&LewisPractical Hematology,(2011),11thedition,Elsevier Publications

B.Sc. MLT-III Semester

Course/Paper: Microbiology-I
PaperCode:BML-303

Learning Objective: This subject gives a general insight into the history, basics of microbiology and imparts knowledge about equipment used in microbiology.

Unit-I
Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner
Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pile, ribosome's.

Unit-II
Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope,

Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

Unit-III

Cellsize,shapeandarrangement,cell-wall,compositionanddetailedstructureof

Gram-positiveand Gram-negativecellwalls, CellMembrane:Structure,functionand chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

Unit-IV

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators.

Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal

Unit-V

Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound.use and abuse of disinfectants. precautions while using the disinfectants.

Learning Outcome: This course make the students to know handling of instruments and sterilization techniques.

SuggestedReadings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. BrooksG.F., CarrollK.C.,ButelJ.S.,MorseS.A.andMietzner,T.A.(2013)
3. Adelberg'sMedicalMicrobiology.26thedition.McGrawHillPublication
4. Goering R.,DockrellH.,ZuckermanM.and WakelinD.(2007)Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM,SherwoodLM,and WoolvertonCJ.(2013)Prescott,Harley andKlein's Microbiology. 9th edition. McGraw Hill Higher Education
6. GoldsbyRA,KindtTJ,OsborneBA.(2007).Kuby'sImmunology.6th edition W.H. Freeman and Company, New York.

B.Sc.MLT-IIISemester

Course/Paper: Immunology & Serology -I

CourseCode:BML-304

Learning Objective: This course has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utilityin laboratorydiagnosis of human diseases.

Unit-I

Historical background, general concepts of the immune system, innate and adaptive immunity;active and passive immunity; primary and secondary immuneresponse.

Cellandorgansofimmunesystem, Phagocytosis

Unit-II

Antigens and haptens : Properties ,foreignness, molecular size, heterogeneity,BandTcellepitopes;TdependentandTindependent

B.Sc. MLT – III Semester Course/Paper: Immunology-I

Course Code: BML-304
Learning Objective: To provide knowledge of the immune system, its components, and laboratory methods used to study immune responses.

Unit I: Introduction to Immunology

- History and scope of immunology
- Innate and adaptive immunity
- Active and passive immunity
- Antigens: properties, types, and factors affecting antigenicity

Unit II: Antibodies

- Historical perspective of antibody structure
- Structure, function, and properties of antibodies
- Classes, subclasses, and biological activities of antibodies
- Concepts of antibody diversity, isotype, and allotype
- Introduction to hybridoma technology, monoclonal antibodies, and polyclonal antibodies

Unit III: Immune Response Mechanisms

- Mechanism of humoral and cell-mediated immune response
- Major Histocompatibility Complex (MHC): organization and inheritance in humans
- Antigen-presenting cells, antigen processing, and presentation
- Complement system and complement fixation test

Unit IV: Laboratory Techniques

- Demonstration of antigen–antibody reactions
    - Agglutination
    - Precipitation
    - ELISA
    - RIA
    - Immunofluorescence

Unit V: Clinical Immunology

- Rheumatological diseases: etiology, pathogenesis, and laboratory investigations

Learning Outcome: Students will understand scientific approaches and laboratory techniques used to investigate immunological and clinical conditions.

Suggested Readings:

1. Abbas AK, Lichtman AH, Pillai S. *Cellular and Molecular Immunology*, 6th edition, Saunders, 2007
2. Delves P, Martin S, Burton D, Roitt IM. *Roitt's Essential Immunology*, 11th edition, Wiley-Blackwell, 2006
3. Goldsby RA, Kindt TJ, Osborne BA. *Kuby's Immunology*, 6th edition, W.H. Freeman, 2007

4. Murphy K, Travers P, Walport M. *Janeway's Immunobiology*, 7th edition, Garland Science, 2008
5. Peakman M, Vergani D. *Basic and Clinical Immunology*, 2nd edition, Churchill Livingstone, 2009
6. Richard C, Geoffrey S. *Immunology*, 6th edition, Wiley Blackwell, 2009

B.Sc. MLT – III Semester Course/Paper: Histopathology & Histotechniques-I

Course Code: BML-305
Learning Objective: To impart knowledge of tissue processing, histological techniques, and staining methods.

Unit I: Introduction to Histopathology

- Introduction to histopathology, cytology, and histotechniques
- Laboratory organization, equipment care, and maintenance
- Safety measures in the histotechnology lab
- Reception, recording, labeling, and transportation of tissue specimens
- Basic concepts of tissue fixation and types of fixatives used in histopathology and cytopathology

B.Sc. MLT – III Semester Course/Paper: Histopathology & Histotechniques-I

Course Code: BML-305
Learning Outcome: Students will be able to carry out tissue processing and general staining procedures.

Unit II: Tissue Processing

- Tissue types, location, and function
- Grossing of tissues, whole mount, sections, smears
- Tissue processing: steps, manual and automated methods
- Components & principles of automatic tissue processors
- Decalcification: methods, types of decalcifying fluid, processing of bones and teeth
- Embedding media: types and properties

Unit III: Microtomy

- Microtome types and working principles
- Microtome knives: types and knife sharpening
- Section cutting: faults and remedies
- Section adhesives

Unit IV: Cryostat and Staining

- Cryostat: frozen sections of fresh, fixed, and unfixed tissue
- Freeze drying, rapid frozen sections, emergency diagnosis
- Dye chemistry: stains and dyes (natural, acidic, basic, neutral, fluorescent)
- Mordants, accelerators, accentuators, metachromasia, metachromatic dyes

