



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore **Shri Vaishnav Institute of Paramedical Sciences**

SCHEME OF EXAMINATION: **BACHELOR IN MEDICAL LAB TECHNOLOGY (BMLT)** **2024-25 Batch First Year B.M.L.T. Examination**

There shall be one paper setter external or internal for theory examination and two examiners, one internal (Chairman) and one external for practical examinations for subjects **Basic Histology, Microbiology, Biochemistry and Hematology**.

Theory papers will of 100 max. marks and 3Hrs. time duration.

Pattern of Examination (Theory) if Maximum Marks are 100 will be as under-

No. & Type of Question	Marks for each question	Total Max. Marks
10 Very Short Answer Questions (Answer to be given in 50-60 words)	02	20
5 Short Answer Questions (Answer to be given in 250-300 words)	10	50
2 Essay Type Questions (Answer to be given in 450-500 words)	15	30
		100

INSTRUCTION FOR THE PAPER SETTER

Section-A: This will consist of 10 very short answer type questions with answers to each question upto five lines (Fifty to sixty words) in length. All questions will be compulsory to answer. Each question will carry two marks. Total weight age of the section shall be 20 marks.

Section-B: This will consist of short answer questions with answers to each question upto 2 pages (250-300 words) in length. Eight questions will be set by the examiner and five must be answered by the candidate. Each question will carry 10 marks. Total weight age of the section shall be 50 marks.

Section-C: This will consist of essay type questions with answers to each question upto 5 pages (approx 500 words) in length. Four questions will be set by the examiner and two must be answered by the candidate. Each question will carry 15 marks. Total weight age of the section shall be 30 marks.

INSTRUCTIONS FOR THE CANDIDATES: Answer all questions only in required words.

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Examination Scheme: BMLT
Syllabus BMLT I Year Session 2024-2025

S.NO.	COURSE CODE	COURSE NAME	Teaching Scheme/ Week		EXAMINATION SCHEME						TOTAL MARKS
					THEORY			PRACTICAL			
			L	T	P	End University Exam	Mid Year Exam	Teachers Assessment	End University Exam	Teachers Assessment	
1	BMLT101	Basic Histology-I (Anatomy & Physiology)	4	0	2	100	60	40	100	0	300

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; *Teacher Assessment shall be based on the following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs): The students will

CEO 1: Proficiently perform a full range of clinical laboratory tests.

CEO 2: Develop and evaluate test systems and interpretive algorithms.

CEO 3: Manage information to enable effective, timely, accurate, and cost-effective reporting of laboratory-generated information.

CEO 4: Communicate with other members of healthcare team, customers and patients in an effective manner.

Course Outcomes (COs) upon successful completion of this course the student will:

COs 1: Proficiency in discovering newer methods of analysis.

COs 2: Understand the diagnostic tests, instrument calibration and develop new testing kits in field of research.

COs 3: Understand routine laboratory procedure.

COs 4: Understand the logical interpretation of clinical lab investigations.

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SYLLABUS:

UNIT 1:

1. Introduction to human body structures, terminologies.
2. Introduction to cell and cellular structures.
3. Blood morphology, chemistry and function.
4. Body fluids and their significance.
5. Blood morphology, chemistry and function.

UNIT 2:

1. Introduction to Skeletal system.
2. Introduction to bones and its development.
3. Structure and types of muscles.
4. Joints and its classification.

UNIT 3:

1. Respiratory system.
2. Cardiovascular and Alimentary system.
3. Mechanism and physiology of digestion and absorption.
4. Liver structure.
5. Urinary system.

UNIT 4:

1. Reproductive organs- Male and Female.
2. Introduction and detailing of nervous system.
3. Spleen, lymph node and reticuloendothelial system.
4. Endocrine glands and their functions.

UNIT 5:

1. Introduction to histopathology and laboratory organization.
2. Laboratory equipment uses and maintenance.
3. Laboratory hazards and safety precautions.
4. Compound microscope - optical system, magnification and maintenance.

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UNIT 6:

1. Reception, recording and labelling of histology specimens.
2. Fixation and various fixatives.
3. Processing of histological tissues for paraffin bedding.
4. Embedding and embedding media.

UNIT 7:

1. Decalcification and its types.
2. Microtomes various types, their working principle and maintenance.
3. Microtome knives and knife sharpening.
4. Practical section cutting, cutting faults and remedies.