Unit V: Staining Techniques

- Progressive, regressive, vital, and supravital staining
- Types of hematoxylin
- Hematoxylin and eosin (H&E) staining
- Use of control sections in tissue staining
- Mounting and mounting media: advantages, disadvantages, refractive index

Suggested Readings:

1. Bancroft, J.D., *Theory and Practice of Histological Techniques*, 7th Edition, Elsevier
2. Harshmohan, *Textbook of Pathology*, 7th Edition, Jaypee Publications, 2017
3. Godkar B. Praful, *Textbook of MLT*, 3rd Edition, Bhalani Publications, 2016
4. C. F. A. Culling, *Handbook of Histopathological and Histochemical Techniques*, 3rd Edition, Butterworths, 1974

B.Sc. MLT – III Semester Practical: Clinical Hematology-I

Course Code: BML-391

Practical Exercises:

1. Determination of hemoglobin by various methods
2. Total RBC count
3. Packed cell volume (PCV)
4. Red cell indices calculation
5. Demonstration of hypochromic microcytic slide
6. General blood picture
7. Determination of G-6-PD
8. Differential leucocyte count
9. Absolute leucocyte count
10. Demonstration of toxic granulation of neutrophils
11. Prothrombin time (PT) and INR calculation
12. Activated partial thromboplastin time (APTT)
13. Sickling test
14. Determination of plasma hemoglobin
15. Reticulocyte count

1. .

B.Sc. MLT – III Semester Practical: Microbiology, Immunology & Serology-I

Course Code: BML-392

Practical Exercises:

1. Demonstration of microscope and its parts
2. Demonstration of glassware used in microbiology
3. Demonstration of autoclave and sterilization of glasswares
4. Demonstration of hot air oven and sterilization of glasswares
5. Gram staining of bacteria
6. Acid-fast staining (Ziehl–Neelsen method)
7. Indian ink staining (capsule staining)
8. Hanging drop method (motility observation)
9. Demonstration of bacterial capsules
10. Staining of bacterial spores
11. Demonstration of agglutination reactions
12. Rheumatoid arthritis (RA) test
13. Widal test (for enteric fever)
14. Rapid plasma reagin (RPR) test
15. C-reactive protein (CRP) test

B.Sc. MLT – III Semester Practical: Histopathology & Histotechniques-I

Course Code: BML-393

Practical Exercises:

1. Demonstration of glasswares and equipment used in histopathology lab
2. Preparation of alcohol solutions of different concentrations
3. Preparation of formalin from stock solution
4. Knife sharpening by honing and stropping
5. Grossing of tissue specimens
6. Manual tissue processing
7. Section cutting of paraffin-embedded tissue
8. Fixing smears on glass slides
9. Hematoxylin and eosin (H&E) staining
10. Mounting and preservation of slides

1. .

B.Sc. MLT – IV Semester: Pathology-II

Course Code: BML-401
Learning Objective:
To teach students the basic hematology techniques, clotting mechanisms, blood banking procedures, and use of automated hematology instruments.

Unit-I: Hematology Fundamentals

- **Hemoglobin**: Structure, function, types
- **Hemoglobinometry**: Estimation methods, advantages/disadvantages
- **Blood cell counting**:
  - RBC count, WBC count, platelet count
  - Absolute eosinophil count and other WBC differentials
  - Neubauer counting chamber (manual) and electronic methods
  - Physiological and pathological variations
- **Erythrocyte sedimentation rate (ESR)**: Manual and automated methods, factors affecting ESR
- **Packed Cell Volume (PCV)**
- **Red cell indices**: MCV, MCH, MCHC
- Variations in values under normal and pathological conditions

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Unit-II: Complete Blood Count & Body Fluids

- **Complete Blood Count (CBC)**: Automated determination and significance of each parameter
- **Reticulocyte count**
- Routine examination of:
  - Cerebrospinal fluid (CSF)
  - Semen
  - Sputum
  - Stool

Unit-III: Coagulation & Hemostasis

- Mechanism of coagulation and coagulation factors
- Hemostasis tests:
  - Bleeding time
  - Clotting time
  - Platelet count
  - Protamine sulfate test
  - Clot retraction test

Unit-IV: Immunohematology & Blood Banking

- Concepts of **antigen, antibody, and complement**
- Blood group systems: ABO, Rh, and other systems
- Blood banking procedures:
    - Donor selection
    - Blood collection, anticoagulants, and additive systems
    - Blood bag labeling, storage, and transportation

Unit-V: Automation & Instrumentation

- Automated instruments in hematology:
    - Coulter counter
    - Coagulometer
    - ESR analyzer
    - Urine analyzer
    - Point-of-care testing devices
- Pre- and post-analytical variables
- Care, maintenance, and calibration of instruments

Learning Outcome:

Students will be able to:

- Perform hematology tests, coagulation profile, and immunohematology procedures
- Handle automated instruments efficiently
- Interpret normal and pathological hematology results

Suggested Readings:

1. Godkar, B. Praful (2016), *Textbook of MLT*, 3rd edition, Bhalani Publications
2. Singh, Tejinder (2014), *Atlas & Textbook of Haematology*, 3rd edition, Avichal Publications
3. Ochei, J. & Kolhatkar, A. (2000), *Medical Laboratory Science: Theory & Practice*, 3rd edition, McGraw Hill
4. Mukherjee, L.K. (2017), *Medical Laboratory Technology*, Vol.1–3, 3rd edition, Tata McGraw Hill
5. Sood, Ramnik (2015), *Textbook of Medical Laboratory Technology*, 2nd edition, Jaypee Publications

Course/Paper:ClinicalHaematology-II
Course Code: BML-402

LearningObjective: Thispaperencompassesthebasicstudyandunderstandingofthe various haematological disorders as well as their laboratory investigations.

Unit-I
Aplastic anaemia, Anaemia of chronic disorders, Sideroblasticanaemia, HaemolyticAnaemia, etiology, pathogenesis, clinical features, laboratoryinvestigations,
Bone marrow examination, composition & functions, aspiration techniques, processing and staining

Unit-II
Hemoglobinopathies,qualitativeandquantitative
Sickle cell anaemia, sickle cell trait,etiology, pathogenesis, clinical features, and laboratory investigations,Disease management and prognosis, Sicklingtest
Thalassaemia,classification,etiology,pathogenesis,clinicalfeatures,laboratory investigations, haemoglobin electrophoresis

Unit-III
Leukemiaandits classification,WHO andFABclassification,AML,ALL,CML, CLL,itsetiology, clinical features, laboratory investigations
Cytochemistryinvolvedindiagnosisofvarioustypesofleukemia.

Unit-IV
Qualitative and quantitative disorders of platelets, hypercoaguable test, Disorders of secondary hemostasis, hemophilia and its lab diagnosis,Von-Willebrand disease, Disseminated intravascular coagulation, thrombosis, Disorder of fibrinogen, test for bleeding & coagulation disorders, correction studies for factor deficiency, quantitative factor assay

Unit-V
LE cells, its demonstration and significance, lupus anticoagulants, Blood parasites, Malaria, Trypanosomes, Filariasis, Leishmania

Learning Outcome: This course made the students competent enough to perform variouslaboratory test related to acute and chronic haematologicaldisorders.

SuggestedReadings:

1. Wintrobe'sClinicalHematology,(2014),13th edition,LippincottWilliams&Wilkins
2. De Gruchy'sClinicalHaematology in Medical Practice,(2012),Sixthedition,Wiley Publications
3. Dacie&LewisPracticalhematology,(2011),11th edition,ElsevierPublications
4. RNMakroo,(2009),CompendiumofTrasfusionmedicine,2nd edition,Career Publications

B.Sc.MLT-IV Semester

B.Sc. MLT – IV Semester: Microbiology-II

Course Code: BML-403
Learning Objective:
To provide students with advanced knowledge of microbiology laboratory practices, host-pathogen interactions, bacterial and fungal pathogens, and antimicrobial susceptibility testing.

Unit-I: Laboratory Organization & Safety

- Lab organization, management, and recording of results
- **Quality control** in medical microbiology laboratories
- **Laboratory safety**:
  - Occurrence and routes of lab-acquired infections
  - Precautions while handling pathogens in teaching and research

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Unit-II: Host-Pathogen Interaction

- **Definitions**: Infection, invasion, pathogen, pathogenicity, virulence, toxigenicity
- **Carriers**: Types and role in transmission
- Opportunistic infections
- Nosocomial infections (hospital-acquired infections)
- **Modes of transmission** of infections

Unit-III: Laboratory Equipment & Sterility Testing

- **Instruments**:
  - Laminar air flow, centrifuge, autoclave, hot air oven, incubator, colony counter, muffle furnace, Mac-intosh jar
- **Sterility testing of I/V fluids**: Collection, transport, processing, and interpretation
- Care, maintenance, and proper use of microbiology equipment

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Unit-IV: Hospital-Acquired Infections & Antimicrobial Testing

- Role of microbiology lab in controlling nosocomial infections
- Specimen collection for clinical and epidemiological purposes
- **Antimicrobial agents and antibiotics**:
  - Introduction, classification, mechanisms of action, uses
  - Antibiotic susceptibility testing:
    - Preparation and standardization of inoculum
    - Control bacterial strains
    - Culture media for susceptibility testing
    - Methods: Kirby-Bauer, Stokes method
    - MIC (Minimum Inhibitory Concentration) and MBC (Minimum Bactericidal Concentration)

- **Clinical bacterial pathogens**:
    - Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Bordetella

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Unit-V: Bacterial & Fungal Pathogens

- **Bacterial pathogens**:
    - Clostridia, Escherichia coli, Salmonella, Shigella, Proteus, Vibrio, Pseudomonas, Spirochetes, Chlamydia, Actinomyces, Rickettsia, Yersinia, Brucella
    - Morphology, culture characteristics, pathogenicity, clinical features, laboratory diagnosis
- **Introduction to Mycology**:
    - Definition, general properties, classification
    - Cutaneous, systemic, and opportunistic mycoses
    - Culture techniques and laboratory tests for fungi

Learning Outcome:

Students will be able to:

- Identify and differentiate bacteria and fungi in clinical and environmental samples
- Understand laboratory safety, equipment handling, and quality control
- Perform antimicrobial susceptibility testing and interpret results

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Suggested Readings:

1. Ananthanarayan, R. & Paniker, C.K.J. (2009), *Textbook of Microbiology*, 8th edition, Universities Press
2. Pelczar, M.J., Chan, E.C.S., Krieg, N.R. (2008), *Microbiology*, 5th edition, McGraw Hill
3. Tortora, G.J., Funke, B.R., Case, C.L. (2013), *Microbiology: An Introduction*, 11th edition, Pearson
4. Dubey, R.C., Maheshwari, D.K. (2012), *A Textbook of Microbiology*, S. Chand
5. Prescott, L.M., Harley, J.P., Klein, D.A. (2008), *Microbiology*, 7th edition, McGraw Hill

B.Sc. MLT – IV Semester: Immunology & Serology-II

Course Code: BML-404
Learning O

bjective:
To provide knowledge of advanced serological techniques, autoimmune disorders, immunodeficiencies, tumor markers, vaccines, and transplant immunology.