UNIT 8:

1. Routine staining procedures, mounting and mounting media. Dye chemistry, theory and practice of staining. Solvents, mordents, accelerators and accentuators.
2. Uses of controls in various staining procedures.
3. Introduction to exfoliative cytology with special emphasis on female genital tract.
4. Collection processing and staining of the Cytologic specimen

Suggested Readings:

1. Junqueira's Basic Histology by Anthony L. Mescher
2. Ross & Wilson Anatomy and Physiology in Health and Illness by Anne Waugh and Allison Grant (for basics)
3. Color Atlas of Histology by Leslie P. Gartner

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1	BMLT103	Microbiology- I	4	0	2	100	60	40	100	0	300	

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UNIT I: Fundamentals of Microbiology

1. Introduction and brief history of microbiology.
2. General characteristics and classification of bacteria and fungi
3. Growth and nutrition of microbes
4. General characters and nature of antigens and antibodies
5. Principles of Antigen-Antibody reactions
6. Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi

UNIT 2: Laboratory Techniques and Practices

1. Safety measures in microbiology
2. Care and maintenance of laboratory equipment
3. Care and handling of various microscopes – binocular, DGI, phase-contrast, fluorescence, and electron microscopes
4. Principles and methods of sterilization
5. Uses and mode of action of antiseptics and disinfectants
6. Handling and cleaning of glassware apparatus
7. Decontamination and disposal of contaminated material
8. Preparation, uses, and standardization of culture media
9. Principles of staining methods and preparation of reagents
10. Aerobic and anaerobic culture methods

UNIT 3: Clinical and Applied Microbiology

1. Collection, transportation, and processing of clinical samples for microbiology investigations
2. Care and handling of laboratory animals.
3. Laboratory organization, management, recording of results, and quality control in microbiology.

UNIT 4: Virology

1. Introduction to Medical Virology.
2. Nomenclature and classification of viruses.
3. General characteristics of viruses: physical, chemical and biological properties.
4. Collection, transport, processing and storage of samples for viral diagnosis.

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UNIT 5:

1. Introduction to medical and safety.
2. General characters and classification of protozoa.
3. Laboratory procedure collections, preservation and processing of samples for parasites stool/blood/fluids/tissue/biopsy.
4. Morphology and life cycles of intestinal protocol, Amoeba Giardia.
5. Laboratory diagnosis of intestinal protozoa infection: - Amoeba-Giardia.
6. Morphology and diagnosis of oral of – trichomonas vaginal flagellates –Gingivalia.
7. Morphology and life cycle of Haemopro malaria protozoa parasite.
8. Laboratory diagnosis of malarial infection.
9. General characters and classification of medical helminthology.
10. Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobius - ancylostoma, - Strongyloides.
11. Laboratory diagnosis of intestinal Nematode infection.

PRACTICAL:

1. Introduction to use of different laboratory instruments and their safety precautions.
2. Collection, handling and storage of samples for viral diagnosis.
3. Washing, cleaning and sterilization of media and glassware in virology.
4. Principles of bio safety hoods, use of pipettes, syringes and other virus contaminated instruments in the laboratory.
5. Demonstration of preservation of viruses, viral antigens, infected biological materials and viruses.
6. Introduction to operation of laboratory instruments and safety precautions.
7. Macroscopic examination of adult worms, cysts, tissues, and processing of stool sample for routine examination.
8. Saline and I2 preparation for protozoa cysts and trophozoites.
9. Concentration procedures for protozoa cysts and trophozoites.
10. Concentration procedures for helminthic ova and cyst.
11. Examination and identification of ova and cyst of parasites of medical importance.

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Suggested Readings:

1. Jawetz, Melnick & Adelberg's Medical Microbiology by Karen C. Carroll et al.
2. Microbiology by Prescott, Harley, and Klein
3. Ananthanarayan and Paniker's Textbook of Microbiology by R. Ananthanarayan & C.K. Jayaram Paniker

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1	BMLT102	Biochemistry-I	4	0	2	100	60	40	100	0	300

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Course Educational Objectives (CEOs): The students will learn

CEO 1: Understand the fundamentals of medical laboratory science, including the scope, ethics, and professional responsibilities of laboratory technologists.

CEO 2: Demonstrate knowledge of laboratory safety protocols, first aid procedures, and proper handling, collection, and disposal of biological specimens.

CEO 3: Acquire skills in the operation, cleaning, and maintenance of laboratory glassware, instruments, and preparation of reagents and standard solutions.

CEO 4: Comprehend the biochemical principles underlying analytical techniques such as pH measurement, osmosis, dialysis, and qualitative analysis of biological samples.

CEO 5: Apply statistical tools and data interpretation methods including measures of central tendency, variation, and probability in laboratory result evaluation

Course Outcomes (COs) on successful completion of this course, the students will be able to:

COs 1. Explain the role, ethical conduct, and professional duties of a medical laboratory technologist in healthcare systems.

COs 2. Implement laboratory safety guidelines and manage biological materials with appropriate preservation and disposal methods.

COs 3. Operate and calibrate essential laboratory equipment and perform basic analytical and volumetric techniques with accuracy.

COs 4. Perform and interpret routine biochemical tests on urine, serum, and faecal samples following standard laboratory procedures.