Unit-I: Advanced Serological Techniques & Hypersensitivity

- **Techniques:**
  - Western blotting
  - Immunodiffusion
  - Immunoelectrophoresis
- **Hypersensitivity:**
  - Types I–IV
  - Introduction to allergy and its laboratory tests

Unit-II: Transplant Immunology

- Basics of transplantation immunology
- **Graft rejection:** Types and mechanisms
- **Tissue typing** for kidney and bone marrow transplants
- Laboratory tests for transplant compatibility

Unit-III: Autoimmune Disorders

- Pathogenesis of autoimmune diseases
- **Types:**
  - Organ-specific: e.g., parietal cell antibody, anti-sperm antibody
  - Systemic: e.g., lupus anticoagulants, ANA, dsDNA, antimitochondrial antibody, ASMA, anti-CCP
- Laboratory markers and diagnostic significance

Unit-IV: Immunological Disorders & Tumor Markers

- **Primary and secondary immunodeficiencies:** SCID, AIDS
- **Tumors:** Classification, tumor types, and laboratory markers
- Methods for estimation of tumor markers

Unit-V: Vaccines & Immunoprophylaxis

- **Vaccines:** Classification, mechanism, and applications
- Active and passive immunization
- Immunoprophylaxis schedules: neonates, children, pregnancy

Learning Outcome:

Students will be able to:

- Perform serological techniques for diagnosis
- Identify markers of autoimmune and immunodeficiency disorders
- Understand vaccine applications and immunoprophylaxis schedules
- Assist in transplant immunology testing

Suggested Readings:

1. Abbas AK, Lichtman AH, Pillai S. (2007). *Cellular and Molecular Immunology*, 6th edition, Saunders, Philadelphia
2. Roitt IM, Delves PJ. (2011). *Roitt's Essential Immunology*, 12th edition, Wiley-Blackwell
3. Goldsby RA, Kindt TJ, Osborne BA. (2007). *Kuby's Immunology*, 6th edition, W.H. Freeman
4. Murphy K, Travers P, Walport M. (2008). *Janeway's Immunobiology*, 7th edition, Garland Science
5. Peakman M, Vergani D. (2009). *Basic and Clinical Immunology*, 2nd edition, Churchill Livingstone

1. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley- Blackwell Scientific Publication, Oxford.
2. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
3. MurphyK, TraversP,WalportM.(2008).Janeway'sImmunobiology. 7th edition Garland Science Publishers, New York.
4. PeakmanM, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
5. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

B. Sc. MLT - IV Semester
Course / Paper: Histopathology & Histotechniques - II
Paper Code: BML - 405

Learning Objective:
This paper aims to understand the principle, procedure, and demonstration of various tissue constituents and advanced tools.

Unit - I

Staining of Carbohydrates:

- Preparation of Schiff reagent
- PAS staining
- Alcian blue
- Staining of glycogen
- Amyloid
- Other staining methods

Connective Tissue & Its Staining:

- Trichrome staining
- Verhoeff stain
- Weigert Resorcin stain
- Gordon's and Sweet stain
- Gomori's method
- von Geison stain
- PTAH stain

Unit - II

Demonstration of minerals and pigments in tissue sample, Demonstration and identification of lipids, Demonstration of enzymes, diagnostic application and the demonstration of phosphatases, dehydrogenases, oxidases and peroxidases, Demonstration of microorganism on tissue specimens, Bacteria, AFB, Actinomyces, spirochetes, fungi

Unit-III
Demonstration of nucleic acids, Processing and staining of bone marrow sample.
Fixation,Processingandsectioncuttingofbones,eyeball,Techniquesinneuropathology:Neurons staining, Myelin, Neuropathology lab specimen handling

Unit-IV
Demonstrationofsexchromatin,Museumtechniques

Electronmicroscopy:Principleandworking,fixation,processingand stainingoftissue Fluorescence Microscope: Principle and working

Unit-V
Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP,

PAP Staining, Quality control in histopathology

Learning Outcome: Students would be able to perform various staining techniques andunderstand principle and application of various techniques.

Suggested Readings:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Harshmohan (2017), Textbook of Pathology, 7th Edition, Jaypee Publications
3. Godkar, B. Praful (2016), Textbook of MLT, 3rd Edition, Bhalani Publications
4. C. F. A. Culling (1974), Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques, 3rd Edition, Butterworths Publishers

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Practical Syllabus

B. Sc. MLT - IV Semester

BML-491 (Clinical Haematology - II)

1. Staining of bone marrow
2. To perform sickling test
3. To determine fetal haemoglobin
4. To perform Heinz bodies test
5. Demonstration of leukemic slides
6. To perform LAP scoring
7. To determine total platelet count
8. To perform PT (Prothrombin Time)
9. To perform APTT (Activated Partial Thromboplastin Time)
10. To perform Thrombin Time
11. To perform D-dimer test
12. To determine fibrinogen concentration
13. General blood picture
14. To demonstrate malarial slides
15. Haemoglobin electrophoresis
16. Demonstration of hemoparasites like Trypanosomes, Filaria, Malaria

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BML-492 (Fundamentals of Microbiology, Immunology & Serology - II)

1. Demonstration of Autoclave and sterilization of media
2. Demonstration of Laminar Air Flow and media preparation
3. Preparation of culture plates
4. Demonstration of Centrifuge
5. Demonstration of Hot Air Oven and sterilization of glassware
6. Demonstration of Incubator and preservation of cultures
7. Preparation of media
8. Antibiotic sensitivity test
9. Microscopic examination of urine
10. Examination of urine
11. Examination of sputum

12. To perform HIV Tridot test
13. To perform Radial Immunodiffusion test
14. To perform Immunoprecipitation method
15. To perform HBsAg rapid test
16. To perform ASO test
17. To perform ELISA test
18. To perform TB IgG & IgM test
19. To perform Dengue IgG & IgM test
20. To perform Typhoid test

BML-492 (Fundamentals of Microbiology, Immunology & Serology - II)
21. Introduction of Allergy panel
22. Montoux test

BML-493 (Histopathology & Histotechniques - II)

1. Grossing of tissue
2. To perform tissue processing by manual method
3. To perform section cutting of paraffin-embedded tissue
4. To fix the smear on glass slide
5. To perform Hematoxylin and Eosin staining
6. To perform PAS staining
7. To perform AFB staining

B. Sc. MLT - V Semester
Course / Paper: Immunohematology & Blood Banking
Paper Code: BML-501
Learning Objective: The prime concern of this subject is to learn about the concepts of blood grouping, blood collection, infectious markers determination, compatibility testing, and quality control involved in blood transfusion services.

Unit - I

- Basic principles of blood banking
- Antigen, Antibody, naturally occurring antibody
- Complement
- ABO & Rh blood group system
- Methods of blood group determination: Forward and Reverse grouping, Slide & Tube method, Gel method

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Unit - II

- Other blood group systems such as Lewis, MNS, Kell, Duffy, etc.
- Anticoagulants and preservatives used in blood bank
- Donor selection criteria
- Blood collection and processing

Unit - III

- Transfusion transmissible infectious disease screening
- Coombs test

- Cross matching and compatibility testing
- Antibody screening & identification
- Grading of reaction/agglutination

Unit - IV

- Blood components and their preparation, preservation, storage, and transportation
- Indications for different blood component transfusion
- Blood transfusion reactions and their types
- HDN (Hemolytic Disease of Newborn)
- Introduction to stem cell banking and bone marrow transplantation

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Unit - V

- Apheresis: indications of hemapheresis, plasmapheresis, plateletpheresis
- Quality control of reagents, equipment, and blood components used in transfusion medicine
- Role of NACO, Indian Red Cross Society, DGHS, and blood transfusion services

Learning Outcome: Students will understand the basics of transfusion medicine, laboratory testing, quality control, and apheresis techniques

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Suggested Readings:

1. Godkar, B. Praful (2016), Textbook of MLT, 3rd Edition, Bhalani Publications
2. Ochei, J. & Kolhatkar, A. (2000), Medical Laboratory Science: Theory & Practice, 3rd Edition, McGraw Hill Education

Suggested Readings (continued)

1. Ochei, J. & Kolhatkar, A. (2000), *Medical Laboratory Science: Theory & Practice*, 3rd Edition, McGraw Hill Education
2. Mukherjee, L. K. (2017), *Medical Laboratory Technology*, Vol. 1–3, 3rd Edition, Tata McGraw Hill
3. Sood, Ramnik (2015), *Textbook of Medical Laboratory Technology*, 2nd Edition, Jaypee Publications
4. Wintrobe's *Clinical Hematology* (2014), 13th Edition, Lippincott Williams & Wilkins

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B. Sc. MLT - V Semester
Course / Paper: Clinical Enzymology & Automation
Paper Code: BML-502

Learning Objective: This course is formulated to impart comprehensive knowledge of enzymes and automation in clinical laboratories.

Unit - I

- Introduction to enzymes
- Classification of enzymes
- Isoenzymes
- Concept of lock and key theory and induced fit theory
- Concept of activation energy and binding energy
- Factors affecting enzyme activity

Unit - II

- Coenzymes: classification, types, and functions
- Structure of NAD+, NADP+, FAD, and FMN
- Pentose phosphate pathway (PPP)
- Units for measuring enzyme activity
- Factors affecting enzyme levels in serum/plasma
- Clinical assays: types, kinetic assay, and endpoint assay

Unit - III

- Enzyme kinetics: Michaelis-Menten equation and physiological significance
- Enzyme inhibition: types of inhibitors

Unit - IV

- Isoenzymes, tissue distribution, and clinical significance:
  - ALT, AST, ALP, GGT
  - CPK, CK-MB
  - LDH, Troponin, Myoglobin
  - Amylase, Lipase, ACP

Unit - V

- Basic concepts of automation
- Principle, working, and maintenance of clinical chemistry analyzers
- Point-of-care testing
- Hospital laboratory management

Learning Outcome: Students will be able to understand contemporary methods and practical approaches used in clinical laboratories for disease investigation, as well as the application of automation in laboratory practice.

Suggested Readings:

1. Vasudevan, D. M. (2011), *Textbook of Medical Biochemistry*, 6th Edition, Jaypee Publishers
2. Chatterjea, M. N. & Shinde, R. (2012), *Textbook of Medical Biochemistry*, 8th Edition, Jaypee Publications
3. Singh, S. & Sahni, (2008), *Introductory Practical Biochemistry*, 2nd Edition, Alpha Science
4. Lehninger, (2013), *Principles of Biochemistry*, 6th Edition, W. H. Freeman
5. Satyanarayan, U. (2008), *Essentials of Biochemistry*, 2nd Edition, Standard Publishers
6. Teitz, (2007), *Fundamentals of Clinical Chemistry*, 6th Edition, Elsevier Publications
7. Bishop, (2013), *Clinical Chemistry*, 7th Edition, Wiley Publications

B. Sc. MLT - V Semester
Course / Paper: Parasitology & Virology
Paper Code: BML-503

Learning Objective:
This paper aims to provide knowledge on the introduction, general characteristics, life cycle, and laboratory diagnosis of various medically important parasites and viruses.