COs 5. Analyze and present laboratory data using basic biostatistical methods to ensure reliability and precision in results.

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Unit 1: Introduction to Medical Laboratory Science and Safety

1. Introduction to medical technology
2. Role of medical laboratory technologists
3. Ethics, responsibilities of laboratory technologists
4. Laboratory safety measures
5. First aid (accidents)
6. Collection and recording of biological specimens
7. Preservation and disposal of biological materials
8. Normal or reference ranges – definition, influencing factors, and determination

Unit 2: Laboratory Equipment, Techniques, and Reagents

1. Cleaning and care of general laboratory glassware and equipment
2. Preparation and storage of distilled water
3. Analytical balance
4. Preparation of reagents and standard solutions
5. Storage of chemicals
6. Units of measurement and S.I. units
7. Measurement and calibration of volumetric apparatus (pipettes, flasks, cylinders)
8. Volumetric analysis – preparation of standard acid and base solutions, chloride estimation

Unit 3: Biochemical Principles, Analytical Methods, and Data Handling

1. Radioisotopes and their use in Biochemistry
2. Mole, molar and normal solutions
3. pH and buffer solutions
4. pH measurement
5. Osmosis, dialysis, surface tension
6. Urine analysis (qualitative) – sugar, proteins, bile pigments, ketone bodies, porphobilinogen
7. Faecal analysis for blood
8. Separation of serum and plasma
9. Basic statistics – mean, standard deviation (SD), coefficient of variation (CV), normal distribution, probability.

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PRACTICALS:

1. To study general laboratory safety rules.
2. To demonstrate glassware, apparatus and plasticwares used in laboratory.
3. Calibration of different weights and glass apparatus.
4. (Measuring cylinder, burette, pipette, volumetric flasks)
5. Preparation of different percentage solutions
6. Preparation of normal and molar solutions (0.1 N NaOH, 0.2 N HCl)
7. Demonstration of photo colorimeter
8. Demonstration of spectrophotometer
9. Demonstration of pH meter
10. Prepare Phosphate buffer (pH 7.4)

Suggested Reading:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition, Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers

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Examination Scheme: BMLT
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1	BMLT104	Hematology -I	4	0	2	100	60	40	100	0	300

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Course Educational Objectives (CEOs): The students will learn

CEO 1: Understand the basic structure, functions, and components of blood and the hematopoietic system.

CEO 2: Identify and describe normal and abnormal blood cells using microscopy and staining techniques.

CEO 3: Perform routine hematological tests, including complete blood count (CBC), hemoglobin estimation, hematocrit, and ESR.

CEO 4: Explain the physiological basis and clinical significance of various hematological parameters.

Course Outcomes (COs) upon successful completion of this course the student will:

COs 1: Demonstrate comprehensive knowledge of hematology concepts, blood physiology, and laboratory techniques.

COs 2: Perform and interpret hematological laboratory procedures accurately and safely.

COs 3: Analyze hematological data to diagnose and resolve clinical cases.

COs 4: Effectively communicate laboratory findings and clinical interpretations.

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Unit 1: Introduction and Laboratory Organization

1. Introduction to hematology and laboratory organization
2. Lab safety and instrumentation
3. Quality assurance in hematology

Unit 2: Blood Formation, Composition, and Anticoagulants

1. Formation of blood
2. Composition and functions of blood
3. Various anticoagulants, their uses, mode of action, merits and demerits
4. Collection and preservation of blood for hematological investigations

Unit 3: Hematological Parameters and Normal Values

1. Physiological variations in Hb, PCV, TLC, and platelet counts
2. Normal and absolute values in hematology

Unit 4: Hematological Techniques and Instrumentation

1. Hemoglobinometry: methods, errors, and instrument standardization
2. Hemocytometry: visual and electronic cell counts (RBC, WBC, platelets), error minimization
3. Romanowsky dyes: preparation and staining procedure of blood smears
4. Morphology and identification of normal blood cells

Unit 5: Specialized Hematological Tests and Examination of Biological Fluids

1. Erythrocyte sedimentation rate: influencing factors, procedures, and significance
2. Hematocrit value: macro and micro methods, merits and demerits
3. Routine examination of urine
4. Examination of biological fluids such as cerebrospinal fluid (CSF)
5. Examination of semen.

Suggested Reading:

1. Dacie and Lewis Practical Haematology by S.M. Lewis et al.
2. Hematology: Clinical Principles and Applications by Bernadette F. Rodak
3. Textbook of Hematology by Mohan H. Raizada (useful for practical and theory)

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PRACTICALS:

1. Phlebotomy.
2. Peripheral blood film, preparation, staining by Leishman stain & examination.
3. ESR & PCV estimation.
4. Understand Leishman's staining and calculate Differential WBC count.
5. Determination of packed cell volume.
6. Calculation of blood indices.

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