Unit - I: Parasitology

Introduction of Parasites:

- Host, zoonosis, host-parasite relationship
- Sources and mode of infection
- Pathogenesis
- Immunity in parasitic infection
- Laboratory diagnosis

Protozoology:

- *Entamoeba histolytica*
- Malarial parasites
- *Leishmania*
- Trypanosomes
- Morphology, life cycle, pathogenesis, clinical features, and lab diagnosis

Helminthology:

- Introduction and classification
- *Taenia solium*, *Taenia saginata*, *Fasciola*, *Ascaris*, *Wuchereria bancrofti*: morphology, life cycle, pathogenesis, clinical features, lab diagnosis
- Hookworm, *Trichuris*, *Dracunculus*: morphology, life cycle, pathogenesis, clinical features, lab diagnosis

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Unit - II: Diagnostic Methods in Parasitology

- Introduction to parasitological diagnostic methods
- Examination of stool, urine, and blood
- Culture methods
- Immunological diagnosis and serology

Unit - III: Virology - Basics

Nature and Properties of Viruses:

- Discovery of viruses, definition, and general properties
- Concept of viroids, virusoids, satellite viruses, and prions

Structure of Viruses:

- Capsid symmetry
- Enveloped and non-enveloped viruses

Isolation, Purification, and Cultivation of Viruses

Viral Taxonomy:

- Classification and nomenclature of different groups of viruses

Modes of Viral Transmission:

- Persistent, non-persistent, vertical, and horizontal

Viral Multiplication and Replication Strategies:

- Interaction with cellular receptors and viral entry
- Assembly, maturation, and release of virions

Unit - IV: Medically Important Viruses

- Poxviruses, Herpesviruses, Hepatitis viruses
- Retroviruses (HIV), Picornaviruses, Rhabdoviruses, Orthomyxoviruses, Paramyxoviruses
- TORCH profile
- Symptoms, modes of transmission, prophylaxis, and control of:
    - Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza
    - Brief description of Swine Flu, Ebola, Chikungunya, Japanese Encephalitis

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Unit - V: Oncogenic Viruses and Viral Control

- Introduction to oncogenic viruses
- Types of oncogenic DNA and RNA viruses
- Concepts of oncogenes and proto-oncogenes
- Prevention and control of viral diseases
- Antiviral compounds and their mode of action
- Interferons and their mechanism
- General principles of viral vaccination

Learning Outcome: Students would be able to identify various viruses with latest biomedical techniques and can demonstrate the diseases associated withthem.

SuggestedReadings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of

Microbiology. 8th edition, University Press Publication
2. BrooksG.F., CarrollK.C.,ButelJ.S.,MorseS.A.andMietzner,T.A.(2013)
3. Adelberg'sMedicalMicrobiology.26thedition.McGrawHillPublication
4. Goering R., Dockrell H., Zuckerman M. and WakelinD. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
1. WilleyJM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley andKlein's Microbiology. 9th edition. McGraw Hill Higher Education
2. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication

B.Sc. MLT- V Semester
Course/Paper:DiagnosticCytology
Paper Code: BML-504

Learning Objective: The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens.

Unit-I
Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors,Instruments used in cytology, preparation of buffers, stainsMicroscopy: Light, compound, phase contrast, fluorescence

Unit-II
InstrumentsandequipmentsusedincytologyFixationandFixatives usedincytology, Adhesive and mounting media, Cell block and cytospin technique,
Staining suchasPAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP- HPV,Destaining and restaining of slides, Cover slipping

Unit-III
Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure

Unit-IV
Pap staining, Progressive & Regressive, Hormonal cytology in different age groups,Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample

Unit-V
Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automatedscreeningdevice
LearningOutcome:Studentswouldbeabletoperformcollection,processing,staining

B. Sc. MLT - V Semester
Course / Paper: Principles of Laboratory Management & Medical Ethics
Paper Code: BML-505

Learning Outcome:
The students will be made aware of the basic ethics, good laboratory practices, and safety awareness in a clinical laboratory.

Suggested Readings:

1. Bibbo, (1997), *Comprehensive Cytopathology*, 2nd edition, Saunders Publishers
2. Koss's *Diagnostic Cytology*, Vol. 1 & 2, (2006), 5th edition, Lippincott

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Unit - I: Ethical Principles & Good Laboratory Practices

- Ethical principles and standards for a clinical laboratory professional
- Duty to the patient, duty to colleagues and other professionals
- Good Laboratory Practice (GLP): introduction, basics, aims, advantages
- Accreditation: national and international agencies for clinical laboratory accreditation

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Unit - II: Laboratory Safety & Sample Management

- Awareness and safety in clinical laboratories, general safety precautions
- HIV: pre- and post-exposure guidelines
- Hepatitis B & C: pre- and post-exposure guidelines
- Drug-resistant tuberculosis precautions
- Patient management for sample collection, transportation, and preservation
- Sample accountability: purpose, methods, and importance

Unit - III: Sample Analysis & Reporting

- Factors affecting sample analysis
- Reporting results: format of a test report, reference ranges, clinical alerts
- Handling abnormal results, results from referral laboratories
- Release of examination results and avoiding report alterations

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Unit - IV: Quality Management System (QMS)

- Introduction to quality management system in clinical laboratories
- Quality assurance and quality control: internal and external
- Quality control charts and documentation
- Calibration and validation of clinical laboratory instruments

- Ethics in laboratory practice: pre-examination procedures, examination procedures, reporting results, preservation of medical records
- Procurement of equipment and inventory control

Unit - V: Laboratory Audits & Management Systems

- Laboratory audit: introduction, importance, responsibility, planning
- Types of audit: horizontal, vertical, and test audit
- Frequency of audits and proper documentation
- NABL & CAP guidelines
- Overview of Laboratory Information System (LIS), Hospital Information System (HIS), and financial management

Learning Outcome:
Students will be competent to understand sample accountability, quality management systems, biomedical waste management, calibration and validation of clinical laboratory instruments, LIS & HIS, and financial management in a clinical laboratory.

Suggested Readings:

1. Teitz, (2007), *Fundamentals of Clinical Chemistry*, 6th edition, Elsevier Publications
2. Bishop, (2013), *Clinical Chemistry*, 7th edition, Wiley Publications
3. *Henry's Clinical Diagnosis and Management by Laboratory Methods*, (2011), 22nd edition, Elsevier

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Practical Syllabus – B.Sc. MLT V Semester

BML-591: Clinical Enzymology

1. To perform enzyme estimation of LFT (Liver Function Tests)
2. To perform enzyme estimation of Cardiac profile
3. Determination of Troponin I
4. To perform enzyme estimation for Pancreatic disorders
5. To perform estimation of ACP (Acid Phosphatase)
6. Antenatal profile
7. Estimation of Bicarbonate
8. Arterial Blood Gas (ABG) analysis
9. Determination of Calcium
10. Creatinine and Urea clearance test

BML-592: Practical Parasitology & Virology

1. Leishman staining for malarial parasites
2. Demonstration of permanent slides of Trichuris, Ascaris, and Hookworm
3. Saline wet mount for observing ova and eggs of parasites
4. Iodine wet mount for observing ova and eggs of parasites
5. Concentration of stool samples by flotation method
6. Zinc sulphate concentration method for stool samples
7. Demonstration of various parasites by permanent slides
8. Concentration of stool samples by sedimentation method
9. Serological diagnosis of Leishmania
10. Aldehyde Chopra test for Kala Azar
11. To perform HBsAg / Australia Antigen by rapid method
12. To perform HBsAg by ELISA
13. To perform HIV Tridot method
14. To perform HIV by ELISA
15. To perform Dengue IgG / IgM test
16. To perform TORCH profile
17. Demonstration of PCR for HBV
18. Demonstration of PCR for HIV viral load

BML-593: Practical Diagnostic Cytology

1. Preparation of various cytological fixatives
2. Preparation of various stains used in cytology
3. Preparation of smear
4. To perform PAP (Papanicolaou) staining
5. To perform Giemsa staining on fluid samples

B.Sc. MLT – VI Semester

Course/Paper: Clinical Endocrinology & Toxicology

Paper Code: BML-601
Learning Objective: This paper is framed to provide basic knowledge of hormones and toxic substances, their determination techniques, and related disorders.

Unit-I:

- Hormones: Definition and classification
- Organs of the endocrine system, their secretion and function
- Regulation of hormone secretion
- Mechanism of action

Unit-II:

- Thyroid function tests
- Thyroid hormones: T3, T4, TSH, FT3, FT4, TBG
- Biological function of thyroid hormones
- Disorders associated with thyroid dysfunction: Hypothyroidism, Hyperthyroidism
- Determination techniques for thyroid hormones

Unit-III:

- Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free Testosterone, DHEA-S, 17-Ketosteroids, Prolactin
- Estimation and clinical significance
- Reference ranges
- Hypo- and hypersecretion disorders
- Triple Test

Unit-IV:

- Growth hormone, ACTH, Aldosterone, Cortisol
- Estimation and clinical significance
- Reference ranges
- Hypo- and hypersecretion disorders

Unit-V:

- Introduction to Toxicology
- Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning
- Drug abuse: screening procedures
- Spot tests, hair and urine tests
- Immunoassay for drugs

Learning Outcome: After completing this course, students will be able to detect hormones and toxic substances in blood samples and understand the basis of endocrine disorders.

Suggested Readings:

1. Teitz, (2007), *Fundamentals of Clinical Chemistry*, 6th edition, Elsevier Publications
2. Bishop, (2013), *Clinical Chemistry*, 7th edition, Wiley Publications
3. *Henry's Clinical Diagnosis and Management by Laboratory Methods*, (2011), 22nd edition, Elsevier
4. DMVasudevan, (2011), *Textbook of Medical Biochemistry*, 6th edition, Jaypee Publishers
5. MN Chatterjea & Rana Shinde, (2012), *Textbook of Medical Biochemistry*, 8th edition, Jaypee Publications
6. Singh & Sahni, (2008), *Introductory Practical Biochemistry*, 2nd edition, Alphascience
7. Lehninger, (2013), *Principles of Biochemistry*, 6th edition, WH Freeman

Course/Paper: Advanced Diagnostic Techniques

Paper Code: BML-602

(You can provide the detailed units for BML-602, and I can format it in the same style as above.)

B.Sc. MLT – VI Semester

Course/Paper: Advanced Diagnostic Techniques

Paper Code: BML-602
Learning Objective: This paper imparts the required skills for the detection of diseases, and the operation and application of various advanced techniques.

Unit-I: Chromatography

- Principle, types, and applications
- Paper Chromatography
- Thin Layer Chromatography (TLC)
- High Performance Liquid Chromatography (HPLC)
- Gas Liquid Chromatography (GLC)
- Ion Exchange Chromatography
- Applications in clinical diagnosis

Unit-II: Electrophoresis

- Basic principle of electrophoresis
- Paper electrophoresis
- Gel electrophoresis: PAGE, SDS-PAGE, Agarose gel electrophoresis
- Buffer systems in electrophoresis
- Electrophoresis of proteins and nucleic acids, hemoglobin, immunoglobulins, isoenzymes
- Applications in clinical diagnosis

Unit-III: Centrifugation

- Fixed angle and swinging bucket rotors
- Relative centrifugal force (RCF) and sedimentation coefficient
- Differential centrifugation
- Density gradient centrifugation
- Ultracentrifugation

Unit-IV: Radioisotopes

- Radioactivity, measurement instruments
- Applications of radioisotopes in clinical biochemistry

Unit-V: Immunoassay

- ELISA (Enzyme-Linked Immunosorbent Assay)
- RIA (Radioimmunoassay)
- FIA (Fluorescent Immunoassay)
- FACS (Fluorescence-Activated Cell Sorting)
- Applications in clinical diagnosis

Learning Outcome: Students will be equipped with advanced skills to operate diagnostic techniques and work in an advanced diagnostic setting.

Suggested Readings:

1. Teitz, (2007), *Fundamentals of Clinical Chemistry*, 6th edition, Elsevier Publications
2. *Henry's Clinical Diagnosis and Management by Laboratory Methods*, (2011), 22nd edition, Elsevier
3. Singh & Sahni, (2008), *Introductory Practical Biochemistry*, 2nd edition, Alphascience
4. Lehninger, (2013), *Principles of Biochemistry*, 6th edition, WH Freeman
5. Wilson & Walker, *Practical Biochemistry*, 2nd edition

Course/Paper: Diagnostic Molecular Biology

Paper Code: BML-603
Learning Objective: This syllabus provides a basic introduction to molecular biology and its techniques like PCR, RT-PCR, and related methods.

Unit-I: Nucleic Acids

- DNA and RNA: composition, structure, and types
- Denaturation and renaturation of DNA
- Chemistry of DNA synthesis
- General principles of replication
- Enzymes involved in DNA replication: DNA polymerases, DNA ligase, primase, telomerase, and other accessory proteins

B.Sc. MLT – VI Semester

Course/Paper: Diagnostic Molecular Biology

Paper Code: BML-603
Learning Objective: Provides a foundational understanding of molecular biology techniques like PCR, RT-PCR, blotting, cytogenetics, and their applications in diagnostics.

Unit-II: Transcription & Translation

- Basic transcription apparatus
- Initiation, elongation, and termination of transcription
- Eukaryotic transcription of mRNA, tRNA, and rRNA
- Types of RNA polymerases
- Transcription factors
- Introduction to translation

Unit-III: Nucleic Acid Amplification

- PCR (Polymerase Chain Reaction): principle, types, applications
- Thermal cycler operation
- RT-PCR (Reverse Transcriptase PCR)
- Nested PCR

Unit-IV: Blotting & Chromosomal Studies

- Southern blotting, Western blotting
- Introduction to chromosomes, structure, and disorders
- Karyotyping
- Chromosomal studies in hematological disorders (PBLC and Bone Marrow)
- FISH (Fluorescence in situ Hybridization)

Unit-V: Advanced Applications

- Radioisotopes: measurement of blood volume, red cell volume, plasma volume, red cell life span, platelet life span
- Radiation hazards and safe disposal of radioactive material
- Introduction and applications of Flow Cytometry
- Stem cell banking
- Prenatal diagnosis

Learning Outcome: Students will be prepared to take on future molecular biology challenges and efficiently work in diagnostic molecular setups.

Suggested Readings:

1. Teitz, (2007), *Fundamentals of Clinical Chemistry*, 6th edition, Elsevier Publications
2. *Henry's Clinical Diagnosis and Management by Laboratory Methods*, (2011), 22nd edition, Elsevier
3. Singh & Sahni, (2008), *Introductory Practical Biochemistry*, 2nd edition, Alphascience
4. Lehninger, (2013), *Principles of Biochemistry*, 6th edition, WH Freeman

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Practical Syllabus – B.Sc. MLT VI Semester

BML-691: Practical Clinical Endocrinology & Toxicology

1. Determine T3 concentration in serum sample
2. Determine T4 concentration in serum sample
3. Determine TSH concentration in serum sample
4. Determine LH concentration in serum sample
5. Determine FSH concentration in serum sample
6. Determine Prolactin concentration in serum sample
7. Repeat determination of TSH (verification)
8. Perform TRIPLE test
9. Demonstration of male and female infertility tests
10. Beta HCG estimation

BML-692: Practical Advanced Diagnostic Techniques

1. Separation of amino acids by paper chromatography
2. Separation of amino acids by thin layer chromatography (TLC)
3. Separation of DNA by agarose gel electrophoresis
4. Separation of proteins by PAGE
5. Separation of proteins by paper electrophoresis
6. Separation of hemoglobin

B.Sc. MLT – VI Semester

Practical Syllabus

BML-693: Practical Diagnostic Molecular Biology

1. Isolation of DNA
2. Separation of DNA by agarose gel electrophoresis
3. Demonstration of thermal cycler and PCR
4. HIV test by Western Blotting
5. Perform karyotyping
6. Demonstration of PCR HLA-B27
7. Demonstration of PCR HIV
8. Demonstration of PCR MTB

Learning Outcome: Students will gain hands-on experience in molecular diagnostics including DNA isolation, amplification, electrophoresis, and interpretation of PCR and Western blot results for infectious and genetic disorders.

BML-686: Hospital Internship and Project

Objective: Practical exposure in real clinical laboratory settings to develop skills in patient sample handling, processing, and testing.

Training Components:

- Students shall be posted to various pathology laboratories within the hospital.
- Hands-on training in handling patient samples: blood, urine, sputum, stool, and other body fluids.
- Identification of patient particulars based on CR number and Lab Number.
- Transfer of samples from collection centers to different laboratory sections.
- Participation in performing various diagnostic tests across lab sections.
- Maintenance of a logbook documenting postings, procedures performed, and observations.

Evaluation:

- Continuous assessment by faculty of respective laboratory sections.
- Monthly submission of student performance records by faculty to HOD.
- Marks will be awarded out of 100 based on performance, adherence to protocols, and documentation in logbook.

Learning Outcome:

- Competency in clinical sample handling, laboratory procedures, and accurate record-keeping.
- Understanding workflow in a hospital laboratory including sample transfer, test execution, and result reporting.
- Preparation for independent laboratory practice in clinical diagnostics.